A case study of office occupants' environmental consciousness and practices in the context of a Green Star SA accredited building

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Dissentation

M Consumer Science (Interior Merchandise Management)

Supervisor: Dr N Sonnenberg
Co-supervisor: Prof AC Erasmus

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DEDICATION

This work is dedicated to my loving husband Teodor

DECLARATION

I, **Marie-Louis Bezuidenhoudt,** hereby declare that the dissertation for the **M in Consumer Science** degree at the University of Pretoria, hereby submitted by me, has not previously been submitted for a degree at this or any other university and that it is my own work in design and execution and that all reference material contained herein has been duly acknowledged.

Marie-Louis Bezuidenhoudt

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SUMMARY

Title of dissertation: A case study of office occupants' environmental consciousness and practices in the context of a Green Star SA accredited building.

by

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The environmental crisis is a certainty (Dunlap & Catton, 1994; IPCC, 2007; South Africa Property Review, 2009:15) and requires change within the objective reality of everyday social life (Spaargaren, 1998). In this regard Gidden's (1984) structuration theory was chosen as a suitable theoretical framework for this study as it emphasises that social reality is continually (re)produced and structured in space and time by competent actors in their everyday practices (Giddens, 1984; Nonaka & Toyama, 2003). In applying the underlying assumptions of this theory, building occupants of so called As Built Green Star SA certified office buildings are viewed as agents that interact within an environment that includes systems of provisions (i.e. social structures such as a built environment that facilitates pro-environmental office practices).

Although the right infrastructure is in place (i.e. systems of provision), the levels of commitment that the building occupants of a green building exhibit towards adjusting their behaviour and practices in it will eventually determine the actual final reduction of greenhouse

gas emissions, and the long-term cost reductions that are associated with greener technologies.

Too often, consumers' operational practices in their occupancy of green buildings are in direct contrast to the main purpose and objectives of environmental friendly behaviour (Frost Sullivan, 2010). In addition, a large portion of the South African population are simply struggling to satisfy their most basic needs with the result that an environmental 'ethos' or concern among the general public has not yet developed to an extent where environmental issues are viewed as a serious priority (Barker, Hill, Bowen & Evans, 2004). In this quantitative study the focus was on how the building occupant's practices reflect appropriate environmental knowledge and accompanying practical and discursive consciousness to engage in pro-environmental practices (e.g. energy saving, water saving as well as the waste reduction and recycling behaviour) in As Built Green Star SA certified buildings. For these reasons a purposive non-probability sampling approach was used to recruit 201 As Built Green Star SA certified building occupants. A structured questionnaire was developed and data was collected by means of electronic and paper-based survey questionnaires.

Knowledge and an environmental consciousness are central to the execution of practices and/or behaviours that reflect a pro-environmental approach. Within the context of a built environment such knowledge may be accumulated and shared through interactions between human agency (i.e. building occupants) and social structures (Nonaka, 1990, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). The results of the study indicate that consumers' overall explicit knowledge of climate change, general environmental facts and personal knowledge on environmental issues are average. Existing literature emphasizes that knowledge and actual behaviour are directly linked to each other. Due to lower general knowledge about environmental issues, building occupants may be less inclined to engage in behaviour that is in line with environmental guidelines that are set in place by the company's management. It is thus argued that if the occupants have the correct knowledge regarding green issues, behaviour could change accordingly.

The results further indicate that the majority of the building occupants work in large open-plan office spaces and thus have limited to no control over their direct office environment. This may have a direct influence on their routine office practices in the sense that they are not reminded of what is expected from them in terms of the application of their explicit knowledge.

Although the building design allows or supplies the green infrastructure it seems as if the building occupants are not willing or do not have explicit knowledge to 'use' the building in the correct way in terms of the lighting, HVAC (heating, ventilation and air conditioning) or window treatments. On the other hand the building infrastructure does not have a direct influence on some routine office practices such and draft printing settings and recycling practices which also influence green office practice.

The study also explored building occupants' actual behaviour to establish to what extent the building occupants use the building in the correct way. It can be concluded that the building occupants do not use the building correctly so that the As Built Green Star SA building operational targets are not met. The results indicate that respondents' discursive consciousness was constantly at a much high level than their actual routine office behaviour. Thus more stringent effort is needed to encourage building occupants to act upon their environmental consciousness and to demonstrate their commitment to go through with the actual pro-environmental practices. This study confirmed that the actual behaviour of a building occupant in an As Built Green Star SA certified building is an important precondition in realising the long term goals of green design and environmentally responsible building practices.

Keywords:

pro-environmental office behaviour, green building, structuration theory, environmental knowledge, building occupants

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

BIM	Building Information Modelling
BREEM	Building Research Establishment's Environmental Assessment Method
BRICS	Brazil, Russia, India, China and South Africa
BRIC	Brazil, Russia, India, and China
CO^2	Carbon Dioxide
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
EFA	Exploratory Factor Analysis
GBCA	Green Building Council of Australia
GBCSA	Green Building Council of South Africa
gha	global hectares
HIV	Human Immunodeficiency Virus
HVAC	Heating ventilation and air conditioning
IEA	International Energy Agency
IEQ	Indoor Environmental Quality
IPCC	International Panel on Climate Change
LEED	Leadership in Energy and Environmental Design
LSM	Living Standard Measure
NA	Not Applicable
PCA	Property Council of Australia
SA	South Africa
SAARF	South African Audience Research Foundation
SBS	Sick Building Syndrome
UK	United Kingdom
UNEP	United Nations Environment Programme
USA	United States of America
USEPA	United States Environmental Protection Agency

USGBC	United States' Green Building Council
VOC	Volatile organic compounds
WGBC	World Green Building Council
WWF	World Wide Fund of Nature

LIST OF ADDENDA

CHAPTER 1

THE STUDY IN PERSPECTIVE

1.1. BACKGROUND AND JUSTIFICATION FOR THE STUDY

Since the 1960s, the public's concern about environmental problems has gradually increased (Dunlap & Catton, 1994; Dunlap, Van Liere, Mertig, & Jones, 2000), in fact, to such an extent that it has become a cultural constant in Western society (Haanpää, 2007; International Panel on Climate Change [IPCC], 2007). In general, the negative effects of human consumption practices on the environment are widely acknowledged (Worldwatch Institute, 2006) and green consumption choices have become part of the consumer's everyday awareness (Autio & Wilska, 2005; Troy, 2008). Nowadays, governments of countries across the world, through rules and regulations, tend to force leading companies to adopt environmentally conscious and sustainable practices to which consumers too generally subscribe and encourage, such as effective energy consumption, reduction of greenhouse gas emissions, sustainable use of water and building materials as well as waste management (Mulholland & Matshe, 2009; Motau, 2010). It is claimed (IPCC, 2007) that ever so many consumers are aware that the state of our environment is reaching a crisis point. Climate change is actually unequivocally accepted by various role players as a cause for major environmental concern. However, the larger part of humanity continues to emit toxic carbon emission gas (CO_2 gas) and, despite consumers' environmental awareness, evidence confirms the existence of an attitude-behaviour gap (Rajecki, 1982; Kollmuss & Agyeman, 2002).

In South Africa's emerging market, pressing issues such as poverty, high unemployment rates, the human immunodeficiency virus (HIV) and the need for basic housing, potable water and food have taken precedence over environmental problems for the past number of years (Du Plessis, 2009). Currently, South Africa's ecological footprint is 2.4 per person/p gha, which is less than the world average of 2.7 p/p/p gha (World Wide Fund for Nature [WWF], 2012a). With that said, little specific attention seems to have been devoted to making South Africans aware of the environmental consequences of their behaviour. Moreover, to date, not enough

guidance is available to inform citizens of methods whereby they can reduce their environmental impact.

In 2010, South Africa became part of the BRICS (Brazil, Russia, India, China and South Africa) alliance in which the agreement included reference to a new focus on environmental issues. South Africa is in a similar situation to the other BRICS countries that too have to face several environmental difficulties due to a rapidly expanding economy and increased consumption patterns (WWF, 2012a). In 2009, BRIC economies accounted for more than 37% of all global carbon emissions, which is double the emissions reported in 1990 (International Energy Agency [IEA], 2012). These reports have led to a more explicit commitment to sustainable development in the BRICS countries (IEA, 2012). Among other targets, a 16% and 17% target reduction in energy use and carbon emissions respectively have been set for 2015 (IEA, 2012). The alliance with the BRICS countries has also led to amendments in policies and legislation in terms of the South African energy efficiency regulations, which makes it compulsory for all new buildings to be designed to a standard that minimises energy usage (Van der Merwe, 2010a). The 2008 energy crisis, which left many industries crippled due to continual electricity outages in key urban areas, provided further reason for the implementation of energy efficiency regulations (United Nations Environment Programme [UNEP], 2013). Although the reduction of energy and carbon emissions requires the commitment of all South African consumption sectors, the built environment warrants particular attention due to its significant environmental impact (Lockwood, 2006:1).

Globally, the construction industry, manufacturing and the life cycles of buildings consume between 40% and 50% of the total energy produced (Lockwood, 2006). In addition, the building sector utilises 40% of the world's raw materials (Roodman & Lenssen, 1995; Gustavsson & Sathre, 2006) and accounts for 12% of the world's fresh water consumption (IEA, 2012). Furthermore, this sector generates a third of the world's CO_2 emissions (IEA, 2012), which is more than any other single sector. According to a 2007 report, the total commercial greenhouse gas emissions are three times that of residential consumption (IPCC, 2007). Buildings also generate approximately 30% of the world's waste (Department of Environmental Affairs and Tourism [DEAT], 2009; South Africa Property Review, 2009; Van der Merwe, 2009). Keeping these figures in mind, the Green Building Council of South Africa [GBCSA] has emphasised that green building practices could make a significant difference in

the strained resource consumption of the local as well as the global community (Van der Merwe, 2009). It is estimated that green building strategies in South Africa, if implemented effectively, have the potential to reduce a building's energy consumption on all levels by up to 70%, depending on the degree of commitment of the occupants who use the buildings on a daily basis. On a global level, tenants in more developed countries such as in the United Kingdom [UK], United States of America [USA] and Australia are willing to pay premium rentals for green buildings, particularly because research in First World countries has shown that productivity of employees in such buildings increased by up to 20% (Van der Merwe, 2009). Therefore, a great deal can be said about the environmental impact and responsibility of the South African built environment, and the benefits that corporate institutions could receive, by investing in more environmentally responsible building practices.

In accord with the proven merit of green buildings, the GBCSA was established in 2007 to ensure that buildings are designed in a more energy-efficient, resourceful and environmentally responsible manner. Such buildings incorporate design, construction and operational practices that significantly reduce or eliminate negative impact on the environment and its occupants (GBCSA, n.d.). The GBCSA established ratings systems, i.e. the Green Star SA rating tool that is based on the rating systems of the Green Buildings Council of Australia.

The first rating system, the Office Version 1 was developed in 2007 by the GBCSA for South African use only. Since then several others have been initiated, including the Multi Unit Residential V1, Public and Education Building V1, Retail Centre V1, and the Existing Building Performance V1. More recently, the Interiors V1 and Socio-Economic Category V1 are in development and currently in their pilot stage (GBCSA, 2014). The main function of these rating tools is to assess the environmental performance and impact of a building, while developing guidelines for best practice in green building design. Depending on the rating system, certain criteria and a point system are used to measure a building's environmental performance and impact in order to achieve a 4 Star SA, 5 Star SA or a 6 Star SA rating. The rating systems are put in place during the design phase of a building where As Design ratings are awarded if all the criteria are met. Applications are made to the GBCSA, the authority that awards these ratings. In addition, if all the criteria are met and a certain number of points are gained after the completion of the project, the building can be awarded an As Built rating (GBCSA, 2014).

Thanks to the GBCSA, environmental awareness in the South African built environment has increased. However, since its establishment in 2007, the rating and certification of new building projects have been done voluntarily without any regulation enforcing GBCSA's initiatives (Frost Sullivan, 2010). Only in 2010, the GBCSA, in conjunction with the South African National Standards 204 building code committees, incorporated the basic 4 Star Green Star SA principles in the South African National Building Regulations. According to these regulations, all new construction projects have to meet a minimum level of energy efficiency. In order to comply with policy and legislation, all new construction projects have to incorporate certain energy-efficient green practices that impact over the entire lifespan of a building (Van der Merwe, 2010b).

Internationally building certification systems clearly support the growth of green building markets, as they provide a crucial means for benchmarking and marketing green building design (Frost Sullivan, 2010). However, cost implications become an inhibiting factor that too should be considered in the growth of the green building sector. Currently, green buildings require more substantial up-front financial investment for components and elements that diminish environmental costs throughout the life cycle of the building. It is estimated that the initial building costs of a green building are between 8% and 10% more than for traditional building methods (Rajgor, 2004:61; Sack-Min, 2007; Motau, 2010). Investors thus have to consider whether they will gain a return on their investment and to what extent a green approach will increase future growth and profitability. In reality, economic interest will always play a dominant role in the production and consumption cycle in the consumer world. Yet, for many businesses, ecological criteria are fast catching up with the economic issues (Mol & Spaargaren, 2002:42). Going forward, businesses may have no choice but to invest in greener technologies and structures due to industry standards, rules and legislation enforced by governments.

For organizations that have already invested in Green Star SA certified initiatives and have taken steps to reduce energy consumption through new technology and infrastructure; for example, lighting, HVAC (heating, ventilation, and air conditioning) and BIM (building information modelling) systems (Davis & Challenger, 2009), questions remain regarding the role of the occupants' behaviour in delivering environmental improvement (Greaves, Zibarras & Stride, 2013). Environmental issues are mostly attributable to human behaviour (Oskamp,

1995, 2000). The argument put forward is that the occupants of a green building may ultimately determine whether a return on investment is realised or not, since success depends on the manner in which occupants go about their daily activities of electricity and water usage as well as waste disposal (Frost Sullivan, 2010). Knowledge and an environmental consciousness are central to the execution of practices and/or behaviours that reflect a pro-environmental approach. Within the context of a built environment such knowledge may be accumulated and shared through interactions between human agency (i.e. building occupants) and social structures (Nonaka, 1990, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003).

Based on the principles of structuration theory, the so-called 'systems of provision' that include society, institutions and social structure, operate behind the scenes to determine the manner in which the building occupants perform their actions from this perspective. It is, however, also important to acknowledge that occupants interact with and within social structures or institutions. Inevitably these would include the rules and regulations that preside over the design, construction and maintenance of As Built Green Star SA buildings. Their effectiveness strongly depends on and is influenced by knowledgeable and capable building occupants who are can, and are committed to providing comments, reasons and even some explanation for what they are doing, and how they do what they do over time and space (Spaargaren, 1998).

1.2. PROBLEM STATEMENT

Internationally, over the last two decades, several initiatives have sought to produce benchmarks and standards to guide the promotion, design and operation of green buildings (Van der Merwe, 2010b). The GBCSA has contributed to an enhanced awareness of environmentally responsible building design within the South African context. Although considerable research has been devoted to the green building principles and environmentally responsible consumer behaviour in First World countries (WWF, 2012a), limited empirical evidence exists about these phenomena within the context of emerging economies of which South Africa is an example. To date there are no benchmarks for local case studies (Naidoo, 2009). Although the right infrastructure is in place, the levels of commitment that the occupants of a green building exhibit towards adjusting their behaviour and practices in it will

eventually determine the actual final reduction of greenhouse gas emissions, and the long-term cost reductions that are associated with greener technologies.

Too often, consumers' operational practices in their occupancy of green buildings are in direct contrast to the main purpose and objectives of environmental friendly behaviour (Frost Sullivan, 2010). In addition, a large portion of the South African population are simply struggling to satisfy their most basic needs with the result that an environmental 'ethos' or concern among the general public has not yet developed to an extent where environmental issues are viewed as a serious priority (Barker, Hill, Bowen & Evans, 2004). This scenario is further aggravated by lack of proper environmental education (Recycling Day SA, 2011). Some measures have been introduced to guide South African communities towards a reduction in energy and water use, pro-environmental transport choices and correct waste management (Clean-up South Africa, 2011; Mayer & Robinson, 2013). However, a deficit prevails in society's understanding of the factors that affect individual citizen's pro-environmental behaviour, not only within their own household environment, but also with their day-to-day work environment.

South Africa's first Green Star SA certified office buildings have drawn much attention to the debate surrounding increased levels of productivity and employee well-being, which shareholders could regard as a return on their initial investment in green building practices. Results from a recent study (Thatcher & Milner, 2012) highlight some of the financial implications from an economic point of view where Green Building Occupants salary outweigh the buildings' initial and usage cost. This encourages the need for further investigation. A particular area of interest, which to date has not yet been explored, is whether the knowledge and behavioural practices of the employees who occupy a so-called As Built Green Star SA certified building, correspond with the green approach set forth by the structure in which they are accommodated. An investigation of the occupants' level of environmental knowledge and behaviour, which according to Giddens' (1984) structuration theory allows for a description of their practical and discursive consciousness, could be significant in changing lifestyle and behavioural practices that synergise with a green design and building philosophy. To date little is known about occupants' routine behaviour in structures that are set in place to facilitate environmentally friendly work environments.

A valid research question therefore is:

> *how do the occupants' practices reflect appropriate environmental knowledge and accompanying practical and discursive consciousness to engage in pro-environmental practices in As Built Green Star SA certified buildings; i.e. their saving of energy and water as well as the waste reduction and recycling behaviour in their office environments?*

In addressing this question and understanding occupants' knowledge and consciousness of environmentally responsible practices within a Green Star SA certified built environment, empirical evidence can be presented that could contribute to realising the long-term benefits of green buildings in a South African context.

1.3. CONTRIBUTION OF THE STUDY

This research represents an effort to add not only to scientific literature but also to business practices in the construction and design industries. The study's theoretical contribution focuses on the relevance of the underlying principles of structuration theory in exploring As Built Green Star SA certified building environments and the level of knowledge and consciousness that As Built Green Star SA certified building occupants' have about their physical office environments, including the use of energy, water and the consumption of other resources. From a practical point of view, the investigation may inform strategies to improve the broader environmental knowledge issues of building occupants and ultimately enable an understanding of factors that affect the sustainability of global resources that have implications for future generations and society in general. It could be argued that much can be done to improve the return on the investment made by owners of As Built Green Star SA certified buildings by addressing occupants' practical consciousness in terms of its manifestation in routine office practices that contribute to energy saving, water saving as well as recycling and the waste reduction.

This research contributes to existing literature by clarifying occupants' knowledge, consciousness and willingness to engage in pro-environmental practices in As Built Green Star SA certified office buildings, in order to defend and encourage the financial commitment that owners of buildings have to make to support this worthy cause.

1.4. THEORETICAL PERSPECTIVE

The environmental crisis is a certainty (Dunlap & Catton, 1994; IPCC, 2007; South Africa Property Review, 2009) and requires change within the objective reality of everyday social life (Spaargaren, 1998). In this regard Gidden's (1984) structuration theory was chosen as a suitable theoretical framework for this study as it emphasises that social reality is continually (re)produced and structured in space and time by competent actors in their everyday practices (Giddens, 1984; Nonaka & Toyama, 2003). In applying the underlying assumptions of this theory, occupants of As Built Green Star SA certified office buildings are viewed as agents that interact within an environment that includes systems of provisions (i.e. social structures such as a built environment that facilitates pro-environmental office practices).

Scholars have argued that structuration theory bridges the gap between theories which emphasise individualistic voluntarism and those that focus on structuralistic determinism (Giddens, 1984; McCracken, 1988; Stirk, 1998; Haanpää, 2007; Lippuner & Werlen, 2009). Theories such as phenomenology, examine the individual actor's knowledge and experiences, and the manner in which these individuals make the social world intelligible to themselves and other actors (Rose & Scheepers, 2001; Lippuner & Werlen, 2009). On the other end of the spectrum, structuralism (e.g. Levi-Strauss' theories of structural anthropology) assumes that there are social and cultural structures within society that shape individual acting, thinking and talking. Hence the focus is not on individual motives and interpretations but rather on the material and symbolic structures that represent the outlines of the social practices. In between these two poles, structuration theory adopts a mediating position; it recognises the individual social circumstances that provide the frame for individual actions, but simultaneously also acknowledges that social structures have to be maintained in actual everyday practices. Structuration theory therefore aims to overcome the dichotomy of agency and structure (Lippuner & Werlen, 2009) and thus recognises the duality in which human agents draw upon understanding of interpretive schemas, norms and power during social interaction, and in doing so, produce and reproduce social structure (Lyytinen & Ngwenyama, 1992).

Structuration theory seems appropriate for this study to not only recognise the unique behaviour of the occupants of As Built Green Star SA certified office buildings, but also to emphasise the important role that systems of provision play to enable individuals to engage in

behavioural practices such as saving energy, recycling and reducing waste. This may then also relate to the amount of control that individuals have over their physical environment and their propensity to engage in pro-environmental practices. Ultimately such practices impact on the overall long-term benefits that companies gain from investing in green buildings. This underlines a basic assumption of structuration theory that relates to the 'duality of structure' i.e. social structure is not only the medium but also the outcome of action (Jackson, 2005; Lippuner & Werlen, 2009).

Furthermore structuration theory emphasises that there are two levels of consciousness in human activity; namely practical and discursive consciousness, which foster and enable behaviour (Giddens, 1984; Jackson, 2005; Lippuner & Werlen, 2009). Practical consciousness involves the capability of an As Built Green Star SA certified building occupant to intuitively maintain everyday office routine activities without much explanation, concern or justification. Practical consciousness is thus based on intuition with limited thinking or rationalization. Discursive consciousness on the other hand is reflexive and involves the capability of an agent to consciously reason and explicitly describe the motivation and intentions behind behaviours and practices (Lyytinen & Ngwenyama, 1992). Discursive consciousness thus involves more explicit theoretical knowledge and also reflects an understanding of why certain patterns of behaviour exist (Lippuner & Werlen, 2009).

Within the context of an As Built Green Star SA certified building, occupants may accumulate and share environmental knowledge. Knowledge is thus created and enlarged although interactions are articulated as explicit knowledge through the process of externalization (Nonaka, 1990, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). Through discursive recognition and revision of existing knowledge deficits occur during externalization, thus individuals have the ability to 'unfreeze' ingrained habits, gestures and routine behaviour that form part of their practical consciousness (Leng, 1997; Spaargaren, 1998). Discursive consciousness therefore represents the level of thinking that may enable occupants of As Built Green Star SA buildings to reflect on their daily office routines and perhaps consider alternative ways of doing. Such reflection may then enhance their willingness to engage in new and innovative pro-environmental office practices.

1.5. RESEARCH OBJECTIVES

This study aimed to explore and describe occupants' environmental knowledge of As Built Green Star SA certified buildings as well as their practical and discursive consciousness that relate to pro-environmental practices in their office environments. The following objectives were defined to cover the scope of the research aim:

1. To assess and discuss As Built Green Star SA building occupants' knowledge about broader environmental issues and factors that will affect the sustainability of global resources that have implications for future generations and society in general;
2. To investigate and describe As Built Green Star SA building occupants' level of control over their physical office environment including their use of energy, water and the consumption of other resources;
3. To investigate and describe As Built Green Star SA building occupants' practical consciousness in terms of its manifestation in routine office practices that contribute to:
    - 1.5.3.1. energy saving
    - 1.5.3.2. water saving
    - 1.5.3.3. recycling and waste reduction
4. To explore and describe As Built Green Star SA building occupants' discursive consciousness that is considered as a pre-cursor for willingness to engage in practices that contribute to:
    - 1.5.4.1. energy saving
    - 1.5.4.2. water saving
    - 1.5.4.3. recycling and waste reduction

1.6. RESEARCH DESIGN AND METHODOLOGY

This case study is quantitative in nature, adopts an exploratory, descriptive approach and explores the environmental knowledge, consciousness and practices of occupants in Green Star SA accredited buildings. The study is cross-sectional as it reflects the occupants' perspectives and practices at a specific point in time (Babbie, 2001; Neuman, 2011:44).

1.6.1. Sample and sampling

Primary data was collected from a purposively selected sample group, a method suggest by both Walliman (2005:279) and Neuman (2011:267) and deemed suitable for this research topic. To date limited research has addressed the perspectives of occupants of such buildings and therefore an instrumental case study research design was followed as described by Delport & Fouché (2009:272). At present there are only six Green Star SA certified As Built buildings in South Africa (GBCSA, 2014). Permission was obtained to recruit participants from four of these buildings that became the unit of analysis for this research. It was a specific case in which the group consisted of individuals employed by companies that occupied office space in these four Green Star SA certified As Built buildings.

1.6.2. Measuring Instrument

A structured questionnaire (Addendum A) was developed for the purpose of this study and included six sections, namely:

- Section A: Demographic information
- Section B: Living Standard Measure (LSM)
- Section C: Type of office environment
- Section D: Environmental knowledge
- Section E: Current office practices that relate to energy saving, water saving, recycling and waste reduction
- Section F: Office workers' obligations and willingness to engage in pro-environmental practices

A trial run to pre-test the measuring instrument on a small number of persons with characteristics similar to those of the target group of respondents should be done (Singleton, Staits, Straits & McAllister, 1988; Monette, Sullivan & De Jong, 1998; Strydom, 2009:206). A pilot study was used to pre-test the questionnaire to ensure that all biased wording and misconceptions were avoided in the final version of the questionnaire, thereby ensuring more reliable results.

1.6.3. Data Collection

A combination of paper-based and electronic survey questionnaires was used to collect quantifiable data. Electronic survey questionnaires offer several advantages, especially reducing costs and is also considered to be more eco-friendly. Electronic surveys physically separate the respondent and the researcher from each other too thus eliminating the possibility of the fieldworker influencing the respondent thereby reducing potential response bias (Delport, 2009:167). The disadvantage of electronic mail questionnaires is that the response rate is often low, but may be increased if the mailings are followed up (Rossouw, 2003:129). In this study, the response rate remained low despite multiple efforts to follow up on questionnaires that were e-mailed to potential participants. In addition, only three buildings' servers allowed for the use of electronic survey software and therefore paper-based copies of the questionnaire were handed out to employees who were occupants of another sampled building and who were willing to participate in the survey. Respondents completed either an electronic version or received a hard copy of the questionnaire.

1.6.4. Data Analysis

Descriptive as well as inferential statistics were used. Descriptive statistics defined and quantified the numerical character of the data through measures such as frequencies, means and standard deviations. Inferential statistics provided a more detailed interpretation of the data through exploratory factor analysis [EFA], Cronbach's α and crosstabs to explore the environmental consciousness and practices of occupants and to produce predictions through inference (Walliman, 2005:305; Neuman, 2011:412-413). The statistical analyses were done and checked in collaboration with the Department of Statistics at the University of Pretoria.

1.6.5. Measures to Enhance the Quality of the Data

The extent of accuracy of a measuring instrument reflecting the concept it intends to measure is referred to as validity (Babbie & Mouton, 2001:122; Gravetter & Forzano, 2003:87; Leedy & Ormrod, 2005:92). An extensive literature review, as was done in this study, ensures that all the key concepts in the study are explained and conceptualised to achieve theoretical validity. In order to avoid misunderstandings and misconceptions in the content of the questionnaire, content validity was applied to ensure that all respondents understood the questions in the same way. For content validity the study leaders and a statistician reviewed the electronic and hard copy versions of the questionnaire that was developed for this study. Additionally, the

questionnaire underwent pre-testing among a smaller subset of the sample population of about 20 respondents who worked in the buildings that were surveyed.

Established scales such as the South African Audience Research Foundation (SAARF) scale for measuring the Living Standard Measures (LSM) of consumers, and the Eco-Scale Rating System for measuring the knowledge of respondents were used to ensure construct validity. In the questionnaire, the practical consciousness of the respondent was measured according to a 5-point Likert-type scale ranging from "Never" to "Always" and included a "Not Applicable" option. In addition a 4-point scale was also applied with answers ranging from "Strongly disagree" to "Strongly agree" to measure the discursive consciousness of the respondent.

The stability and consistency of the findings of a measurement instrument is described as reliability (Denscombe, 2007:296). A reliable study will produce the same results if the same set of variables is measured under the same conditions so that it has the ability to produce consistent numerical results each time it is applied. In this way, the results do not fluctuate unless the variables that are being measured change (Monette *et al.*, 2002:117; Gravetter & Forzano, 2003:91). To ensure reliability in this study, an effort was made to conceptualise each construct clearly and unambiguously through a thorough investigation of relevant literature and to establish that each measurement indicated only one concept. Additionally, numerous indicators were used to measure particular aspects of the variables. This was done because respondents could possibly misconceive the true meaning of environmentally friendly concepts such as recycling, waste reduction and climate change.

1.7. PRESENTATION AND OUTLINE OF THE DISSERTATION

The preceding chapter presented the background to and justification for the study. The research problem and the main objectives for the study were important aspects covered in this chapter. Subsequent chapters are summarised as follows:

Chapter 2 provides an overview of relevant literature pertaining to 'green building' initiatives, rating systems and the implications of 'green' building environments for various role players in the industry. The chapter also introduces structuration theory as a relevant theoretical framework to address the study's research objectives as its theoretical perspective is

intertwined with the literature review. This chapter includes the conceptual framework of the study and the main research objectives are noted again.

Chapter 3 covers the research design, sampling and sampling techniques, the development of the questionnaire as well as data collection and data analysis. Reliability and validity issues in addition to ethical considerations are also highlighted in this chapter.

Chapter 4 offers the results with discussion in accordance with the objectives for the study. Graphs and tables are included to present certain findings visually to enhance their interpretation.

Chapter 5 presents the conclusions and reviews the study in retrospect. Implications of the findings and limitations of the study are discussed and suggestions for future research are made.

The questionnaire is presented as an addendum at the end of the dissertation.

1.8. CONCLUSION

This chapter provided a general introduction to the research topic. Background information concerning the research problem with necessary justification regarding the research subject was offered. Relevant concepts and theories related to the research objectives were introduced and will be further clarified in the chapters to follow.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL PERSPECTIVE

2.1. INTRODUCTION

This chapter provides an overview of the current critical situation of the environment, what "green building" entails, rating systems and the implications of "green building" and "green environments" within the industry. In addition, the theoretical perspective, namely, structuration theory, is introduced as it lays the foundation for the structure and interpretation of the research and the organisation of the conceptual framework of this study that is situated within a building environment. The basis of this theory is the assumption of "duality of structure" in terms of how the agent on the one end of the spectrum influences the social practices and, on the other end of the spectrum how the systems of provision interact on the very same set of social practices within an As Built Green Star SA building environment.

2.2. THE WORLD AT RISK: INCREASING ENVIRONMENTAL CONCERN

Since the 1960s global concern has escalated due to the growing evidence that Earth is reaching a crisis point in regenerating enough resources to sustain human life (Brundtland, 1987:8; Cole, 2005). The Brundtland Commission was the first to acknowledge and make the environmental crisis public in 1987. This event was then followed by the Rio Earth Summit in 1992, the subsequent World Summit on Sustainable Development in 2002 as well as the more recent debate about the Kyoto Protocol in Qatar, 2012 and the Rio+20 Summit in Brazil, 2012 (Mackenzie, 1997:10; Munton, 1997; Aguirre, 2002; United Nations Conference on Sustainable Development, 2012). The Brundtland report noted that "never before has world opinion been as united on a single goal as it is on achieving sustainable development" (Brundtland, 1987:8). In 2007, the IPCC announced that evidence on climate change is now unequivocal and that global warming is the net result of human activity, in particular the emissions of greenhouse gases (IPCC, 2007).

The demand on the world's resources and natural life is in part due to human population growth. The larger the population the more impact it has on the Earth since all people require food, water and shelter. However, population growth is not the only reason for the intensified demand on the Earth's natural resources. The vast majority of people aspire to affluent lifestyles, and it is a known fact that wealthier people consume far more resources than the less affluent (Boudreau, Chen & Huber, 2008; Alt, 2011). Rapid economic growth and increased consumption, especially in emerging economies such as South Africa, has fuelled an ever-growing demand for energy, transport, products, living space and space to dispose of waste. According to the 2012 Living Planet Report, indicators clearly demonstrate that the unprecedented drive for wealth and well-being over the past 40 years has placed unsustainable pressure on the planet (WWF, 2012a). In particular, the ecological footprint shows a doubling of demands on the natural world since the 1960s, while the living planet index indicates a 30% decline in the health of species that are the foundation of the ecological systems on which all humanity depends (WWF, 2012b).

Since people consume resources from all over the world, the ecological footprint of consumption is an important measure that tracks humanity's competing demands on the biosphere by comparing human demand against the regenerative capacity of the planet, that is, its bio-capacity. This calculated measure comes from adding together the areas required to provide renewable resources that people use, the areas occupied by infrastructure and the areas required for absorbing waste. In so doing, it provides decision makers with an account of the extent to which the human economy operates within the Earth's ecological limits (WWF, 2012a). To determine whether human demand for renewable resources and CO_2 uptake is maintained, both the ecological footprint, namely the demand for resources, and bio-capacity, the availability of resources, must be considered. The ecological footprint and the bio-capacity are then expressed in global hectares (gha), where 1gha represents the productive capacity of 1ha of land at world average productivity (Kitzes, Peller, Goldfinger & Wackernagel, 2007:3; WWF, 2012a).

Examining the ecological footprint at the per person level shows that people living in different countries differ greatly as far as the demand they place on Earth's ecosystems is concerned. For example, if everyone in the world lived like an average resident of the United States or the United Arab Emirates, then a bio-capacity equivalent to more than 4.5 Earths would be

required to keep up with humanity's consumption and CO_2 emissions. Conversely, if everyone lived like the average resident in India, humanity would be using less than half the planet's bio-capacity (IEA, 2012). According to Leape (2010), director of the World Wildlife Fund of Nature (WWF, 2010), the implications are clear - rich nations must find ways to live more environmentally responsibly on Earth and sharply reduce their footprint (Kitzes *et al.*, 2007). For emerging economies such as South Africa the challenge is to find a new model for growth, specifically one that allows for the continued advancement of citizens' well-being in ways that the environment can actually sustain it (UNEP, 2009).

South Africa's ecological footprint is 2.4 per person per gha, while the world average is 2.7 (WWF, 2012a). Yet the South African population is characterised by extremes as it it ranks as the third largest mega-diverse country in the world (UNEP, 2013). On the one hand in the country some individuals have lifestyles that reflect those of Western world citizens, whereas others who constitute a majority of the South African population are very poor and live below the breadline with little to no negative impact on the environment (Milford, 2009). Thus, even though South Africa's average ecological footprint may appear in line with the world's average ecological footprint some South African citizens are potentially more to blame for increased pressure on the environment than others (WWF, 2012a). In a recent article, Johannesburg, which is considered one of the main metropolitan areas in South Africa with a population estimated at 4.4 million people, is reported to produce the same amount of CO_2 emissions (i.e. 26.53 million tons) as the entire London metropolis with a population of 7.8 million people (Tempelhoff, 2014). In another comparison, New York produces 53 million tons of CO_2 emissions (i.e. double the amount generated in Johannesburg) but has more than four times the number of residents (Tempelhoff, 2014).

These figures raise fundamental questions of how to curb CO_2 emissions and adapt ways of living, and definitions of development, to include the imperatives of nurturing not only the world's ecosystems, but also the natural resources as is necessary in South Africa's case too. Living within the Earth's regenerative capacity and appreciating the true value of the goods and services that people consume remain key concerns, and today considerable focus is directed towards technology as a means of addressing these problems. However, technology

is as much a cause of the environmental burden as it is a potential solution (Mol & Sonnenfeld, 2000; Boudreau *et al.*, 2008).

As an example, technology implemented in coal-fired power stations provides the electricity consumers need to support a modern, affluent lifestyle, thus creating carbon emissions that contribute to global warming. On the other hand, the same technology enables modern day solutions such as online banking or electronic media that eliminate the need for paper-based transactions and thus it contributes to a more environmentally responsible approach, yet not all consumers opt to support these alternatives (Boudreau *et al.*, 2008). Leveraging technologies to produce goods and services that are environmentally sound is a momentous endeavour, and may in fact constitute several challenges, but it is also one of the biggest opportunities in the history of commerce (Hart, 1997). Nowadays, many business leaders are linking sustainability to their corporate strategy in recognition of their key responsibility to participate in solving the environmental crisis especially in the direct context of doing business. The building industry is no exception as the construction sector has severe environmental consequences requiring drastic change that the adoption of more green building practices could achieve.

2.3. THE NEED FOR THE BUILDING INDUSTRY TO SHIFT TO GREEN CONSTRUCTION

In general, the construction and maintenance of buildings require a large portion of water, wood, energy and other resources derived from the natural environment (Lockwood, 2006). Estimates are that globally buildings use 40% of all raw materials (Roodman & Lenssen, 1995), and that the built environment is responsible for up to 70% of end-use energy consumption (Kats, 2003:2). Furthermore, the building sector accounts for 40% of solid waste generation, 12% of the world's fresh water consumption (IEA, 2012) and generates a third of the world's CO_2 emissions (IEA, 2012). According to the 2007 IPCC report, the total commercial greenhouse gas emissions are three times that of residential consumption (IPCC, 2007). There are countries, such as the US and China, where buildings account for more CO_2 emissions than is the case in some other countries (Kats, 2003:2). An increasingly broad shift to green construction offers a potentially promising way to help address a range of environmental

challenges facing the world. Green buildings, for example, consume up to 26% less energy (Poque, 2010) and generate less greenhouse gases than the average conventional building (Milford, 2009).

For the purpose of this study it is important to appropriately define the concept of a "green building", because, despite its widespread use, there are several misconceptions surrounding the term (United States Environmental Protection Agency [USEPA], 2003b)**.** The United States' Green Building Council (USGBC, n.d.) defines "green buildings" as buildings that significantly reduce or eliminate negative impacts on the natural environment and building occupants. A green building thus incorporates design, construction and operational practices that are energy and resource efficient, and environmentally responsible. In the construction of green or sustainable buildings, key resources such as energy, water, materials and land are used more efficiently than is the case with buildings that are simply built to code.

Empirical evidence gained in more developed countries has proven that green buildings are more effective than traditional buildings in a number of ways (USEPA, 2003b). Over the past decade, most attention in the area of green commercial office buildings has focused on the ecological benefits, and to some extent, on cost saving associated with improved operational benefits (World Green Building Council [WGBC], 2013). However, as the green building industry now progresses beyond its initial inception into the construction sector, the focus has shifted to the benefits of such buildings to the occupiers. Green buildings typically have more natural light and better air quality, which contribute to the improved health, comfort and productivity of the occupants (Armitage, Murugan & Kato, 2011). Much of the existing research argues that green commercial buildings produce happier and more productive workers (Fisk, 2000a; Fisk, 2000b; Kumar & Fisk, 2002; Palmer & Mariscal, 2002; Green Building Council of Australia, 2006; Leaman, Thomas & Vandenberg, 2007; Singh, Syal, Grady & Korkmaz, 2010). For many businesses, building green is thus seen as an opportunity to use resources wisely and address climate change while creating healthier and more productive environments for their employees to work in.

2.3.1. The Role of the Green Building Council of South Africa (GBCSA)

Considering the many benefits of green buildings, several building valuation and certification systems have been established globally to provide the necessary means for benchmarking and

marketing a green approach in the construction sector. Various non-governmental organisations that contribute to these valuations and certification systems have endeavoured to stimulate green building awareness and to educate policy makers and the general public about the benefits and the savings achievable through green building practices. Following the lead of international green building movements, the independent, non-profit GBCSA has been instrumental in stimulating environmental awareness within the South African built environment (GBCSA, n.d.). Since the GBCSA's inception in 2007 the number of Green Star SA certified buildings has grown exponentially in the local context. Despite its inability to enforce legislative change, the GBCSA provides and develops rating tools, training, information and serves as a platform for networks to promote green building practices across the country (GBCSA, n.d.). In establishing a national movement that envisages a change in the way South Africa is built, the GBCSA promotes the many benefits of green building that may include lower operating costs, more efficiency, long-term return on assets and increased wellness and productivity for green building occupants (Kats, 2003:2). In maintaining standards and certification, the GBCSA employs specific rating processes, whereby a building may be classified as "green".

2.3.2. Green Building Certification and Rating Systems

Prior to the turn of the century, companies generally regarded green buildings as interesting experiments but unfeasible projects in the real business world (Kats, 2003:2)**.** Since then, several factors have caused a major shift in thinking. The creation of reliable building-rating and performance measurements systems for new construction and renovations has helped change corporate perceptions about green building certification. Current rating or assessment tools have been crafted to assist in accurately predicting, calculating or estimating one or more environmental performance characteristic of a building (Cole, 2005). Internationally there are different rating systems for different countries and different markets. As an example, the United States Green Building Council launched its rigorous "Leadership in Energy and Environmental Design" (LEED) rating programme in 2000, which specifically focuses on conditions in the United States construction sector (Lockwood, 2006). In the United Kingdom (UK), the "Building Research Establishment's Environmental Assessment Method" (BREEAM) is used to assess buildings in the UK market (Lockwood, 2006) and in Australia they have developed the Green Star Australia rating system (GBCA, n.d.). These certifications assure

prospective buyers and tenants that a building is truly sustainable in the milieu in which it is built (Cole, 2005; Lockwood, 2006).

Although many of the current assessment methods originated in developed countries, the exchange and "borrowing" of methods has been greatly assisted through the active participation of many countries in international programmes (Cole, 2005). Despite the benefits of international collaboration, certain social and economic concerns in developing countries necessitate careful consideration of the domestic constraints on environmental progress in emerging contexts, which differ from those in the more developed settings. As an example, in more developed countries the focus has been on maintaining standards of living while reducing resource depletion and environmental damage, whereas the average standard of living in developing countries is far lower and in many cases basic human needs are not yet met. For these reasons, the emphasis in emerging countries is more focused on development that aims to address these basic needs while avoiding negative environmental impacts (Gibberd, 2001). It is thus evident that some environmental criteria related to resource use and loadings must be reconfigured to acknowledge different regional and geographical contexts.

Within the South African context, the GBCSA developed the Green Star SA rating system, which is an adapted version of the Green Building Council of Australia's [GBCA] Green Star rating system. The aim of this rating system is to provide the commercial property industry with an objective measurement for green buildings and to recognise and reward environmental leadership in the property industry (GBCA, n.d.). As is the purpose of most rating tools it must promote an integrated holistic approach to building design, raise awareness of green building benefits and reduce the environmental impact of development (GBCA, n.d.). Each Green Star SA rating tool reflects a different market sector or phase in the building life cycle and covers a number of aspects including the environmental impact that is linked to a project's site selection, design and construction. During the rating process the building is rated according to different categories and to achieve a certain rating, minimum points must be achieved in each of these categories (GBCSA, 2010).

The categories included in the Green Star SA rating tools are the following:

- Management - In terms of the management category, the GBCSA promotes sound environmental management values from the beginning of the project, through the design and construction phase, to commissioning and operation of the building and its systems. The management programme may benefit from the services of a professional with a thorough understanding and education of some sort in green building principles such as recycling, and an environmentally responsible approach to demolition and construction waste. In this category, emphasis is directed towards the manner in which construction actions are supervised to minimise pollution and maximise soil and air quality protection as well as enhanced commissioning and adjusting of building systems (AECOM, 2013).
- Indoor environmental quality (IEQ) - The IEQ category on the other hand, targets the well-being, the health, and indirectly, the productivity of the occupants. Credits are obtained based on the manner in which the heating, ventilation and air conditioning (HVAC) system, lighting, indoor air pollutants and other building attributes such as external view, individual comfort and volatile organic compounds (VOC), contribute to a good indoor environmental quality (AECOM, 2013).
- Energy - In the energy category, the GBCSA targets an overall reduction in energy consumption. Energy reduction has a direct impact on greenhouse gas and other emissions associated with energy generation from fossil fuels. In the long term, the targeted reductions in energy consumption can be achieved through more efficient use of energy by building occupants and/or the use of alternative energy sources (Milford, 2009).
- Transportation - Transportation is a category that also requires particular attention in the South African context. In this category, efforts that are directed towards facilitating the reduction in private automotive transportation, and encouraging the use of alternative transportation (such as the Gautrain) are recognised.
- Water - Among the Green Star SA rating tool the reduction of potable water usage, which is particularly important in South Africa as the country has a generally low annual and seasonal rainfall. The GBCSA addresses the reduction of potable water use by

prescribing efficient design of building systems, rainwater collection and water reuse (UNEP, 2013).

- Materials - In the materials category, the underlying goal is to reduce the amount of natural resources used, reuse whatever materials can be reused, and recycle whenever possible (AECOM, 2013).
- Land use and ecology - Through the land use and ecology category of the Green Star SA – Office v1 rating tool, the GBCSA supports initiatives to improve or reduce impacts on ecological systems and biodiversity. In this regard, the term "biodiversity" is used to describe the variety of life in an area, including the number of different species, the genetic wealth within each species, the interrelationship between them and the natural areas where they occur (WWF, 2012a).
- Emissions - With the emissions category, the GBCSA specifically targets the environmental impact of a building's CO_2 emissions and other harmful by-products that contribute to the carbon footprint of the buildings' occupants such as watercourse pollution, light pollution, ozone depletion, global warming, legionella and sewerage (IEA, 2012).
- Innovation - The innovation category is included in the Green Star SA – Office v1 rating tool as a means of encouraging, recognising and rewarding the spread of innovative technologies, design and processes for commercial building applications that impact upon environmental performance. This category requires innovative ideas and the demonstration of efforts to apply sustainable development principles to the wider process of designing and procuring a building, as well as any positive environmental influence brought to bear on the wider geographic area in which the project is located. These efforts are recognised over and above the ratings achieved in the other categories (AECOM, 2013).

In terms of implementation, all the mentioned categories are credit bearing, each addressing an initiative that improves or has the potential to improve environmental performance. Points are awarded in each credit for actions that demonstrate the project has met the overall objectives of Green Star SA. Once all claimed credits in each category are assessed, a percentage score is calculated and weighting factors are then applied. The category weighting

factors vary across rating tools to reflect the importance of the different environmental concerns in each tool's specific market sector or building life cycle phase (GBCSA, 2010).

Depending on the final assessment, Green Star SA certified ratings can be achieved: 4 Star Green Star SA certified rating (with a weighted score of 45-59 that is recognised as "Best Practices"); 5 Star Green Star SA certified rating (with a weighted score of 60-74 that is recognised as "South African Excellence") and lastly, the 6 Star Green Star SA certified rating (with a weighted score of 75-100 that is recognised as "World Leadership") (GBCSA, 2010). Although all practitioners can use the Green Star SA rating tools as design and benchmarking aids, a design, project or building cannot publicly claim a Green Star SA rating unless the GBCSA has certified the rating. The GBCSA will commission one or more third-party certified assessors to validate the projects' self-rating and recommend a Green Star SA certified rating (GBCSA, 2010).

2.3.3. "Design" versus "As Built" Certification

Another important aspect to consider with regard to the GBCSA's Green Star SA rating is the differentiation between Design and As Built certification. A design certification may be applied for and awarded at the end of the design phase of a project, once it has been evaluated in terms of specific aspects. For each aspect the building will gain or lose point and a certain number of points must be gained in order to achieve a certain status i.e. 4 Star up to 6 Star rating. At this point, the documentation is only specific to what can be demonstrated at the design stage. Once the building is completed, another application can be submitted for an As Built certification. The rating process is repeated and a building can then only achieve an As Built rating if the design ideas were correctly executed in practice. This would include meeting a range of requirements that could be itemised as follows. Ensuring that energy loads were reduced and natural light and the circulation of fresh air was maximised was essential. Energy efficient air conditioning and lighting was to be implemented and non-toxic, recycled or recyclable materials were to be used. Water efficient plumbing, water harvesting systems and renewable energy sources had to be incorporated in the construction of the building. Together these practices would reduce the overall impact of the development on the environment. An As Built certification is therefore only granted when the successful procurement and

implementation of green building strategies are verified in the completion of the building (GBCSA, 2010). This entire process has several financial implications.

2.3.4. The Financial Benefits of Green Buildings

To date there has been a widespread perception that green buildings are more costly to build than conventional buildings and these may therefore not be justified from a cost-benefits perspective (Kats, 2003:2). This perception has been the single largest obstacle to more widespread adoption of green design (Kats, 2003:2) as exemplified in a 2003 New York Times article entitled "Not Building Green Is Called a Matter of Economics" (Kats, 2003:2). Research on the other hand shows that building green does not necessarily need to cost more, particularly when cost strategies, programme management and environmental strategies are integrated in the development process right from the start (WGBC, 2013).

In recent years several international studies, especially in the USA, have supported the financial advantages of going green (Lockwood, 2006). In one particular project that focused on determining the cost of green buildings, several building representatives and architects were contracted to obtain the cost of 33 green buildings that were to be built in various locations across the United States. The quotations for the green buildings were then compared to conventional designs for the same buildings. The average premiums for the green buildings turned out to be slightly less than 2%, which was substantially lower than commonly perceived (WGBC, 2013). Much of the cost was attributed to the increased architectural and engineering design time, modelling and time necessary to integrate sustainable building practices into projects. Generally, the sooner green building features are incorporated into the construction process, the lower the cost. In this regard it should be noted that the cost of implementing a green design in the USA has declined in the last few years as the number of green buildings has increased along with increased experience in green building construction (Kats, 2003).

Although the construction of green buildings may at this point still exceed the cost of more conventional methods of building in markets that are less developed than the USA, green buildings in the long run still provide additional financial benefits such as lower operational and maintenance costs due to reduced energy and water consumption, lower waste costs, as well as improved indoor environmental quality that benefit employee comfort, productivity and

health (Milford, 2012; WGBC, 2013). These benefits may account for $50 to $70 (1$ = 12.50 ZAR) per square foot, which is estimated to be more than ten times the initial added capital expenditure to construct a building according to specified green standards (Kats, Alevantis, Berman, Mills & Perlman, 2003). Despite data limitations and the need for additional research, preliminary empirical evidence demonstrates that building green is cost-effective in a number of mature international markets such as the USA, Europe and Australia, in particular for projects that started using a 'green' design early in the process.

In emerging markets such as South Africa it is to be expected that green buildings will incur premiums above the costs of standard construction (Warren, 2009). To address questions surrounding the costs of green building in the South African context, the GBCSA has compiled a report to build on evidence derived from international studies with data obtained from local case studies where possible (Milne, 2012). The Green Star SA case studies set out in this report show that the South African property industry should expect the cost premium of building a new commercial green building to be between approximately 1-10% (Milne, 2012). The argument put forward is that, once these markets mature and green building practices become more prevalent, these 'new market premiums' decrease and green building will be able to be done at costs similar to traditional buildings (WGBC, 2013).

An aspect that is increasingly emphasised over and above the cost savings from utilities and maintenance of green buildings, is the benefit these buildings offer to their occupants and more specifically for businesses, the advantages of increased total employee performance in such buildings (Lee & Guerin, 2009). Rask and Kato (2008) found in their survey among the occupants of twelve Green Star rated buildings that 100% of employees and employers alike thought that the green building was "better that expected with all things considered", and that the majority of the occupants would not want to relocate to a non-green office building. Moreover, 80% of the business managers believed staff absenteeism had decreased since moving into a Green Star rated building (Rask & Kato, 2008). By considering the link between the indoor environment and productivity, one begins to understand how the quality of the indoor environment of a green building can impact directly on the human resources and financial performance of an organisation (Clements-Croome, 2000).

2.3.5. The Benefits of Improved Indoor Environmental Quality in Green Buildings

There is growing recognition of the large health and productivity costs imposed by poor indoor environmental quality in commercial buildings. Employees spend as much as 90% of their time indoors, and the concentration of pollutants indoors is typically higher than outdoors with estimates ranging between ten to even a hundred times more concentrated (USEPA, 2003a). It is estimated that approximately 23% of US office workers experience two or more sick building syndrome (SBS) symptoms such as dizziness, nausea and acute eye, nose, and throat irritations in their workplaces annually (Lockwood, 2006). Empirical evidence further suggests that the improved air quality generated by the use of green building materials and technologies lowers SBS symptoms by 20% to 50%, while colds and influenza reduced by 9% to 20%, and allergies and asthma dropped by 8% to 25% (Lockwood, 2006). Considering these arguments and that employee and salary costs comprise approximately 70% to 90% of a firm's total expenditure (Woods, 1989), building owners have become more interested in the return on investment via increased occupant/employee satisfaction and performance when committing to sustainable building (Kats *et al.*, 2003).

Productivity benefits from green buildings are estimated to be between 4% and 10 % (Property Council of Australia [PCA], 2001) One study for example found that the productivity benefits are between 37 and 55 US dollars per foot as a result of less sick time and greater worker productivity (Kats, 2003). It is argued that workers' increased satisfaction, health and productivity in green buildings are mainly the result of better airflow, increased amounts of natural light and views, the use of less-toxic building materials and furnishings, reduction of glare, increased thermal comfort, satisfying noise levels and individual controllability of systems (GBCA, n.d.). Wilkinson, Reed and Jailani (2011) identify thermal comfort and lighting as the main attributes associated with workers' increased productivity and satisfaction in green buildings. Interior lighting typically accounts for 20% to 25% of a conventional office building's direct energy usage, partly because heat generated by artificial interior lighting leads to more air conditioning (Lockwood, 2006), which in turn also affects occupants' health and well-being. Apart from thermal comfort and interior lighting, the use of sustainable, non-toxic building materials such as low and zero-VOC paints, strawboard made from wheat (rather that

formaldehyde-laced particle board), and linoleum flooring made from jute and linseed oil (as opposed to conventional vinyl) contribute to a built environment in which occupants are exposed to fewer toxins. From a cost perspective, these materials are often reasonably priced compared to other alternatives and have much less negative impact on the environment (Lockwood, 2006).

The IEQ category in all different rating tools was created to ensure that these benefits are accomplished in the execution of green building designs (Portman, Clevenger & France, 2006). This is based on numerous studies that have found significantly reduced illness symptoms, less absenteeism and an increase in perceived productivity of green building occupants (Fisk, 2000a; 2000b; Heerwagen, 2002; Kumar & Fisk, 2002; Palmer & Mariscal, 2002; GBCA, 2006; Leaman, *et al.*, 2007; Singh *et al.*, 2010). Although assessment of the relationship between worker comfort and productivity and a building's design and operation may seem straightforward, there are, however, issues that certainly complicates such assessments. Amongst others, is the point that specific standard measurements are determined by a singular performance and do not address the range of interrelationships present when mixed with other environmental items. More specifically, the result of adopting certain standards may differ from the desired outcomes of occupants who experience the environment as a whole (Kim, Kim, Yang & Kim, 2008). For these reasons, the current international rating tools for the IEQ category involve a minimum assessment of those IEQ criteria that depend on the occupant's point of view and additionally, an assessment of the certified building at large (Mendler, Odell & Lazarus, 2005). This is to complement high reliance on normative measures in the rating tools certification system with human occupants' evaluation and perspectives of how they actually work and live inside these "green" buildings.

2.3.6. Occupants' Perspectives of Green Buildings

In considering occupants' evaluation of green buildings, it is important to note that for many the transformed indoor environmental quality is substantially different from what they were accustomed to, and they sometimes have difficulty adjusting their lifestyles and/or everyday practices to "use" the state-of-the-art green buildings in the envisaged sustainable manner (Armitage *et al.*, 2011). As an example new "green" office environments may necessitate changes in behaviour and adjustment to new office layouts, office furnishings, thermal

comfort, air quality, lighting, acoustics, cleaning and maintenance, which may impact on office employees' overall satisfaction with a green building itself and it as workspace (Abbaszadeh, Zagreus, Lehrer & Huizenga, 2006: 365). Because these green environments are different from what they are used to, the occupants may end up using the facilities in a green building in the wrong manner thereby contradicting the objectives involved in the construction of a green building. This in turn may lead to a reduction in the return on the investment, thus eliminating the cost and financial benefits originally bargained for; and the experience of low occupant satisfaction and performance due to the lack of understanding of the green principles incorporated in the design and construction of the building.

Some studies have in fact explored green building occupants' perceptions and satisfaction with their environments and have drawn important conclusions about this. Lee and Kim (2008) compared employees' evaluation of indoor environments between certified and non-certified green buildings and found that occupants in certified workplaces were more satisfied with office furnishings, indoor air quality as well as cleanliness and maintenance, but less satisfied with office layout, lighting and acoustic quality that those of non-certified buildings. Armitage *et al.*, (2011) also conducted a study among the occupants of 107 certified Green Star Australian buildings that had been operational for more than 12 months. The strengths that they found within the certified builds were high levels of overall satisfaction amongst both employees and the managers who worked in these buildings. Abundance of natural light, spacious open plan layouts, convenient locations and views to the outside of the buildings were identified as the most important positive attributes of the green buildings. Although the managers were firmly convinced that the environment in which everyone worked was healthier and that employees were therefore more productive, the employees themselves were not altogether convinced, although generally positive. Management also believed that Green Star Australia buildings improved environmental awareness amongst staff members. Unfortunately, only a third of the employees agreed on this point. Weaknesses that both management and employees agreed on were the reduced thermal comfort of the building interiors, the lack of privacy and higher internal noise levels, especially as they were previously accustomed to traditional buildings with more enclosed spaces (Armitage *et al.*, 2011).

Recommendations that have emerged from studies such as these include the need for appropriate green building induction programmes and workshops whereby prospective

occupants are properly educated on how to use the building's green features (Armitage *et al.*, 2011). It is argued that many occupants do not understand how to use such green features and with that comes an increased level of dissatisfaction, which also negatively impacts on the environmental performance of the building. In summary, it may be said that Green Star SA certified buildings and workplaces offer several benefits that may form the basis of increased satisfaction among the occupants of such buildings. However, at the same time, there are specific areas which require further refinement in order for green workplace environments to operate at their fullest potential. In particular it has been argued that in order for green buildings to perform effectively in the context of a low-carbon future, a mindset shift is required. The change should be conceptualising the office occupant/employee as a passive recipient of indoor conditions to that of a green building inhabitant who plays a more active role in the maintenance and performance of the green building they occupy (Cole, Robertson, Brown & O'Shea, 2008; Brown & Cole, 2009).

2.4. STRUCTURATION THEORY

The actions of occupants in a built environment and the choices they make to engage in energy- saving practices, to reduce waste, recycle and to appreciate the pro-environmental principles that form the basis of an As Built environment, all impact on the sustainability of natural resources, as well as on the personal and collective well-being of individuals, institutions and society in general. For the purposes of this study, a theoretical perspective that acknowledges the interdependence and relationship between various role players in the context of a built environment was of primary importance. Giddens' (1984) structuration theory seemed particularly appropriate as it attempts to explain the interdependence between the "*agent*" (i.e. the occupants of an As Built Green Star SA building) and "*structure*" (i.e. the built environment in which certain day-to-day practices occur) and how these dimensions relate to each other.

The role of individuals who occupy and work in green building environments were of particular interest in this study. Structuration theory views such individuals as role-taking and norm-fulfilling beings who act according to their own images of what reality is, and treat all institutions and social practices as structures (Nonaka & Toyama, 2003). On the one hand, the

environment influences agents (i.e. green building occupants). On the other hand, these agents are continuously recreating their environment by engaging in social actions such as pro-environmental practices in the built environment in which they find themselves. Hence, social structure does not exist independently outside of human agency, and the interplay between these internal dimensions in defining and reproducing each other are of particular significance (Rose & Scheepers, 2001; Nonaka & Toyama, 2003). Giddens' (1984) integrated model of human agency and social structure therefore seemed appropriate to understand the influence that a green building environment can have on an individual (i.e. the human agent) and, at the same time, to appreciate what role the individual's actions may play in shaping a built environment that underscores the principles of sustainability. This interpretation relates to a central theme within structuration theory, namely the duality of structure.

2.4.1. The Duality of Structure

Giddens' (1984) concept of the "duality of structure" is an important underlying assumption of structuration theory. Duality implies that social structure is constituted by human agency while, at the same time it is the way this happens (Lyytinen & Ngwenyama, 1992; Rose & Scheepers, 2001). Reflecting briefly on Giddens' (1984) views on the concept of the duality structure explains the theory behind the method this study followed.

Structure is said to consist of two aspects, namely rules and resources. Rules and resources relate to the power, hence authority, over people and materials and must be understood in terms of the potential capability for transformation (Jackson, 2005). Within the context of a Green Star SA rated building, it denotes the range of pro-environmental practices an actor is able to perform because of green technologies and systems that were incorporated into the design and construction of the building. Hence it becomes apparent that the flow of human action is embedded in these rules and resources that are, at the same time, produced and reproduced by human action (Lyytinen & Ngwenyama, 1992).

Structures cannot extend beyond the capability of acting individuals. Agents in their actions constantly (re)produce and develop the social structure that both constrains and enables them. By specifying green principles of design and construction, constraints are set in place to limit the unsustainable use of natural resources. Yet, simultaneously, it also enables individuals to adopt more pro-environmental practices. Social practices in the context of this research are,

inter alia, reducing waste, recycling or saving energy but they cannot be viewed in isolation as the structures influence them to a great extent. It is through the social practices of everyday life that the connections between the doing and the impact of the structures create change. Structure is regarded as the outcome of such actions, yet at the same time, are the means that generate the very actions themselves (Leng, 1997). These actions, as social practices, are thus to be interpreted from two different angles (Spaargaren, 1998; Jackson, 2005). The argument put forward is that every social situation, and this would include those found within the built environment, can be viewed from two different perspectives, that of agency (i.e. the occupants of an As Built Green Star SA building) on the one hand, as influenced by social norms and lifestyle choices, and, on the other hand, as being the institutions and structures of society (Jackson, 2005; Lippuner & Werlen, 2009).

From a structuration viewpoint, it is important to note that human beings are considered knowledgeable and capable agents who monitor their own actions, the actions of others as well as the consequences of such actions, in addition to being aware of the environment in which these actions occur (Lyytinen & Ngwenyama, 1992; Rose & Scheepers, 2001). The analysis of social practices and structural settings is important, but, according to the theory of structuration, only the acting individual is gifted with a consciousness (Leng, 1997). Giddens (1984) assigns the main constitutive power of the social world to the agency of human individuals, who in return relate to structures in their social praxis (Lippuner & Werlen, 2009). These aspects are applied to the green building environment and further highlighted in the sections to follow.

2.4.2. Green Building Occupants as Agents and Agencies of Change

A prominent emphasis in modern day society is the importance of rethinking current habits and adopting new values and norms which would be far more cognizant of the realities of current enviornmental issues of which climate change is a topical example. 'Human agency' in Giddens' (1984) formulation, essentially relates to a person's ability to make a difference and to act with conscious intention based on own commitment. Only human individuals are capable of acting and bringing about intended or unintended outcomes that, in turn, become the conditions of succeeding actions (Lippuner & Werlen, 2009). This 'capacity to make a deliberate difference' is also known as transformative capacity (Giddens, 1984).

Transformation is influenced by internal and external factors that are relevant in certain realities that may differ from one environment to a next. Green building design and construction initiatives may serve as an example of external factors that play a role in the development of transformative change in the built environment. If human agency has the ability to transform habits, it is imperative that the rules, resources, structures and systems such as those that exist in the context of an As Built Green Star SA building, help to facilitate this change. In addition, Giddens (1984) also emphasises that agency does not only relate to people's intentions of doing things, but also to their knowledge and capability of doing those things in the first place.

2.4.3. The Consciousness and Knowledge of Human Agents in a Built Environment

Social interaction of human agents in the structures of the world can be explained in terms of an individual's consciousness and knowledge (Nonaka, 1990, 1991, 1994; Lyytinen & Ngwenyama, 1992; Nonaka & Takeuchi, 1995). There are two levels of consciousness in human activity namely the practical and the discursive. The border between practical and discursive consciousness is rather dynamic and not always clearly definable. Much of what actors know about the world and the domain of their actions is known to them in an unarticulated manner, as part of their practical consciousness (Leng, 1997). Practical consciousness involves the capability of an agent to intuitively maintain everyday routine activities without much explanation or justification (Giddens, 1984; Jackson, 2005; Lippuner & Werlen, 2009) and this could apply to a specific built environment. Human agents often know what they are doing without thinking about it or directly reporting on their actions. This is possible because it depends on a huge wealth of commonly accepted knowledge concerning how to go about things (Jackson, 2005). Even though it may feel as if the conviction comes naturally, such convictions have been developed over many years. In this regard the influence of the parents, families and the communities of origin play a crucial role in the development of the practical consciousness. An example in this context would be, for example, that children are taught from an early age to save water and to dispose of waste in an appropriate manner.

Giddens (1984) suggests that the bulk of human agency depends on this kind of practical consciousness, especially in the context of familiar, routine situations and behavioural contexts

(Lyytinen & Ngwenyama, 1992; Jackson 2005) such as that of a built environment. Social actors possess a great deal of unquestioned, rationally undoubted knowledge (i.e. practical consciousness) about the social world, which they apply in the production and reproduction of everyday social encounters. For instance, they may simply dispose of waste in a certain manner without any recourse, premeditation or deliberate reasoning (Jackson, 2005) until circumstances change e.g. the dustbin is moved or replaced with recycling bins. The changing of the circumstances calls for reflection and such reflection may facilitate a better understanding of behaviour by questioning alternative ways of executing daily routines (Bartiaux, 2007). Most agree that the practical consciousness of an agent is difficult to change, but at the same time, human agency is also characterised by the ability to engage in such reasoning when asked to expand upon the underlying reasons for routine actions. In such instances it would be discursive consciousness that would be addressed (Stirk, 1998; Jackson, 2005; Lippuner & Werlen, 2009).

Discursive consciousness is reflexive and involves a person's ability to consciously reason and explicitly explain the motivation and intentions behind actions (Lyytinen & Ngwenyama, 1992). Discursive consciousness thus consists of everything that actors are able to say about the social conditions of their actions (Jackson, 2005). This reflexivity allows the continuous revision of the direction of social practices such as the disposing of waste, the use of energy and the consumption of water. Describing agency as being reflexive stresses the freedom of human practice – at least to a certain degree; limitations may apply and people can always act differently to what they say they do or have done (Lippuner & Werlen, 2009). Nevertheless, discursive consciousness reflects our understanding of why things exist, especially the patterns of our organisational and personal lives (Leng, 1997). The human ability to argue and reason would play an important role in adopting pro-environmental practices in an As Built Green Star SA building, since it forms the basis for the building occupant's ability to articulate and rationalise why power and resources are allocated to greener principles, and the underlying justification for legitimating such distribution patterns.

Similar to practical consciousness, discursive consciousness is developed over time and can therefore not be altered within a short period (Hargreaves, Nye & Burgess, 2013). However, unlike practical consciousness where the intuition plays an integral role in the praxis, discursive consciousness involves more explicit theoretical knowledge, which fulfils a significant role in

changing the everyday praxis. (Lippuner & Werlen, 2009). People as actors are continually responding to given and altering situations of actions. In our societies events take place, such as the development of an As Built Green Star SA building, which will generate conversation and reflection. Consciously and unconsciously members of society and/or occupants of such a building form opinions, some of which will have long-term implications, whereas others are short-lived. Whether the implications are long or short term, their social context and their environment are increasingly constituted through reflexively applied knowledge (Parker, 2000; Lippuner & Werlen, 2009).

Knowledge is created and enlarged though interactions between human agency and social structures (Nonaka, 1990, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). Change can take place when the human agents and the social structures interact and converse. Occupants of an As Built Green Star SA building may accumulate and share tacit knowledge based on their everyday experiences during socialisation processes in the built environment. As such tacit (i.e. implied and unspoken) knowledge is articulated into explicit knowledge through the process of externalisation. During the externalisation stage, individuals use their discursive consciousness and try to rationalise and articulate the world around them (Nonaka & Toyama, 2003). As an example, building occupants may share their understanding of why it is important to save energy and water or to reduce waste in their everyday practices. Tacit knowledge is therefore made explicit so that it can be shared by others to become the basis of new knowledge of energy saving, water saving and/or recycling practices. This actor-related perspective emphasises the fact that, however persistent and immobile some social structure or institutions seem to be, they are always produced and reproduced by knowledgeable and capable human agents who are able to provide comments, reasons and even some explanation for what they are doing, and how they are doing it over time and space (Spaargaren, 1998). The reflection helps form the basis of new and innovative pro-environmental practices in a built environment.

In addition to the agents and their consciousness and knowledge, it is important to consider the other end of the spectrum that impacts on practices within a built environment. These are the so-called 'systems of provision' which include society, institutions and social structure that operate behind the scenes to determine the manner in which actors perform actions (Lippuner & Werlen, 2009).

2.4.4. Systems of Provision within the Built Environment

As explained in the first section of this chapter, the building sector and construction industry, which are important to the quality of life in terms of housing, workspaces, utilities and transportation infrastructure, is of high economic significance and has serious environmental and social consequences (Burgan & Sansom, 2006). Construction is directly and indirectly responsible for the emission of greenhouse gases as energy is used for raw material extraction, transporting, construction, operation, maintenance and the eventual demolition of buildings (Rwelamila, Talukhaba & Ngowi, 2000; Sorrel, 2003). Social and political forces are imposing additional pressure for more environmentally conscious building solutions. Globally, and also in the local context, building valuation and certification systems have supported the growth of green building markets by providing critical criteria for benchmarking and marketing. The primary role of these systems, which are being implemented by non-governmental organisations and councils such as the GBCSA, is to stimulate green building awareness and to educate policy makers and the general public about the benefits and the savings achievable through green building practices. As the GBCSA continues to expand its rules and regulations to ensure that commercial buildings contribute to the environment and sustainable living, economic stakeholders and investors are also directly influenced. Environmental values are permeating corporate culture and it may be said that corporate society in general is moving towards a more environmentally responsible economy (Vail, 2008).

According to the principles of structuration theory, in the built environment the range of organsations associated with green building serve as examples of so-called *systems of provision*. Leng (1997) explains that organisations such as corporate investors and the GBCSA should be seen as a social system with processes and functions that are linked to structure the organisation. Within it the core group and/or executive directors define and reinforce the normative values and ethos of the organisation that are the institutionalised within the structure of the organisation. The core group exhibits consciousness of a certain set of values, in this research environmental values are the major concern. This group is cognitively aware of what they are doing, why they are doing it, and what they expect to achieve by their actions. As an example, many South African businesses in the public and private sector have sharpened their focus on their commitment to the 'triple-bottom-line' concept since the publication of the second King report on corporate governance (Institute of Directors in Southern Africa [IDSA],

2002). This concept represents an expanded baseline for measuring a company's performance which now includes, in addition to the traditional financial yardstick, an accounting of the company's impact on society and the environment (Van den Ende, 2004).

At this point it is also important to be aware that 'structure' and 'systems' should not be equated. They are seen as institutionalised features of social systems and are many and varied. They, have structural properties that include the rules and resources that agents and actors draw upon and are therefore simultaneously also reproduced in the course of social interaction (Giddens, 1984). Rules are constitutive in shaping action (Lippuner & Werlen, 2009), whereas resources relate to transformation capacity and power that is implicit in all interactions and social relations (Giddens, 1984). Two types of resources are relevant in this regard, namely authoritative and allocation resources. Authoritative resources are non-material in form and derive from the co-ordination of human activity, whereas allocative resources stem from control over material artefacts or aspects of the natural world (Giddens 1984; Lippuner & Werlen, 2009). Authority relates to power in decision making and in the context of this study, it may include the decisions of investors and/or directors to incorporate green principles in the daily operations and conduct of their business. These types of resources are thus derived from the capacity to harness the activities of other human beings, and to direct them based on a pre-existing, agreed upon patterns of domination. Allocative resources on the other hand relate to the instrumental implementation in the area of daily practices of life (Leng, 1997) and would typically involve channelling funds and material means towards the design and construction of a green building to accommodate the everyday business practices of a company and its employees.

Human agents may both be constrained and enabled by the various elements involved in defining an organisation's structure. Whereas the initial investment in greener technologies may be viewed as a constraint, companies also recognise that initiatives such as proper materials and waste management, efficient process and product design, resource efficiency and recycling will be profitable and environmentally preferable. In addition, new international standards and mandates (i.e. rules) are encouraging companies to manage their environmental costs and considerations better by developing environmental assessment and management systems (Lerario & Maiellaro, 1999; Owens and Cowell, 2002). Knowledgeable agents must be aware of these factors in order to assess an appropriate course of action. In

the end, the human agent is the one who uses resources, power, surveillance and administrative skills, with varying levels of success, to resolve problems critical to the continued existence of the organisation (Leng, 1997). It is therefore also apparent that an environmentally responsible approach requires that all stakeholders must buy into the philosophy of sustainable living and green design, and adjust their lifestyles and practices accordingly (Leng, 1997). In line with Giddens' (1984) views, social agents, such as the executive directors of a firm, must frame their strategic actions within the social practices and knowledge that are institutionalised within the organisation itself over both time and space. This forms a social totality that is recognised by the collective that comprises the employees of the firm, business partners, clients and other relevant stakeholders.

2.4.5. Environmentally Responsible Lifestyles and Social Practices in a Built Environment

In sociological terms, definitions of 'lifestyles' vary greatly (Veal, 2000). As an example, Miles (2000) defines lifestyles as a 'material expression of identity', whereas Veal (2000) defines it as 'the pattern of individual and social behaviour characteristic of an individual or a group'. These definitions concur that lifestyles are primarily a matter of activities or behaviour affected by values and attributes, simply put, 'how people live'. In green consumerism research, the concept of lifestyles is, for example, connected not only to the process of consuming, individual choice and decision making (Sanne, 2002; Southerton, Warde & Hand, 2004), but also to the social and symbolic dimensions of consumption (Spaargaren & Van Vliet, 2000). In general though, lifestyle has become a synonym for the concept of behavioural patterns (Spaargaren & Van Vliet, 2000), and refers to the degree of coherence that can be found in an individual's behaviour (Spaargaren & Van Vliet, 2000). In the context of this study, lifestyle may thus be viewed as the coherence in building occupants' behaviour and practices that underscore an environmentally responsible approach.

It appears thus that social practices are closely linked to an individual's lifestyle. As a concept it also clearly illustrates the "duality of structure" upon which structuration theory is based. According to Giddens (1984), social practice comprises the sum of individual and collective human activities that maintain and transform social life and, as such, it represents the manner in which all aspects of social reality is constituted (Lippuner & Werlen, 2009). Social practices

are dynamic and evolve over time and space. More commonly they evolve as they are produced and reproduced by the agent (Rose & Scheepers, 2001). The further social practices extend through space and time, the better established they become, and the more likely they are thought of as institutionalised features of social life (Rose & Scheepers, 2001). This means that, if human action or behaviour starts to reproduce itself within the given structure, the practice will become part of the social life's pattern or routine behaviour (i.e. it becomes part of the agent's practical consciousness). Furthermore, if a human agent's outlook on life is changed by, for example, environmentally responsible trends and lifestyles, the social practices will also change accordingly. To change social practices, or to teach actors how to 'apply' new social practices is, however, exceedingly difficult. In essence, it requires a change in the agent's core value system and mindset to address discursive consciousness.

In a commercial building, social practices are often characterised as the different practical business systems within an organisation's environment. In this study, Warde (1990) would agree that the building occupants' office consumption within an As Built Green Star SA accredited building be taken as a specific type of social practice. These are somewhat arbitrarily determined, usually on the basis of some task orientation within a working, meeting or socialising environment. It can be argued that the office-based social practices in a commercial building are an important issue for environmental scientists, because an office environment represents the context in which many individuals' routine interaction and behaviour is shaped. Also to note is that research has determined that commercial buildings account for approximately 20% of greenhouse gas emissions globally, and are responsible for 50% of all global resources that are consumed (Edwards & Hyett, 2001), both during the construction phase and once the building is in use. All activities or social practices in a building involve the use, redistribution and concentration of some components of the Earth's resources, such as water, energy and materials (Sev, 2009). Sound environmental practices or behaviour in a commercial office building can therefore significantly contribute to the reduction of carbon emissions (Mulholland & Matshe, 2009). The examples discussed in the following sections represent some areas in which social practices could have a noteworthy environmental impact.

2.4.5.1. Energy use in a commercial building environment

A significant reduction in greenhouse gas emissions is necessary to reduce their impact on the environment and affect climate change positively (IPCC, 2007). This will, amongst other initiatives, require large-scale changes to the way that energy is produced, transported and consumed (Carrico & Riemer, 2011). The reduction of energy use through conservation and efficiency has been identified as one of the more immediate and cost-effective options available for meeting reduction targets (McKinsey Global Institute, 2007). Research has shown that lighting and heating, ventilation and air conditioning (HVAC) in commercial buildings is responsible for the highest consumption of energy in the Western Cape (Winkler, Borchers, Hughes, Visagie & Heinrich, 2006). HVAC and lighting in commercial buildings therefore offer significant potential for action to achieve energy savings. In this regard effort has focused on the technological and operational modifications of commercial buildings to incorporate more energy efficient building management systems (Starik & Marcus, 2000). These systems ensure that energy is only used for HVAC and lighting when required (Motau, 2010).

In addition, many businesses are ignorant of the fact that the long-term use of equipment costs them much more than the initial acquisition. As an example, one study conducted in the USA indicated that a photocopier, which initially cost $4,000 (R50,000) to buy, may consume $1,500 (R18,750) of electricity, $24,000 (R300,000) of paper and $15,000 (R187,500) of ink toner if it is left on continuously for the typical seven years (two-million copies) lifespan of a photocopier (Sustainable Solutions (Pty) Ltd, 2001). The greenhouse gas emissions that result from supplying energy for the manufacturing and disposing of the paper alone, could exceed 80 tons of carbon dioxide, which is equivalent to more than the total greenhouse gas emissions of a typical household over that seven-year period (Sustainable Solutions (Pty) Ltd, 2001).

Based on empirical evidence, many leading-edge organisations have bought into the green philosophy, not only from an environmental point of view, but also in consideration of their operational energy costs (Sustainable Solutions (Pty) Ltd, 2001). An energy efficient photocopier designed to use recycled paper and refill toner cartridges, which can copy double-sided and which can be set to a power-save mode, could, over a seven-year time span, reduce the electricity costs by up to 80%, halve toner and paper bills, reduce greenhouse gas emissions from electricity, paper and toner by 75% and leave 50 trees in the ground which

would otherwise have been chopped down to make the paper used (Sustainable Solutions (Pty) Ltd, 2001).

With all the accummulated evidence, employee practices will eventually determine whether a reduction in energy use and environmental impact is really achieved, and it will be based on the manner in which they use energy and other resources at work (Sierra Club, 2007). Energy conservation initiatives require participation of all relevant stakeholders who occupy buildings (Winkler *et al.*, 2006; Carrico & Riemer, 2011) and could include basic routines such as switching lights off if a space is vacated for more than 15 minutes, and/or ensuring that only the necessary strategic lights are left on during the night. Increased reliance on natural daylight instead of artificial light sources could also contribute to a reduction in energy use.

Another basic practice which could be adopted to save energy is the unplugging of all unused or seldom used appliances and the application of power-management settings. In one particular study, it was found that 81% of the respondents knew or claimed to know that a television in standby mode consumes electricity. However, results in the same study also revealed that only 29% never left their televisions in standby mode (Bartiaux, 2007). This illustrates that even though individuals may be aware of effective energy-saving behaviour in their daily usage of equipment, more effort should be directed towards developing a practical consciousness that will ensure that such practices become routine behaviour.

2.4.5.2. Water consumption in a commercial building environment

South Africa is a semi-arid country which means that the country is a chronically water-stressed and that surface water is heavily committed for everyday consumption. Water is imported from neighbouring countries and the limited groundwater resources in South Africa do not offer much reprieve (Ashton, 2002; Scholes, 2001). Precipitation has fluctuated over the years with an average of 500 mm per annum, well below the world average of about 860 mm per annum (Department of Water Affairs and Forestry [DWAF], 2002). As a result, water availability is predicted to be the single greatest and most urgent development constraint facing South Africa. The need for water is further highlighted by the fact that water scarcity in developing countries must be closely monitored to ensure enough for consumption (Turpie, Marais & Blignaut, 2008).

Consumption of water in a commercial building environment includes manufacturing and operational processes, bathrooms and food services (Surendran & Wheatley, 1998). Although manufacturing and operational processes are not relevant in all commercial environments, most require food services and bathrooms. Hence environmentally friendly building practices prescribe structures and fixtures to contribute to a reduction in water consumption (Cheng, 2002). However, the manner in which occupants of a building utilise the devices that have been implemented to reduce water consumption, will ultimately determine the amount of water which is saved. Within bathrooms for example, occupants must press the correct button on the toilet to ensure more water efficiency. Examples of other water-saving practices is to prevent water from running the whole time while washing hands and to throw tissue or paper towels in a bin instead of flushing them down a toilet. Water usage is often difficult to monitor, but an effort could be made to establish a baseline of water usage for a facility and to then try and encourage a yearly reduction (Millock & Nauges, 2010).

2.4.5.3. Consumables, waste management and recycling in a commercial building

Consumables such as paper, ink and stationery form part of the daily practices in a commercial office environment. Studies in the US have established that the average office worker uses 10 000 sheets of copy paper a year (USEPA, 2011; Petronzio, 2014). Ample empirical evidence has brought to light the importance of educating and training office workers to judge the necessity of printing information and to opt for paperless electronic mediums whenever possible (Petronzio, 2014). Some initiatives to encourage saving paper are to include screen messages that appear when a print job is submitted, to consider the necessity of printing before doing so and making more use of e-copies by scanning and e-mailing of documents instead of faxing. Office workers could also be encouraged to print double-sided and in draft mode whenever feasible in their day-to-day routine activities. Overall, the use of recycled paper with a minimum of 50% post-consumer fibre content, and refill toner or ink cartridges could lead to a substantial reduction in the carbon footprint (University of Notre Dame, n.d.). As a further example, remanufactured toner cartridge 'keeps approximately 1,1 kg of metal and plastic out of landfills, and reserves about 1,9ℓ of oil (Botes, 2012).

Paper reduction and recycling schemes with sufficient recycle bins and clear information, can reduce costs and environmental impacts associated with the manufacturing and use of paper by 75-95% (Sustainable Solutions (Pty) Ltd, 2001). If all stakeholders of a company buy into a reduction of consumables, savings can be achieved but effective training and feedback on performance and waste management are essential. Waste audits are very important in this regard and involve an assessment of the amount of waste generated by the occupants of a building over a certain period. The results are used as the baseline for the building and subsequently a process of reducing the amount of waste begins (Paper Recycles, 2011; USEPA, 2013). This is where social practices will contribute the most and have the largest influence in achieving the long-term benefits of a green approach. It is also where most education and training is needed to ensure productive and sustainable ways of reducing waste (Paper Recycles, 2011; USEPA, 2013;). Moreover, those who are encouraged to participate must understand that saving money, living simply, reducing waste and reusing whenever possible is not as a result of a financial crisis, but rather because of the fundamental need to reduce pressure on the raw resource consumption of the local and global community.

By incorporating pro-environmental practices such as those described in this chapter in an organisational setting, openness to environmental information can be achieved. It is argued that the more environmentally aware individuals become, the more they will be willing to change their behaviour or social practices accordingly. It also seems that the more a company creates opportunities to engage in pro-environmental practices, the more people will feel that they can adopt environmentally responsible habits and lifestyles. To achieve this, the company needs to 'sell' the going green concept and develop a culture that underscores the importance of pro-environmental principles so that social pressure is imposed on those who do not accept the greener lifestyles and practices automatically (Bartiaux, 2007).

2.5. THE CONCEPTUAL FRAMEWORK

As confirmed by exisiting literature, human nature always takes priority over essential needs of the society. The behaviour gap between knowledge and the social practices of a building occupant is finally not surprising in societies where socio-technical innovations and evolving socio-cultural perspectives on comfort and convenience converge into daily social practices

that demand an ever-increasing amount of natural resources (Bartiaux, 2007). The research in question, that is based on Giddens' (1984) structuration theory, aims to assess occupants' level of environmental knowledge about broader environmental issues and investigates the level of control building occupants have over their physical office environment. Finally, through describing their practical and discursive consciousness that represents a key role in changing a lifestyle and social practices, the potenial to synergize acceptance of the As Built Green Star SA design can build a philosophy in such a way as to engage occupants as agents in pro-environmental practices that contribute to energy and water saving, as well as waste reduction and recycling in their office environments.

Figure 1 summarises the conceptual framework, which guided the investigation. By applying the main assumptions taken from structuration theory it illustrates the relationship between the critical concepts and role players identified in literature.

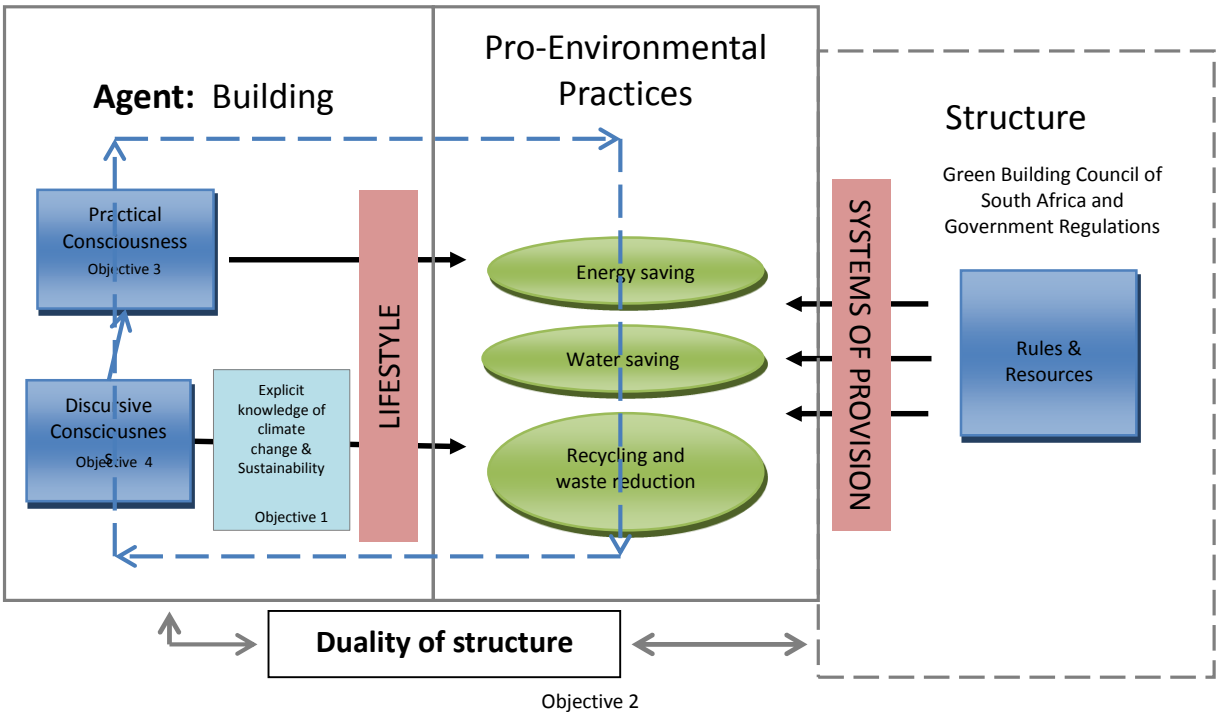

FIGURE 2.1: CONCEPTUAL FRAMEWORK

The conceptual framework, based on the 'model of consumption' by Spaargaren and Van Vliet (2000), which is based on structuration theory, aims to illustrate that building occupants' behaviour is studied with the notion of the duality of structure in mind. Duality of structure implies that two perspectives need to be considered when investigating the same set of pro-environmental practices such as energy and water saving practices as well as recycling and waste reduction. These two perspectives can be seen as both the building environment and the structures that influence agents (i.e. green building occupants), as well as the fact that these agents are continuously recreating their environments by engaging in social actions particularly pro-environmental practices in a built environment. Hence, social structure does not exist independently outside of human agency and the interplay between these dimensions in defining and reproducing each other are of particular significance (Nonaka & Toyama, 2003; Rose & Scheepers, 2001).

The conceptual model (Figure 1) further proposes that the building occupant, as an agent, has two kinds of consciousness. Firstly practical consciousness involves the capability of an agent to intuitively maintain everyday routine activities in a built environment without much explanation or justification (Giddens, 1984; Jackson, 2005; Lippuner & Werlen, 2009). Secondly discursive consciousness is reflexive and involves the capability of an agent to consciously reason and explicitly describe the motivation and intentions behind actions (Lyytinen & Ngwenyama, 1992). Based on the underlying assumptions of structuration theory, it is argued that to change behavioural patterns requires the building occupant to 'raise' routine behaviours from the level of practical consciousness to discursive consciousness through explicit knowledge. Explicit knowledge of climate change and sustainability issues should, in turn, influence the agent's lifestyle and the enactment of pro-environmental practices. This stresses the fact that knowledge plays a dominant role in the pro-environmental practices of agents (Kollmuss & Agyeman, 2002).

However, adopting pro-environmental practices in a built environment also requires systems of provision such as those facilitated by GBCSA initiatives and government regulations that allows the agent a certain level of control over their physical building environment, with particular reference to their use of energy, water and the consumption of other resources. The inclusion of the structure and systems of provisions in the model is important in contextualising

the duality of structure. It should, however, be noted that for the purposes of this study, the agent (i.e. building occupant) and associated practices constitute the main focus of enquiry. It is argued that in the context of an As Built Green Star SA building where the enactment of pro-environmental practices is facilitated, the agent may ultimately determine whether or not, in the long run, the building is 'used' in the correct way to ensure that it reaches its maximum potential. Hence the study objectives are (Section 1.5):

1.8.1. To assess and discuss As Built Green Star SA building occupants' knowledge about broader environmental issues and factors that will affect the sustainability of global resources that have implications for future generations and society in general

1.8.2. To investigate and describe the level of control that As Built Green Star SA building occupants' have over their physical office environment including their use of energy, water and the consumption of other resources

1.8.3. To investigate and describe As Built Green Star SA building occupants' practical consciousness in terms of its manifestation in routine office practices that contribute to:

3.1. energy saving

3.2. water saving

3.3. recycling and waste reduction

4. To explore and describe As Built Green Star SA building occupants' discursive consciousness that is considered a pre-cursor for willingness to engage in practices that contribute to:

4.1. energy saving

4.2. water saving

4.3. recycling and waste reduction

2.6. CONCLUSION

In the first part of this chapter on green building, the certification process and the costs involved in going green were explained in detail. It is also clear that the imposed initial higher prices for green building are not so high anymore and that the benefits associated with green buildings are far more valuable than the initial higher costs involved.

The next part of the chapter provided an in-depth discussion of each of the essential concepts that places this investigation in perspective within the framework of structuration theory. Each concept was explained and described so that the concepts are clear and to ensure content validity. Lastly, all the concepts were summarised within a conceptual framework that also locates the objectives within the scope of the study. The conclusion reiterated the aim and stated objectives of the investigation.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1. INTRODUCTION

This chapter focuses on the research design and methodology that was used to obtain primary data to address the objectives of this study. More specifically, a discussion of the research design highlights the exploratory and descriptive nature of this research in addition to the specified unit of analysis and the purposive sampling plan implemented to recruit an appropriate sample for the study. The chapter also provides an outline of the method and processes used to explore the environmental knowledge, as well as the practical and discursive consciousness of occupants of certified As Built Green Star SA buildings that translate into everyday practices in an office environment. The chapter concludes with a discussion of the validity and reliability of the data as well as the ethical issues that were considered in the execution of the study.

3.2. RESEARCH DESIGN

This study adopted an exploratory and descriptive approach by conducting a survey-based case study of the environmental consciousness and practices of occupants in Green Star SA certified As Built buildings. Exploratory research is conducted in order to gain a better understanding of a community, situation or phenomenon of which limited information is available (Fouché & De Vos, 2009:106). To date, limited empirical research has been done in the South African green building domain and therefore a contextual gap exists in current literature regarding the pro-environmental practices of individuals who work in Green Star SA certified As Built buildings. Descriptive research involves the observation of a situation and explains these observations in more detail (Walliman, 2005:115). Adoption of a combined exploratory and descriptive research design served two purposes: it enabled a better understanding of how occupants of green buildings engage with their environment; and to yield specific details surrounding their daily practices noting the extent to which they are

conscious that their behaviours reflect the green ethos of the buildings in which they are accommodated. A cross-sectional case study design was followed since the data reflected the occupants' current state of consciousness, knowledge and practices. Cross-sectional research involves once-off observations to produce the best possible empirical evidence of phenomena at one specific moment in time (Babbie, 2001; Neuman, 2011:44). According to Creswell (1998:61) and Yin (2012:5), a case study involves exploratory and descriptive questions that are bound by time and place pertaining to a specific situation and may involve methods such as survey questionnaires or experiments. This case study focuses solely on describing and exploring the specific case of certified As Built Green Star SA buildings. The purpose is not to understand a broad social issue, but rather merely to describe the current situation within the green building sector (Fouché, 2009:272). In using a survey approach, the data was collected by means of electronic and paper-based questionnaires, which resulted in quantifiable primary data.

3.3. SAMPLE AND SAMPLING

3.3.1. Units of Analysis

Following the objectives of this study an important prerequisite for participation was that respondents had to occupy space for work purposes in an As Built Green Star SA certified building. The units of analysis thus included tenants and/or employees of organisations occupying these buildings irrespective of their demographic profile. No restrictions were placed on gender, age, income, population group, education and/or marital status as long as the potential participant had experience of working in an As Built Green Star SA certified building. In 2014, there were six As Built Green Star SA certified buildings in South Africa. Permission was obtained from the building management themselves to access four of the six buildings for data collection purposes.

The profiles of the tenants and/or organisations that occupy space in these four buildings differed to some extent and can be summarised as follows: The first building is occupied by a major South African bank and is situated in the new Menlyn Maine development east of Pretoria. This building has a local bank branch on the ground floor where bank tellers and administrative personnel attend to the everyday banking needs of their clients. The rest of the

building accommodates specialised bankers in various fields and personnel in supportive roles for the specialised bankers. The second building is occupied by employees of a large engineering firm and is located in the Lynnwood area, in Pretoria East. The building provides office space for 1500 specialised engineers, administrative personnel as well as some human resource and internal finance staff. The third building is situated in a new development in Umhlanga, in KwaZulu-Natal. This building accommodates several tenants, each representing different industries. This building posed several difficulties in the recruitment of participants since the researcher had to rely on the building owners to send out an electronic survey link to their tenants who would, in turn, distribute it to their employees. Despite efforts to follow-up and encourage participation, the overall response rate for this building remained low. The fourth building that was included in this study is a refurbished building in the Cape Town inner city area. The building accommodates 20 individuals who operate and specialise in the green building industry.

In summary it should be noted that, due to the profile and composition of the staff who worked for the organisations that occupy these buildings, the eventual sample included mostly high income earners who had higher than average levels of education. Although it may be argued that these individuals do not reflect the demographic characteristics of the larger South African population, their perspectives remain of interest as they have the ability to contribute to the country's ecological footprint in a significant manner, an observation placed indicated by Jorgenson (2003). This coincidence can be explained by the location of the buildings in more affluent suburbs in established metropolitan areas.

3.3.2. Sampling

A purposive sampling technique was chosen for this study to include participants who complied with the criteria as set out in the fore-mentioned discussion of the unit of analysis. Essentially the sole criterion was for respondents to have had experience working in the prescribed type of building. Their biographic profile was irrelevant. Purposive sampling involves recruiting a sample that is composed of elements that contain the most characteristic representative or typical attributes of a population (Strydom, 2009:202), and therefore involves the researcher's judgment regarding the most appropriate 'typical' sample (Walliman, 2005:279). Since permission was obtained to access only four As Built Green Star SA certified buildings, the

scope for recruitment to secure the most appropriate, typical participants was limited, as the other two buildings' management refused to grant access.

The initial sampling plan was to send an electronic survey link to all office space occupants in the selected buildings. The developers and/or owners of the As Built Green Star SA certified buildings were to be asked for permission to send the link of the online survey to all occupants. Since contact details of private persons, including email addresses, are strictly confidential and therefore not readily available, the researcher had to rely on the developers, owners, and/or renting companies to forward the survey link to appropriate individuals in the different buildings. Since using the online surveys was becoming difficult to implement effectively, it was also established later that the servers of two of the buildings were not compatible with the online survey software that was used for this study. Since using the online survey turned out to be problematic it was eventually decided to offer both electronic and paper-based versions of the questionnaires to enable willing respondents to complete the questionnaire in a mode of presentation that was most suitable for them. However, permission to gain physical access to the facility to recruit participants and distribute paper-based questionnaires could only be obtained from the facility managers of one building. Because only restricted access to this building being granted the researcher was compelled to use a non-probability convenience based sampling approach to gather primary data inside the building. Convenience or accidental sampling involves recruiting any individuals who are willing to participate in the study on a voluntary basis. Employees were approached in the building cafeteria or delicatessen and asked to complete the survey questionnaire. Four hundred printed questionnaires were distributed in this particular building. In all cases, as a token of appreciation, individuals who volunteered and completed a questionnaire were offered a token for refreshments that they could redeem in their own building.

A total of 203 completed questionnaires were retrieved through the combination of the electronic survey link (which was main form of data collection in three of the four buildings) and the paper-based questionnaires that were distributed in the fourth building. Two questionnaires had to be discarded due to incomplete responses. It is important to note that non-probability, convenience based samples can only provide a vague basis for generalisation of the conclusions (Walliman, 2005:278), but was deemed appropriate for the exploratory purposes of this study.

3.4. DATA COLLECTION

An instrumental case study research design was followed as very little research to date has addressed the perspectives of occupants of As Built Green Star SA certified buildings in South Africa. Furthermore, primary data was collected from a purposively selected sample group by means of electronic and paper-based survey questionnaires as explained in the sampling plan. It is a method recommended in the literature (Walliman, 2005:279; Neuman, 2011:267). Survey based research is an effective way of obtaining information from individuals who presumably have an understanding of the topic under investigation, and is an excellent way of finding out about people's opinions, actual practices and attitudes that relate to the topic in question. This attribute makes it appropriate for this study on As Built Green Star SA certified buildings.

In adopting a "paperless" approach (in accordance with the environmental theme of the study), electronic survey questionnaires were distributed by means of Survey Monkey software to all occupants in the selected As Built Green Star SA certified buildings. This approach offered the advantage of physically separating the respondent and the researcher to eliminate the possibility of the fieldworker cum researcher influencing the response, thereby increasing the chance of obtaining a true representation of the respondent's viewpoint. Eventually such a procedure should produce findings that are more valid and reliable. Despite efforts to encourage participation, response rates from electronic mail questionnaires were very low. The reason for this may be attributed to the busy schedules and time-bound nature of the occupants' professions, which allow them limited time to complete questionnaires during office hours.

A second approach was therefore followed, whereby a decision was made to distribute paper-based copies of the questionnaire in the buildings. Unfortunately this step too was hampered by strict security codes that limited entry into the buildings. In the end, only one company granted permission and agreed to allow the researcher access to their building. During the course of two weeks 400 copies of the questionnaire were handed out to staff members who occupied space in this particular building and 203 of the were returned. As far as possible a green philosophy was adopted in that the distributed paper-based questionnaires were printed on paper with 95% recycled content.

3.4.1. The Measuring Instrument

The structured questionnaire (Addendum A) developed for this study comprised six sections, which are briefly summarised as follows:

- Section A addressed demographic information namely gender, age, education, income and language in order to get a better understanding of the respondents' demographic profile.
- Section B included the South African Audience Research Foundation's (SAARF) and the living standard measure (LSM).
- Section C comprised questions that determined the type of office environment in which respondents conducted their daily work routines.
- Section D included items that were derived from combining two scales namely the Stone, Barnes and Montgomery's Eco-scale (1995) and the Social Responsible Consumption Scale (Antil & Bennett, 1979) to determine respondents' level of environmental knowledge.
- Section E determined respondents' practical consciousness in terms of its manifestation in routine office practices that contribute to energy saving, water saving as well as recycling and waste reduction.
- Section F determined respondents' discursive consciousness that related to their willingness to engage in practices that contribute to energy saving, water saving as well as recycling and waste reduction.

Sections A and B predominantly focused on the demographic profiles of the respondents to accurately describe the sample of this study. Section B was based on the South African Audience Research Foundation's (SAARF) living standard measure (LSM), which has become a widely used measuring instrument and marketing research tool in South Africa (SAARF, 2011). This measuring instrument divides the population into ten LSM groups, with LSM 10 indicating the highest level of the living standard measure and LSM 1 relating to the lowest. SAARF's LSM measure is a unique means of segmenting the South African market as it cuts across race and other outdated techniques of categorising people, and instead groups individuals according to their living standards using criteria such as degree of urbanisation and ownership of cars and major appliances. Each item in the scale is assigned a certain weight.

3.4.2. Data Analysis

As briefly explained in Chapter 1, descriptive and inferential statistics were used to analyse and portray data. In the chapter to follow, the data is presented in graphs and tables in order to gain more insight into the responses elicited from the respondents. Descriptive statistics defined and quantified the numerical character of the data through measures such as frequencies, means and standard deviations. Inferential statistics provided a more detailed interpretation of the data through exploratory factor analysis [EFA], Cronbach α and cross-tabulations to explore the environmental consciousness and practices of occupants and to produce predictions through inference (Neuman, 2011:412-413; Walliman, 2005:305). The statistical analyses was done and checked in collaboration with the Department of Statistics at the University of Pretoria.

3.4.2.1. The living standard measure (LSM)

To calculate a respondent's LSM score, the weights of all the questions marked as true are summated. The constant of 0.81 is then subtracted from the summed weight to determine the final score and the LSM group to which the respondent belongs. Table 1 provides a summary of the scores that specify each LSM group.

Table 3.1: Living Standard Measure score categories (SAARF, 2011).

LSM Score	LSM Group
<-1.390140	1
≥ -1.390140 to < -1.242001	2
≥ -1.242000 to < -1.011801	3
≥ -1.011800 to < -0.691001	4
≥ - 0.691000 to < -0.278001	5
≥ - 0.278000 to < 0.381999	6
≥ 0.382000 to < 0.800999	7
≥ 0.801000 to < 1.168999	8
≥ 1.169000 to <1.744999	9
≥1.744999	10

3.4.2.2. Class of the buildings

In addition to the demographic profile of the sample, it was important to understand the degree to which respondents' had control over their physical office environments with particular reference to their use of energy, water and the consumption of other resources. Office environments can be categorised as traditional or more contemporary open plan designs that differ in terms of layout, furniture design, lighting and functionality of the office space (Kopec, 2006:240). The As Built Green Star SA certified buildings that formed the focus of this investigation predominantly reflected more contemporary office designs with particular emphasis on a green approach that should have a direct influence on the way occupants interact with the office space, especially in terms of their pro-environmental practices. For the purposes of this study differentiation was made between working spaces described as follows:

1. large open plan office spaces where a desk and a chair is allocated to each employee;
2. a work environment which entails a cubical office space where each employee has a separated cubicle, desk and chair;
3. a work space that is enclosed with walls (e.g. glass, brick or drywall) where each employee has a private office space;
4. an office space where employees occupy a desk space and seat on a first-come-first-serve basis.

The respondents were asked to indicate what statement best described their own office environment and also to indicate to what extent they had control over equipment and environmental conditions in that particular office space such as lighting, temperature, window treatments, printing facilities, stationary and recycling bins.

3.4.2.3. Knowledge test

In addition to questions pertaining to demographics that gave the sample a specific identity and office environments, a series of knowledge items were included in Section D to establish occupants' of the different green buildings degree of environmental knowledge about general environmental issues. It was argued that respondents would have some understanding of broader environmental issues and factors that impact on the sustainability of global resources, especially in light of the fact that they work in state-of-the-art green buildings that could contribute to their consciousness and willingness to engage in pro-environmental practices.

Respondents had to indicate their responses on a 3-point nominal scale described as true, false and do not know. The items that were used in this scale were based on knowledge and awareness items that were combined form Stone, Barnes and Montgomery's (1995) Eco-scale as well as the the Social Responsible Consumption Scale (Antil & Bennett, 1979).

The knowledge assessment included 17 true/ false questions: 8 items were drawn from the "Eco Scale" (Stone, Barnes & Montgomery, 1995); two items were drawn from the Social Responsible Consumption Scale (Antil & Bennett, 1979). In addition to the fore mentioned, six items were included that were developed for two similar studies in the local context (Ferreira, 2014). All 17 items were successfully tested in both these studies and seemed appropriate for the purposes of this study to assess building occupants' knowledge about issues such as climate change and other environmental facts. Response options included "true", "false" or "I don't know" categories. For data analysis purposes, incorrect answers, (that could be either true of false depending on the statement in question), and "I don't know" responses were combined. The responses were grouped into categories ranging from poor to excellent knowledge. A mean below 50% was regarded as a poor reflection of knowledge; 50 to <60% was regarded as average; 60 to <70% was regarded as above average; 70 to <80% was regarded as good; 80 to <90% was very good and a mean above 90% was considered excellent.

3.4.2.4. Practical and discursive consciousness

In Section E the practical consciousness of respondents was measured in terms of its manifestation in actual office practices. The questions addressed a range of pro-environmental practices which contribute to the building's achievement of efficiency levels as per the initial envisaged green principles incorporated into the design and construction of the building. A series of questions was developed to measure practices pertaining to water and energy usage as well as waste management. Responses were indicated on a 5-point Likert-type scale ranging from 'Never' to 'Always' and included a "Not Applicable" option. This option was added to accommodate responses from participants who were not familiar with or had no control over certain practices in their particular office environments.

As a further contribution to existing theory pertaining to pro-environmental practices in an office environment, the 25-item scale (Section E) developed for this study was subjected to Exploratory Factor Analysis (EFA). EFA is used to establish whether the variables in a data matrix are related to each other to represent underlying dimensions known as factors. EFA thus explores patterns among the variables to disclose if any underlying combination of the original variables can summarise the original set in terms of factors (Cooper & Schindler, 1998:560; Mazzocchi, 2008:221). For the purposes of this study, an extraction method known as Principal axis factoring was performed using Varimax rotation with Kaiser Normalization. Based on Kaiser's criterion (i.e. retaining all factors that are above the eigenvalue of 1).

Finally, Section F incorporated a series of items that measured the occupants' discursive consciousness and their willingness to change their practices in order to be more environmentally responsible. In the previous section, occupants' actual practices were addressed, and in this section question items were formulated to tap into a discursive recognition of the environmental impact of energy saving, water saving, recycling and waste reduction practices. A 4-point scale was used with responses ranging from "strongly disagree" to "strongly agree". This scale did not include a "Not Applicable" option as it was assumed that respondents would have an opinion about environmentally responsible practices although they may not be directly confronted with it in their everyday office environment.

Similar to the scale developed for Section E, Section F included 25 self-developed items: ten items tapped into respondents' understanding of the underlying energy saving outcomes of certain office practices, five items measured their understanding of the water saving outcomes of specified practices and ten items focused on the underlying recycling/waste reduction reasons for particular office practices. This scale differed from the one used in Section E by capturing responses on a four-point Likert-type scale with increments varying from "strongly disagree" to "strongly agree". To simplify the interpretation and analysis of data the "strongly disagree" and "disagree" response options were combined and labelled as "disagree", whereas the "agree" and "strongly agree" options were merged and categorised as "agree".

A similar process as described for the building occupants practical consciousness was followed to conduct an EFA on the data pertaining to respondents' discursive consciousness, whereby

the 25-items included in Section F of the questionnaire was subjected to Principal axis factoring using Varimax rotation with Kaiser Normalization as an extraction method in order to distinguish coherent factors and components for each factor.

3.4.3. The Pilot Study

A pilot study was conducted before the onset of the main study to pre-test the measuring instrument on a small number of persons with characteristics similar to those of the target group of respondents (Singleton *et al.*, 1988; Monette *et al.*, 1998; Strydom, 2009:206). After the pilot study was conducted, some of the wording of the questions was altered to avoid confusion and to ensure that all of the questions were clearly understood. The structured questionnaire was available in English only, as the corporate language of all four buildings was predominantly English.

3.5. OPERATIONALISATION

TABLE 3.2: OPERATIONALISATION TABLE

OBJECTIVE	QUESTIONNAIRE SECTIONS:	STATISTICAL PROCEDURES
1. To assess As Built Green Star SA building occupants' knowledge about broader environmental issues and factors that will affect the sustainability of global resources that have implications for future generations and society in general.		
	Section D	Descriptive statistics Cronbrach's α
2. To investigate and describe the level of control that As Built Green Star SA building occupants' have over their physical office environment including their use of energy, water and the consumption of other resources		
	Section C	Descriptive statistics Cronbrach's α
3. To investigate and describe As Built Green Star SA building occupants' practical consciousness in terms of its manifestation in routine office practices that contribute to:		
3.1. energy saving 3.2. water saving, as well as 3.3. recycling and waste reduction	Section E	Descriptive statistics Cross tabulation Cronbrach's α Exploratory factor analysis
4. To explore and describe As Built Green Star SA building occupants' discursive consciousness that relates to their willingness to engage in practices that contribute to :		
4.1. energy saving 4.2. water saving, as well as 4.3. recycling and waste reduction	Section F	Descriptive statistics 4 point scale Cronbrach's α Exploratory factor analysis

3.6. ENHANCING THE QUALITY OF THE DATA

3.6.1. Validity

Validity refers to the extent to which a measuring instrument accurately reflects the concept it intended to measure (Babbie & Mouton, 2001:122; Gravetter & Forzano, 2003:87; Leedy & Ormrod, 2005:92). In this study, validity was addressed as follows:

Theoretical validity was achieved through an extensive literature review to ensure that all the key concepts in the study were properly conceptualised and explained. Well-established theories were used to clarify the key concepts and relevance between the concepts. The theoretical validity also explains the phenomena in such a manner that it supports the construct validity (Cohen, Manion, & Morrison, 2007:135).

Construct validity determines the degree to which an instrument successfully measures a theoretical construct. To establish construct validity, established scales were used where possible such as the South African Audience Research Foundation's (SAARF) scale for measuring living standard measures (LSM) and the eco-scale, which amongst other, measures individuals' broader environmental knowledge as designed by Stone, Barnes and Montgomery (1995) as well as the Social Responsible Consumption Scale (Antil & Bennett, 1979). The meaning of the construct must also be understood as well as the proposition the theory makes about the relationship between the different constructs (Mouton & Marais, 1990:66). A pre-test of the questionnaire was conducted to ensure terminology was understood and to eliminate potential problems with the question format.

Content validity has to do with whether a measuring device covers the full range of meanings, a representative sample of all content, elements or instances of the phenomena being measured (Monette *et al.*, 2002:115; Delport, 2009:160-161). Content validity ensures that all respondents will understand the content of the questionnaire in the same way so that all misunderstanding or misinterpretation can be avoided. An effort was made to achieve content validity by submitting the questionnaire that was developed for this study for peer review by the study leaders and a statistician as well as pre-testing it among a smaller subset of the sample population.

3.6.2. Reliability

Reliability of a measurement instrument refers to the stability and consistency of the measurement findings (Denscombe, 2007:296). This means that if the same variables are measured under the same conditions, a reliable study will produce the same findings. A reliable study thus has the ability to produce consistent numerical results each time it is applied. It does not fluctuate unless there are variations in the measurement of variables (Monette *et al.*, 2002:117; Gravetter & Forzano, 2003:91). Although a study is seldom perfectly reliable, some procedures can be followed to enhance reliability (Neuman & Kreuger, 2003:179-180). In this study attention was paid to ensuring reliability through clear, unambiguous conceptualisation of each construct, and that each measure indicated only one specific concept. In addition, multiple indicators were used to measure all aspects of the variables. This was especially important since respondents might have had misconceptions about the true meaning of environmentally related concepts such as recycling, waste reduction and energy usage. Pre-testing the questionnaire in a pilot study ensured that all biased wording was removed in the final version of the questionnaire, thus contributing to more reliable results (Delport, 2009:162-3).

3.6.3. Ethics

When conducting research, cognizance should be taken of the need to eliminate any psychological and/or emotional harm (Walliman, 2005:432; Strydom, 2009:58). Respondents who participated in this study were not subjected to any psychological or emotional harm and participation occurred on a completely voluntary basis at a time that best suited each individual. An informed consent form accompanied each questionnaire. It included the following information: a brief explanation of the study; a short descriptive explanation of the nature of the research procedure and the estimated time for completion (approximately 15 minutes) was indicated; the respondent was reminded that the study was based on voluntary participation; and that they could terminate their participation at any given time. In addition, a declaration was given that all responses would remain confidential and anonymous. The researcher's contact information was given and respondents were invited to contact her should they have questions or concerns about the study. Before commencement of the actual data collection process, approval was obtained from the University of Pretoria's Ethics Review

Committee of the Faculty of Natural and Agricultural Sciences to conduct the research. In addition, permission and approval was obtained from the management of the various organisations that occupied the buildings that were included in this study. In completing the study, care was taken to offer honest and true research findings. Moreover full statements of acknowledgement and recognition of the thoughts, ideas and other intellectual property of third parties were given as advised by Leedy and Ormrod (2005:102).

3.7. CONCLUSION

This chapter provided an overview of the methods that were used to gather and interpret the data so that valid and reliable research findings could be generated. The chapter highlighted the research design of the study that was explorative and descriptive. The research design was further classified as a cross-sectional case study with a detailed description of the sampling plan and the purposive recruitment of individuals that occupy office space in As Built Green Star SA certified buildings as respondents. The development of the questionnaire and data collection procedures were also described and presented as an operationalisation table that illustrated the manner in which the study objectives be accomplished. At the end of this chapter, an explanation of the data analysis approach and the techniques that were used to ensure the quality of the data was presented. Finally the ethical aspects considered in this study were highlighted. The following chapter describes the findings of this study and provides an interpretation of the data as generated through the methods and procedures described in this chapter.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1. INTRODUCTION

This chapter provides an overview of the demographic characteristics of the sample, before attending to insights gained from the data analysis. The results and a discussion of the results are presented in accordance with the objectives of this study. The study's main objectives were formulated to obtain detail about As Built certified building occupants' current knowledge regarding environmental issues and to what extend their knowledge is reflected in their actual everyday office behaviour. Findings are interpreted in accordance with the underlying assumptions of the structuration theory. This theory underscores the intricate and interdependent relationship between the agent (i.e. occupant of Green Star SA, As Built certified building) and his/her immediate office environment which in turn can be seen as the systems of provision that were designed to facilitate pro-environmental office practices. The theory also emphasizes the importance of an agent's level of knowledge, which may enable certain everyday routine behaviours and mould perceptions of how an individual should interact within a certain environment. The findings of this study thus provide a current scenario within the green building sector that highlights the green building occupant's understanding of the built environment in which he/ she is accommodated and what behaviour/ practises are needed to ensure that the envisaged long term goals of green building project is achieved.

4.2. DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE

A total of 201 questionnaires were retrieved for data analyses after the electronic survey link was sent out to three As Built buildings' occupants and 400 printed questionnaires were distributed among the occupants of a fourth As Built building. The first section of the questionnaire probed various demographic characteristics of the respondents that were considered relevant to this study.

4.2.1. The Gender Distribution of the Sample

The sample for this study (N=201), consisted of 52.7% males (n=106), and 47.3% females (n=95). The gender distribution was coincidental as convenience sampling was used whereby any willing participants in a particular building were asked to fill in a questionnaire. The eventual sample does however closely reflect the gender distribution of the larger South African population. Based on reports issued by Statistics South Africa (2011a), the South African population is made up of 48.65% males versus 51.35% females. More specifically, the male/female distribution in the Gauteng region (where most of the respondents reside) is 50.43% males versus 49.57%, females (Statistics South Africa, 2011a). According to a recent statistical labour quarterly report released end 2014, the gender workforce distribution between men and woman of different population groups are also relatively equal (Statistics South Africa, 2014). The gender representation in this study was therefor considered acceptable.

4.2.2. The Age Distribution of the Sample

A building occupant's age may have a significant influence on how the he/ she will respond to a new environment. A study by Prensky (2005) explains how the younger generations under 35 years of age process information fundamentally different to their older counter parts purely because of their increased exposure to modern technology. Since the younger generation have had more exposure to media such as the internet and "pay TV", they may be more adept at utilizing new technology and perceive change is a constant. It could therefore be argued that age may influence individuals' acceptance of new technology and information pertaining to a green built environment, as well as how to change behaviours and adapt to routine behaviour within these new environments. For this study, the age criteria was not restricted. The respondents were asked to indicate their age at their last birthday. The responses were divided into four categories as seen in Table 4.1.

TABLE 4.1: AGE CATEGORIES (N=201; Missing: n=5)

Age categories	n	%
<25 years	19	10
≥25 to <35 years	94	47
≥35 to <55 years	75	38
≥55 years	10	5
Total	**196**	**100**

As indicated in Table 4.1 the majority of the respondents were between 25 and 35 years of age (47%, n=92), with the second largest segment of the building occupants, between 35 and 55 years of age (38%, n=75). These two age groups represent the largest age group segments within the general South African population and may therefore also represent the main workforce in South Africa (Rousseau, 2003). This age distribution also resembles the typical composition of a population in a developing country rather than the developed countries. According to recent census reports the largest segment of the South African population is aged between 35 and 55 (Statistics South Africa, 2011a). The mean age of the respondents in this study was 35.62 years. A small minority of the sample was under 25 years (9.7%, n = 19). In some instances, the organisations/ companies that occupy these buildings employ younger individuals on a part time basis to contribute to their training or qualification for a particular degree/ diploma. Only 5% (n = 10) of the respondents were above 55 years of age. Individuals in this age category are usually nearing retirement, and often fulfil higher managerial roles (Statistics South Africa, 2011b). This perhaps contributes to the fact that they are at times more time stressed and less accessible and willing to participate in research surveys.

4.2.3. Population Group

According to the Employment Equity Act, the South African population can be grouped into four broad categories including Black, White, Indian/Asian and Coloured (Statistics South Africa, 2011b). Respondents were asked to indicate which population group they belonged to in terms of the fore mentioned categories. Responses were subsequently grouped as White, Black and "other" (including Indian/Asian and Coloured population groups) as illustrated in Figure 4.1.

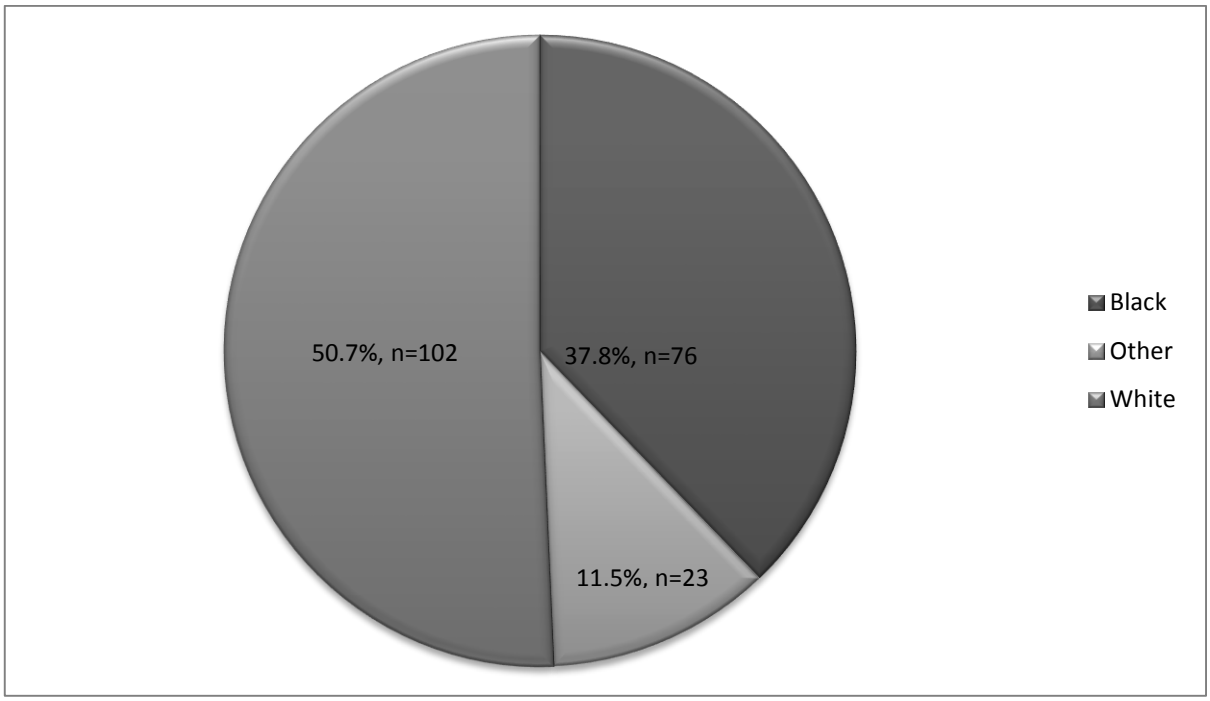

Figure 4.1: Population groups (N=201)

Based on the analysis, 50.7% (n = 102) of the occupants of the different buildings are White (which may account for Afrikaans and English being the most preferred home languages reported) and 37.8% (n = 76) are Black. Only 4.5% (n = 9) are Asian and 7% (n=14) are Coloured. These groups were thus combined to form the minority "other" group (11.5%, n=23) as illustrated in Figure 4.1. The Statistics South Africa Quarterly Labour report of end 2014, provides a summary of how the local skilled workforce is divided among the various population groups in South Africa. According to this report, White men and woman occupy more than 60% of the skilled employment positions in South Africa and more than 30% of the semi-skilled jobs. The Indians/Asian population groups occupy the second highest percentage (50%) of skilled positions and more than 42% of the semi-skilled jobs. Coloureds are represented in more than 23% of the skilled positions and 46% of the semi-skilled jobs, whereas Blacks are employed in just over 16% of the skilled jobs and almost 60% of the semi-skilled jobs (Statistics South Africa, 2014). The fore mentioned statistics should be taken into consideration in addition to the fact that most of the offices in the Green Star SA, As Built certified buildings are occupied by skilled labour, which may suggest a higher percentage of White building occupants. In terms of the larger South African population, Census 2011 reports

indicate that the Blacks constitute 79.2% of the South African population, Coloureds and Whites represent 8.9% of the population and the Indians/Asians only constitute 2.5% of the population. The Gauteng population in particular is made up of 77.4% Blacks, 15.6% Whites, 3.5% Coloured and only 2.9% Indians (Statistics South Africa, 2011a). Thus, the sample of this study may not be reflective of the larger South African population, but it does reflect some resemblance in terms of the skilled labour distribution in South Africa by including a higher percentage of White respondents.

4.2.4. The Preferred Home Language of the Sample

South Africa is a country with a wide diversity of cultures and eleven official languages with numerous dialects. Figure 4.2 provides a summary of the preferred home languages spoken by the respondents. In this study, English speaking building occupants represented 27.8% (n=52) of the sample, whereas the Afrikaans speaking respondents constituted 44.4% (n=83) of the sample. Respondents who preferred native African languages represented 34.9% of the sample. It should also be noted that 4.5% of the respondents did not respond to this question.

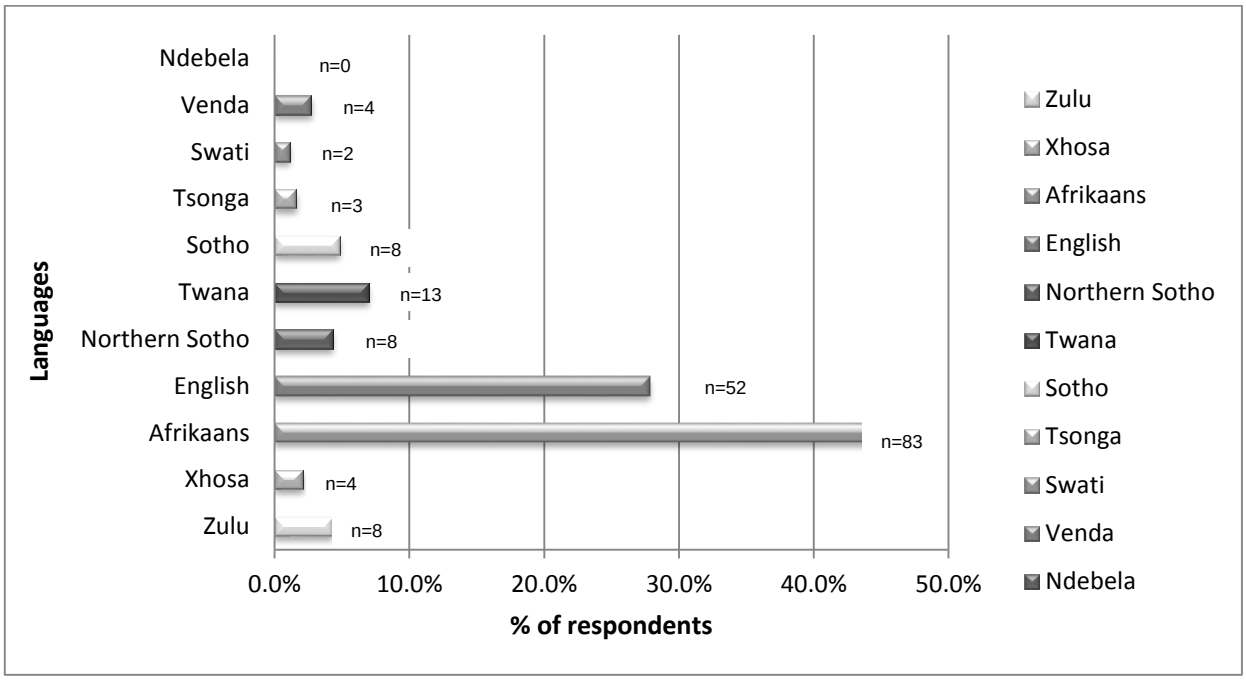

Figure 4.2: Home language (n=201)

According to Statistics South Africa (2011a) the larger South Africa population is mostly Zulu speaking (22.7%) and the rest speak Xhosa (16%), Afrikaans (13.5%), English (9.6%), Sepedi (9.1%), Tswana (8%), Sotho (7.6%), Tsonga (4.6%), Swati (2.6%), Venda (2.4%), Ndebela (2.1%) and other (2.1%). The results of this study can therefore not be interpreted as an accurate reflection of the languages spoken by the larger South African population. Some explanation may be offered for the language preferences of this sample in terms of the geographical areas where the buildings are situated. For example, Building A from which most respondents were recruited is situated in the Tshwane district. According to Statistics South Africa (2011a) the language distribution of Tshwane is 19.4% Sepedi, 18.4% Afrikaans, 14.7% Tswana, 8.4% English, 8.3% Tsonga combined with Zulu, 5.6% Ndebela, 5.1% Sotho, 2.3% Venda, 2.1% Xhosa and a combined 7.2% other languages (Statistics South Africa, 2011c). Afrikaans is thus a prominent language in the Tshwane district, spoken mostly by Whites, which may explain why it is the most preferred language among this sample. English was the second highest preferred language, which may be attributed to the fact that English is acknowledged as the corporate/ business language in South Africa.

4.2.5. Level of Education

The questionnaire for this study distinguished three response options for levels of education. As seen in Table 4.2., the majority of respondents' (56.6%) level of education was high.

TABLE 4.2: LEVEL OF EDUCATION (N=201)

Level of education	n	%
Grade 12 or lower	48	23.9%
Grade 12 and a degree/diploma	113	56.2%
Postgraduate	40	19.9%
Total	**201**	**100**

The underlying reason for this high level of education among the respondents can be attributed to the requisite skills and specialist knowledge that accompany the type of commerce that is conducted in the buildings that were targeted e.g. a financial institution (such as the one accommodated in one of these buildings) that employ mostly skilled and professional individuals who obtain their qualifications through tertiary education. However, some positions (e.g. reception, cleaning and maintenance) require less skilled labour. This might account for

24.1% of the respondents who only had a Grade 12 or lower. Respondents' level of education may be an important aspect to consider since higher education levels are linked to an increased ability to receive, interpret and act on information more effectively (Prensky, 2001). Empirical evidence mostly indicate that with higher levels of education comes greater awareness and knowledge of environmental concerns (D'Souza, Taghian & Khosla, 2007). Furthermore, based on the assumptions of the structuration theory, the social interaction of human agents in the structures of the world can be explained in terms of an individual's consciousness and knowledge (Nonaka, 1990, 1991, 1994; Lyytinen & Ngwenyama, 1992; Nonaka & Takeuchi, 1995). As the majority of the respondents had higher education levels they may be more knowledgeable about environmental issues and tend to be more clued up with sustainable behaviour (Laroche, Bergeron & Barbaro-Forleo, 2001) and thus be able to more effectively transform routine habits into green office behaviours (Giddens, 1984).

4.2.6. Income Levels

Respondents were instructed to indicate their household income per month to the nearest R1000. The responses were grouped in R10 000 intervals, starting at <R10 000, ≥R10 000 to <R20 000, ≥R20 000 to <R30 000, ≥R30 000 to <R40 000, ≥R40 000 to <R50 000 and ≥R50 000. According to the results presented in Figure 4.3, only 17% (n=34) of the respondents earned less than R10 000 monthly, with the majority 20.5% (n=41) of the respondents earning between R10 000 and R20 000 per month and almost half (49.1%, n=99) of the respondents earning a monthly household income of R20 000 and more. 13.4% (n=27) of the respondents did not respond to this question. Many respondents may feel uncomfortable with questions surrounding earning, which may explain the high level of missing values for this question.

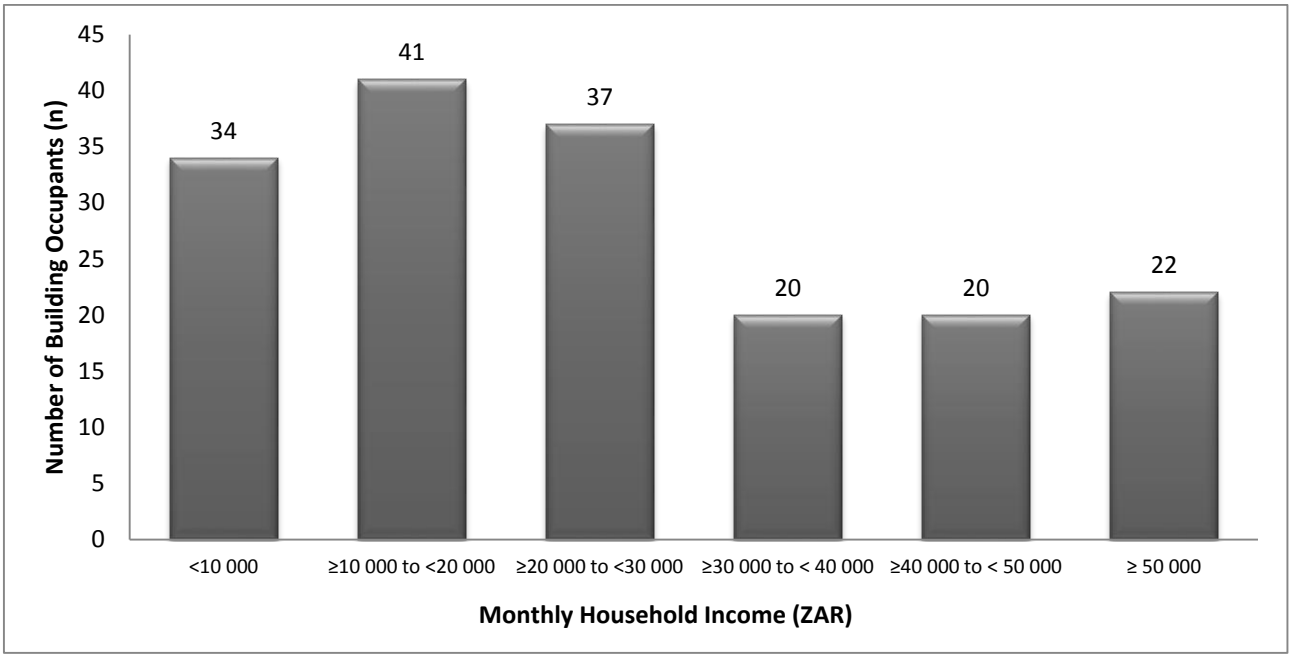

Figure 4.3: Monthly Household income (ZAR) (N=201); Missing (n=27)

It should be noted that due to the profile and composition of the staff that worked for the organisations that occupy these buildings, the eventual sample included individuals who earned higher incomes and also had higher levels of education. Although it may be argued that these individuals do not reflect the demographic characteristics of the larger South African population, their perspectives remain of interest due to their increased ability to contribute to the country's ecological footprint (Jorgenson, 2003). Household income has long been an important variable for distinguishing between different market segments because it is an indicator of the ability of an individual to exercise more choice in his/ her acquisition of goods (Barber, Almanza & Donovan, 2006; Schiffman, Kanuk & Wisenblits, 2010) which is an influential factor in an individual's approach to pro-environmental consumption.

4.2.7. Employment Status

Only 5.4% (n=11) of the respondents indicated that they were part time employed as indicated in Table 4.3. The remaining 94.6% (n=192) of the respondents are fulltime employed, which implies that they may spend most of their working week within the green building environment and that they may be reasonably familiar with the building and its surroundings.

TABLE 4.3: EMPLOYMENT STATUS (N=201)

Employment status	n	%
Employed full time	192	94.6%
Employed part time	11	5.4%
Total	**201**	**100**

4.2.8. Marital Status, Household Size and Dependants

To provide further detail about the demographic profile of the sample, questions were included pertaining to the respondents' marital status, household size and their dependents. In this study, the sample included an almost equal distribution between married/coupled (50.7%, n=102) respondents and single/divorced/ separated individuals (49.3%/ n=99), as seen in Table 4.4.

TABLE 4.4: MARITAL STATUS (N=201)

Marital status	n	%
Single / Separated / Divorced / Widowed	99	49.3%
Married / Couple	102	50.7%
Total	**201**	**100%**

With regard to the respondents' household sizes which may be linked to their marital status, Table 4.5 shows that most respondents' households consisted of two members (27.4%, n = 55). Three and four member households were also fairly prominent among the sample, whereas one member households were the least prevalent (Mean=3.44). Census 2011 data indicate that one member households represent 26.7% of the South African household size distribution, 19.4% are two members, 15% is three members and 14.1% are four members and lastly five members are 9.35%. The larger household sizes are drastically lower. Although the sample is not a true reflection of the larger South African population in terms of household size distribution, this sample was purposively selected among occupants of a Green Star SA, As Built certified building, which may incorporate specific characteristics such as higher education and income levels in addition to smaller household sizes. Table 4.6 further indicates

that 57.1% (n=115) of the respondents did have children and 42.9% (n=86), did not have children.

TABLE 4.5: NUMBER OF HOUSEHOLD MEMBERS (N=201)

Number of house hold members	n	%
Single member	18	9%
2 members	55	27.4%
3 members	38	18.9%
4 members	40	19.9%
5 members	29	14.4%
6 members or more members	21	10.5%
Total	**201**	**100**

TABLE 4.6: DEPENDENTS (N=201)

Dependents	n	%
Yes	115	57.1%
No	86	42.9%
Total	**201**	**100**

In summary the eventual sample of the study included individuals who earned higher incomes and also had higher levels of education. Although it may be argued that these individuals do not reflect the demographic characteristics of the larger South African population, their perspectives remain of interest due to their increased capacity to consume more than the lower income households. It can also be argued that individuals who earn higher incomes have the means to change their behaviour in such a manner that it can contribute to the country's ecological footprint in a significant manner (Jorgenson, 2003). Yet, it is important to admit that several other factors may contribute to an individual's behaviour. In addition to demographic variables such as age, income, gender and education, respondents were asked to complete a section that measured their living standards to provide further insight into the profile of the sample.

4.3. LIVING STANDARD MEASUREMENT (LSM) OF THE SAMPLE

To provide further detail regarding the sample of this study, Section B of the questionnaire included a lifestyle measurement scale specifically designed for the South African population. Furthermore, the conceptual framework for this study illustrates the relevance of lifestyle as a central underlying construct in the structuration theory (Lippuner & Werlen, 2009). The South African Audience Research Foundation (SAARF) designed the Living Standard Measurement (LSM) scale to profile the South African consumer market into relatively homogeneous groups and has been a vital tool in the South African marketing arena for over 20 years (The Media, 2012). Although populations may be diverse in terms of several denominators, certain segments may share specific commonalities. The LSM questionnaire is based on a set of marketing differentiators which group people according to their living standards, by means of allocating weights for ownership of various household items such as their access to services and durables, and geographic indicators as determinants of standard of living rather than segmenting them in terms of income or personal attributes (SAARF, 2013). Essentially, the LSM is a wealth measure based on standard of living rather than income - in fact, income is not assessed in the LSM scale (SAARF, 2013).

Although the LSM tool portrays aspects that relate to respondents' lifestyles in general and at home, these lifestyle attributes can also be relevant to conditions and behaviour at work specifically with regard to consumption and environmental behavioural practices. Based on the assumptions of the structuration theory (Giddens, 1984), the building occupant's practices are influenced by, on the one hand, an internal practical and discursive consciousness (i.e. knowledge of pro-environmental principles) and on the other hand, the external As Built Green Star SA office building infrastructure and environment. These elements simultaneously influence the very same set of social practices that eventually form part of a building occupant's overall lifestyle. Other material commodities and infrastructure (such as those reflected in the LSM scale) also form part of people's lifestyles and may therefore manifest in their approach to certain practices, whether these be enacted in their work environment or other areas of their daily routine.

Based on SAARF's (2013) existing LSM tool, respondents' lifestyle standard was assessed on a scale from LSM 1, which is the lowest lifestyle level, to LSM 10 that represents the highest

level of lifestyle (SAARF, 2013). To conduct the LSM test, the respondent was required to answer yes or no to 29 scale items with each scale item allocated a certain weight. All the weights of the questions that were answered 'yes' were added and then subtracted from the constant of 0.81519 as per LSM measuring guidelines. The resulting score was indicative of a particular LSM group/ category, which enabled the researcher to specify the specific LSM level to which each respondent belonged.

It should be noted that the existing SAARF LSM scale includes some questions that are stated in the negative. An initial pilot study revealed that these questions (three in the pool of 29 items) were incorrectly interpreted and were subsequently changed to positive wording. Based on the recommendations and assistance of statistical advisors, the weighting of the items and the resulting LSM scores were checked and accurately interpreted. The initial results of the LSM test led to the elimination of two questionnaires from the data set, since the respondents were from a much lower LSM group and therefore quite distinct from the rest of the sample. Table 4.7 indicate that most respondents (77.6%, n=156) belonged to the highest LSM 10 segment with a further 16.9% (n=34) of the respondents categorized in the LSM 9 level.

TABLE 4.7: LSM GROUPS (N=201)

LSM categories	n	%
LSM 7	4	2%
LSM 8	7	3.5%
LSM 9	34	16.9%
LSM 10	156	77.6%
Total	**201**	**100**

Overall, the sample predominantly represented people who are in the higher LSM categories which may significantly contribute to the ecological footprint in terms of their wealth and standard of living. It is a well-known fact that wealthier people consume far more resources than less affluent people (Boudreau, Chen & Huber, 2008; Alt, 2011). Education, occupations and income tend to be closely related; highly skilled occupations that produce high incomes usually require advanced education and are associated with higher levels of socio-economic status (Schiffman, Kanuk & Wisenblits, 2010). Thus, it may be argued that the higher LSM levels of the sample are in line with the education level, income and employment status of the respondents as previously described in the demographic section of the results.

In summary, rapid economic growth and increased standards of living in emerging economies such as South Africa, has fuelled an ever-growing demand for resources – especially food, water, energy, transport, electronic products, living space and space to dispose of waste, particularly carbon dioxide from burning fossil fuels. Clearly, the respondents that form part of the sample of this study belong to the higher socio-economic population groups in South Africa. Based on their contribution to the ecological footprint, it is important to understand their knowledge of general environmental issues in the local and broader global context.

4.4. AS BUILT GREEN STAR SA BUILDING OCCUPANTS' GENERAL ENVIRONMENTAL KNOWLEDGE (Objective 1)

Respondents' knowledge about broader environmental issues and factors that will affect the sustainability of global resources was measured in Section D of the questionnaire. According to the literature, knowledge is created and enlarged though interactions between human agency and social structures (Nonaka, 1990, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). When the building occupant and the social structures such as the As Built Green Star SA building interconnect within daily office practices, the potential for environmentally responsible behaviour should be increased. As stated in the review of literature, knowledgeable and capable human agents who are able to provide comments, reasons and even some explanation for what they are doing (Spaargaren, 1998) may form the basis of new and innovative pro-environmental practices in a built environment. The knowledge referred to is often described as "explicit" since building occupants may rely on such knowledge to rationalize and articulate decisions in their daily routines (Tshoukas, 2002). For the purposes of this study it was necessary to reflect on potential reasons for building occupant's engagement in pro-environmental practices in an As Built Green Star SA office building. A deficit in explicit environmental knowledge may contribute to building occupants' non-compliance to practices that would conform to the long term ideals of an As Built Green Star SA building. Table 4.8 presents a summary of the results.

The results indicate that respondents' overall explicit knowledge about climate change and general environmental issues is average (M=53.36%). This level of knowledge is concerning since existing literature emphasizes the importance of knowledge regarding topics such as

climate change in reaching the potential of sustainable consumption levels (Nonaka & Toyama, 2003), especially in a context of an As Built Green Star SA building were systems of provision have been implemented to reach pro-environmental targets. Although the overall results indicate the need for further knowledge enhancement, findings concerning individual scale items did however reveal some positive insights.

TABLE 4.8: RESPONDENTS' GENERAL ENVIRONMENTAL KNOWLEDGE (N=201)

Knowledge	Item	% Correct
Very Good 80 - <90%	An increase in the South African population will put further strain on our natural resources	89.4
	Saving electricity in our everyday living will contribute to saving our planet	89.4
	Pollution is currently one of the most critical problems in terms of the sustainability of South Africa's natural resources	84.8
Good 70 - <80%	The amount of energy used by my household has a significant impact on the environment	76.3
	My current purchase decisions will have consequences for product availability of future generations	72.2
Above average 60 – <70%	The economic growth of South Africa is influenced by environmental problems	67.7
	Environmental pollution taking place in China has an impact on South Africa	67.2
Average 50 - <60%	All locally produced products are environmentally friendly	59.6
	The earth's resources are infinite and should be used to the fullest to increase the standard of living of all South African citizens	59.1
	I think that global warming is caused by the sun radiating (giving out) more heat	55.1
	Pollution does not affect me personally to the same extent that it affects fellow citizens in South Africa	51.5
Poor <50%	The USA is the biggest producer of gasses that contribute to air pollution	37.6
	Organic materials like compost heaps emit green-house gasses that are harmful to the environment	35.9
	Methane, which is responsible for a great deal of environmental damage, is only emitted by cars which are powered by fossil fuels	22.3
	Climate change is a direct consequence of the hole in the ozone layer	16.2
	Climate change is caused by the presence of greenhouse gasses in the air	15.2
	The average citizen can do much to reduce climate change	7.

Respondents scored very high (above 80%) on issues such as the environmental strain caused by the growing South African population, the role of saving electricity and the fact that pollution is currently a critical problem worldwide. The impact of a growing population on the use of natural resources is fairly apparent considering that every individual requires water, food and other basic necessities to survive (Du Plessis, 2009). South Africa's current energy crisis with perpetual power failures and load shedding in addition to several informational campaigns that encourage local citizens to reduce their electricity usage has resulted in an increased awareness of energy issues among the local population. In similar vein, the latter part of the 20th and early 21th century has seen much attention devoted toward the topic of pollution and has led governments and civil societies to increase their efforts to raise public understanding of the underlying nature of current water, air and ground pollution issues (Anderson, Romani, Phillips, Wentzel & Tlabela, 2007). Respondents also seem to have a good understanding of the impact of current purchase decisions on future generations and the implications of environmental problems on the country's economic growth.

Respondents were however less convinced about the eco-friendliness of locally produced products and/or whether the world's resources are infinite. These items reflect average scores of 50 to 60%. In terms of life cycle analysis, the distribution and transportation of products have significant environmental implications and for these reasons, locally produced items are considered more environmentally friendly (Avetisyan, Hertel & Sampson, 2013). The country of origin may guide decisions when other information pertaining to the environmental impact of the production, consumption and eventual disposal of a product is limited (Avetisyan *et al.,* 2013). In addition to the above, it is concerning that almost half of the respondents perceived the world's resources as infinite and that it can therefore be used to the fullest extent to elevate living standards. Currently, populations across the world are consuming the capacity of 1.5 earths a year which implies that existing levels of consumption already exceeds the earth's capacity to produce the necessary resources (WWF, 2012a). The results of this knowledge test substantiate prior empirical evidence, which suggest that there is still a high level of confusion regarding the underlying reasons for global warming and the depletion of the ozone layer (Ungar, 2000; Gleditsch, 2012) Effort should thus be made to clarify more intricate concepts that relate to climate change and global warming.

Most concern relates to the six items for which respondents obtained scores below 50%. These items tapped into respondents' understanding of the USA's contribution to air pollution, the role of methane and organic materials such as compost heaps, climate change and the depletion of the ozone layer as well as the presence of greenhouse gasses. These environmental issues could be viewed as highly theoretical issues that need to be explained in more simplistic terms in order to mitigate higher levels of explicit knowledge among the occupants of As Built Green Star SA office buildings. Yet, the item that obtained the lowest score (7.6%) is perhaps the most discouraging result of this knowledge test. Considering that the respondents work in an environment where pro-environmental effort is emphasized and facilitated, it is rather disappointing that the majority misunderstand the relevance of individual effort in lowering the effects of climate change. The human ability to argue and reason plays an important role in adopting pro-environmental practices in an As Built Green Star SA building, since it forms the basis for the building occupant's ability to articulate and rationalize why power and resources are allocated to greener principles, and the underlying justification for legitimating such distributions (Lyytinen & Ngwenyama, 1992). For these reasons, it is imperative that more effort is directed toward broadening building occupants' general understanding and knowledge of the broader environmental pressures that necessitate the adoption of green standards and environmentally responsible behaviour.

4.5. AS BUILT GREEN STAR SA BUILDING OCCUPANTS' CONTROL OVER THEIR PHYSICAL OFFICE ENVIRONMENT (Objective 2)

Section C of the questionnaire included items that tapped into occupants' level of control over their physical office environment in As Built Green Star SA buildings. At the time when the study was conducted, only six As Built Green Star SA certified office buildings were fully furnished and occupied within the South African context. Permission was obtained to distribute online questionnaires via an electronic link among the occupants of four of these buildings. These buildings were labelled A, B, C and D. Due to the low response rates obtained in the initial online survey, permission was sought to distribute paper-based questionnaires among the occupants of the various buildings. In the end consent was obtained to gain access to Building A and to distribute questionnaires among the occupants who eventually constituted

the largest segment (82.3%, n=165) of the sample. Collectively, online responses from Buildings B, C and D constituted 15.3% (n=31) of the sample. Five respondents did not indicate the building in which they were accommodated. It is therefore important to note that most of the responses relate to one building as a result of difficulties encountered in gaining access to the other buildings and the low response rates obtained via online questionnaires.

4.5.1. Categorisation of the As Built Green Star SA Building Occupants' Office Spaces

To establish the level of control that respondents have over their physical office environment, question 17 (Section C) addressed the type of office space that respondents occupied. Five response options were specified including a large open-plan office space, a cubical office space, a private office or a so-called "hot desk" option. Due to globalisation and increased internet accessibility, companies often have offices situated all around the world with employees that often commute and travel between various office sites. Building occupants therefore do not necessarily work only in one office, and for these reasons it is more economical to have 'shared' or 'hot' desks available that work on a first come first serve basis when the building occupants are in the office (Greene & Myerson, 2011). Question 17 was thus included as office spaces can differ substantially in terms of layout, furniture design, lighting and other interior elements (Kopec, 2006:240) that impact on the level of control that office workers have over practices that relate to energy use, water consumption as well as waste reduction and recycling.

As indicated in Table 4.9, most respondents (74.6%, n=147) work in an open-plan office space where a desk and a chair is allocated to each individual. The second largest group (22.2%, n=44) include respondents that have a confined cubicle area with a chair and desk. The other two response options were combined as "other" to specify the third group that included respondents who either had private offices or a hot desk. Five respondents did not complete this question.

TABLE 4.9: TYPE OF OFFICE SPACE (N=201; Missing: n=5)

Office space categories:	n	%
Open-plan office space	147	74.6
Cubical office space	43	22.3
Other	11	5.5

A recent study conducted in the USA that surveyed 15 LEED-certified buildings, also indicate an increased use of open-plan office space (Lee & Guerin, 2009). These office settings offer several advantages and a number of studies have already investigated employee's environmental satisfaction and job performance based on certain attributes (e.g. indoor environmental quality) in such settings (Sundstorm, Town, Rice, Osborn & Brill, 1994; Larsen, Adams, Deal, Kweon & Tyler, 1998). The layout and design of an office environment is thought of as an important tool that contributes to better work efficiency and consequently increases the business' bottom line which in turn is the basis for its existence (Brill, Weidemann, Alard, Olson & Keable, 2001; Hertzberg, Mausner & Bloch Snyderman, 2003). In terms of this study, the office environment in addition to the facilities and equipment incorporated into the design thereof, represent important facilitating structures whereby a business can achieve its envisaged pro-environmental targets, but this would depend on the input of individuals who operate within the business and occupy space in the building structure.

4.5.2. As Built Green Star SA Building Occupants' Control of Facilities and Equipment in their Office Spaces

In addition to exploring the type of office space that respondents occupied, it was also important to gain an understanding of their specific control over building facilities and equipment that could lead to practices such as waste reduction, recycling and reduced energy consumption. For these reasons question 18 (Section C) included ten items that related to respondents' access to office equipment (e.g. computers and printers), their control over HVAC and lighting within their office space and also their ability to reduce, re-use and/or recycle consumables.

Although it was initially specified that the units of analysis for this study had to have access to a computer and the internet to be able to complete the online electronic survey, the decision was made to also distribute paper-based questionnaires. Apart from facilitating higher response rates, paper based questionnaires enabled the researcher to collect responses from building occupants who were not allocated their own computer by their employer. Although these respondents constituted a small minority (5.9%, n=12), their responses were included in the data analysis as they engage in many of the practices that contribute to overall energy and water usage, recycling and waste reduction in the As Built Green Star SA buildings. As illustrated in Figure 4.4, 95% of the respondents (n=190) had their own computers, but only 10% (n=20) were allocated printers for their own exclusive use. This may result in a reduction of printing and subsequent paper usage with more emphasis directed toward the practice of e-filing. Conversely, it may limit the level of control that individuals have over other waste reduction practices (e.g. recycling of cartridges) if printing equipment is shared and collectively maintained.

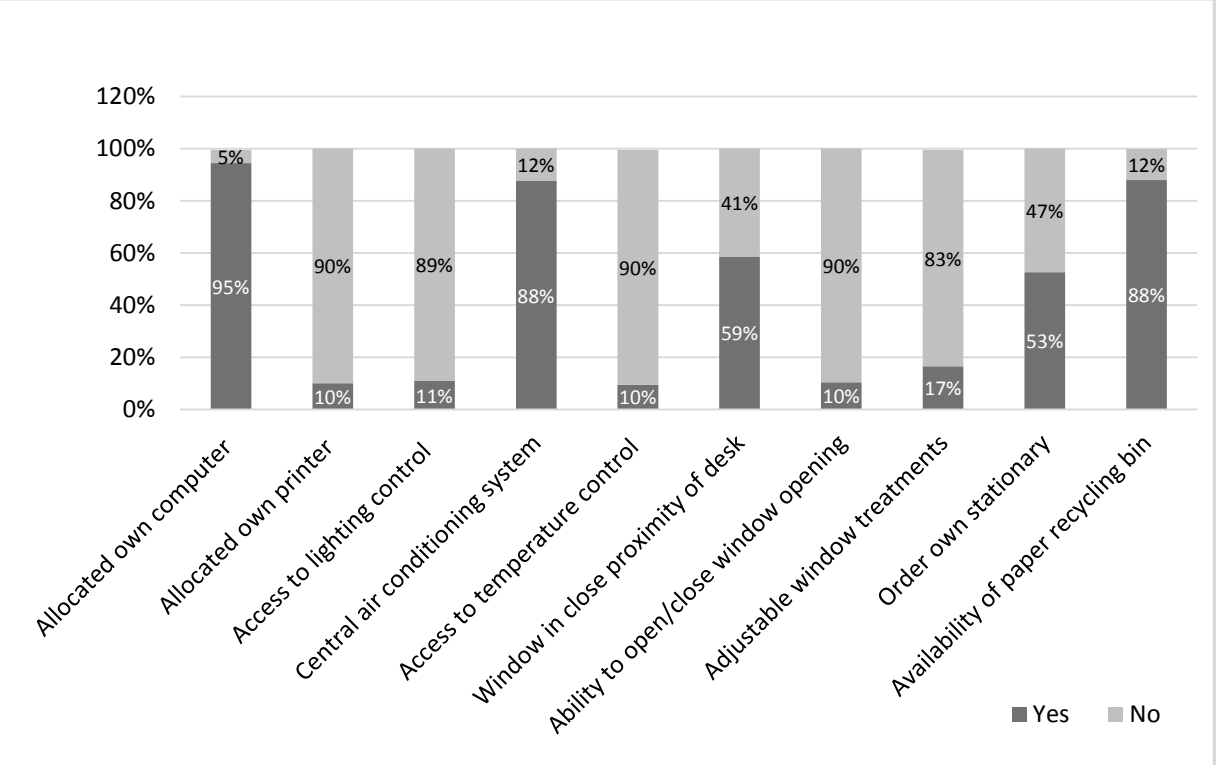

Figure 4.4: Occupants' access to and control of equipment and facilities (N=201)

The results summarised in Figure 4.4 further indicate that only 11% of respondents (n=22) were able to control the lighting in their office space. As explained in the review of literature, energy saving central lighting and/ or intellectual lighting systems represent important advances in green technology and are installed in most state-of-the-art green buildings (AECOM, 2013). These so-called "smart lighting systems" minimize human intervention, maximize energy savings and reduce operational costs by regulating and optimizing lighting conditions through motion/ occupancy sensors, time clocks and photocells that will automatically turn lights on or off according to specific building requirements (Sustainable Sources, n.d.).

Most respondents (88%, n=176) also confirmed that they have central air conditioning systems in their offices. Similar to the lighting systems, HVAC systems form part of the design and construction of contemporary green buildings and limits the control that individual building occupants have over the heating, ventilation and air conditioning in the space that they occupy. In this study only 10% of the respondents had access to temperature control in their offices. Energy conservation, indoor air quality and comfort are key issues in green building design. Interrelated HVAC systems are usually custom designed and are therefore complex and expensive to install, but offer many opportunities to save on energy. These systems also measure the level of CO^2 in the air and transmit clean air accordingly to establish more productive working environments and prevent conditions such as "sick building" syndrome (Runeson-Broberg & Norbäck, 2013). In some instances, building occupants are allowed to open windows to replace artificial airflow with natural airflow, but for the most part, measures have been put in place in larger buildings to prevent building occupants to open windows as it will interfere with the HVAC systems and reduce the efficiency of these systems. This may explain why 90%, (n=181) of the respondents indicated that they are unable to open/ close windows. Furthermore, responses to question 17 indicated that 96.9% (n=192) of the respondents work in an open-plan area or in a cubicle setting, which may explain why 41% (n=84) do not have a window in the close proximity of their desk. Only 17% (n=33) were able to adjust the window treatments in their office space. In an open-plan office space, office workers need to consider their co-workers and may therefore not be able to adjust window treatments according to their own preferences. These issues are important to create an understanding of the behaviour and practices that occur in a commercial office environment.

Some of the items included in Section C (question 18) also addressed the issue of waste reduction and recycling, specifically in terms of the availability of paper recycling bins and respondents' control over stationary usage. The results that are summarised in Figure 4.4 indicate that 53% (n=106) of the respondents, i.e. almost half, do order stationary according to their own needs versus 47% (n=96) who do not have control over stationary procurement. The issue at hand is whether systems of accountability is put in place to reduce excessive stationary usage and whether office workers are sensitized toward reducing waste in their everyday consumption of office supplies. What is encouraging is that 88% (n=178) of the respondents indicated that they do have access to paper recycling bins. This provides some indication of the awareness and consciousness that revolve around waste reduction and the support for recycling as a point of departure for good stewardship of resources.

In summary, it becomes apparent that due to systems of provision within the As Built Green Star SA buildings, respondents have limited control over some facilities and equipment. Such control may be purposively inhibited to reduce human intervention and ensure optimum efficiency in relation to aspects such as energy efficiency. With regard to waste reduction and recycling initiatives, respondents' indicated a higher level of control which emphasize their roles and responsibilities as agents of change in the As Built Green Star SA buildings. The following section provides further insight pertaining to respondents' practical consciousness and is focused on actual practices within these office environments.

4.6. AS BUILT GREEN STAR SA BUILDING OCCUPANTS' PRACTICAL CONSCIOUSNESS IN TERMS OF ITS MANIFESTATION IN ROUTINE OFFICE PRACTICES (Objective 3)

Based on the assumptions of the structuration theory, practical consciousness involves the capability of a building occupant to intuitively maintain everyday routine activities without much explanation or justification (Giddens, 1984; Jackson, 2005; Lippuner & Werlen, 2009). Section E of the questionnaire included items that focused on building occupants' routine office practices (i.e. practical consciousness) that contribute to energy saving, water saving, recycling and waste reduction within an As Built Green Star SA certified building. These items (25 in total) were self-developed based on existing literature pertaining to "green" office practises:

ten items addressed energy saving practices, five items measured water saving practises and ten items focused on recycling/ waste reduction practices. A 4-point Likert-type scale ranging from "never" to "always" was used in addition to a fifth "not applicable" response option to accommodate responses from participants who were not familiar with certain practices or who perceived the practises as irrelevant in their particular office environment. This option may have also captured respondents' views that they had no control over a particular practice and that it was therefore "not applicable" to them as individual building occupants. The findings related to Section C of the questionnaire indicated that the majority of respondents occupy open plan office space, which restricts their level of control over certain practices within the building and consequently contribute to their inability to perform some of the behaviours specified in Section E of the questionnaire.

4.6.1. As Built Green Star SA Building Occupants' Energy Saving Practices

To simplify the interpretation and analysis of data, the "never" and "sometimes" response options were combined and labelled as "seldom", whereas the "frequently" and "always" options were merged and categorised as "often". As indicated in Table 4.10, a few items relating to energy saving practices attained a high percentage of "not applicable" responses.

The items that attained a high percentage of "not applicable" responses may be linked to results obtained from Section D of the questionnaire (Objective 2). As an example, in Section C, 83% of the respondents indicated that they were unable to adjust window treatments (question v.18.8) and 90% responded that they were unable to open windows in their offices (question v.18.7). In response to a question relating to their practices of opening window coverings to utilise natural light, a high percentage of 31.8% (n=64) of the respondents indicated "not applicable". Similarly, 26.4% (n=54) noted that the practice of opening windows to minimise air conditioning did not apply to them. Referring back to Section C, 89% of the respondents indicated that they were unable to control the lights in their offices (question v.18.3), which may account for 33.8% (n=68) of the respondents who stated that the practice of switching off lights when leaving offices for extended periods of time were not applicable to them and a further 28.9% (n=58) of the respondents, who noted that the practice of turning off lights to utilize natural light was not applicable.

TABLE 4.10: BUILDING OCCUPANTS' ENERGY SAVING PRACTICES (N=201; Missing: n=4)

Please indicate to what extent you engage in the following practises.....	Seldom (%)	Often (%)	Not applicable (%)	Mean	Standard deviation
Do you activate energy saving features on your computer equipment?	28.3	67.2	3.0	3.07	1.14
Do you switch off office equipment such as computers when it is not in use?	29.4	66.6	2.5	3.15	1.04
Do you turn your computer equipment off when you leave the office for the day?	17.4	74.2	7.0	3.46	0.93
Do you turn your computer screen off when leaving the office?	28.8	65.1	4.0	3.15	1.11
Do you unplug chargers when it has finished charging (e.g. cell phone/lap tops)?	54.7	41.3	2.5	2.81	1.11
Do you open window coverings to allow natural light into your office?	24.3	42.3	31.8	2.87	1.19
Do you switch off lights when you leave your office for extended periods of time?	23.4	41.3	33.8	2.95	1.14
Do you switch off lights when there is sufficient natural light in your office?	21.4	48.2	28.9	3.01	1.16
Do you open windows instead of using air conditioning where possible?	34.8	37.3	26.4	2.59	1.14
Do you fill the kettle with just the amount of water you require?	30.8	61.7	6.0	3.00	1.08

Despite the high percentage of not applicable responses, the results in Table 4.10 indicate that most respondents did engage in energy saving practises especially with regard to office equipment (e.g. personal computers) that were allocated to them on an individual basis. The overall mean for energy saving practices (M=2.99; M_{Max}=4, "not applicable" responses excluded) indicate a positive level of engagement in these practices and a high level of internal consistency (α =.83) of responses was observed. Four items relating to energy saving practices that is activated on personal computer equipment achieved high mean scores (M=3.07 – 3.46) and emphasizes the role of personal control over the practise in question. Saving energy is a familiar subject in the South African context with much attention directed toward energy saving

guidelines in the local media and other relevant information sources. However, more can be done to draw attention to seemingly trivial practices such as unplugging chargers when not in use, which may collectively contribute to substantial energy savings in an office environment (Heikkinen & Nurminen, 2012). In this study, 41.3% (n=83) of the respondents seldom engaged in the practice of unplugging chargers when its function has been fulfilled and in similar vein 29.4% (n=59) seldom bothered to switch office equipment off when it is not used. Another aspect that is also frequently highlighted in such campaigns is the practise of filling kettles with the required amount of water since it has energy saving implications: 61.7% (n=124) of the respondents admitted that they do engage in this practise, which points to the relevance of information campaigns.

4.6.2. As Built Green Star SA Building Occupants' Water Saving Practices

Based on the results reported in Table 4.11, respondents seemed to be quite conscientious in their efforts to conserve water. The "not applicable" responses were substantially lower for items relating to water saving practices compared to energy saving practices and the reliability coefficient (Cronbach α =.76) for these items were above the minimum threshold of 0.7. The overall mean for water saving practices (M=3.21; M_{Max}=4, "not applicable" responses excluded) was also substantially higher than those reported for energy saving and recycling/ waste reduction practices. The vast majority of respondents (91.5%, n=184) ensure that the taps are properly turned off after using them and 69.2 % (n=139) make an overall effort to use water sparingly at work. It is a known fact that South Africa is a semi desert area with limited water resources (Ashton, 2002; Scholes, 2001) and therefore media campaigns from time to time focus on water saving measures, especially when water restrictions apply. Such campaigns often emphasize the importance of repairing leaking taps. The results of this study indicate that 64.7% of respondents do in fact report leaking taps to maintenance staff.

It is commonly accepted that toilet facilities significantly contribute to water consumption in commercial properties (Surendran & Wheatley, 1998). For these reasons, low flush mechanisms are included in the design of toilet facilities, and as indicated in Table 4.11, the majority of the respondents (64.7%, n=130) do make use of this feature. Further water savings measures which are often implemented in newly built Green Star SA buildings are taps

with sensors that will only allow the flow of water if a person's hands are placed under the tap (Energy and Resource Institute, 2004). For the sake of completeness, a question was however included to measure whether respondents do close taps in the process of dispensing soap onto their hands: a slight majority (55.2%, n=111) did engage in this practice. Only 2% indicated that this practice was not applicable. More attention could therefore be devoted to this practice in continued efforts to save water in a commercial office buildings.

TABLE 4.11: BUILDING OCCUPANTS' WATER SAVING PRACTICES (N=201; Missing: n=4)

Please indicate to what extent you engage in the following practises.....	Seldom (%)	Often (%)	Not applicable (%)	Mean	Standard deviation
Do you leave taps closed while dispensing soap onto your hands?	40.8	55.2	2.0	2.88	1.06
Do you make an effort to use water sparingly at work?	26.9	69.2	2.0	3.16	0.95
Do you ensure that taps are turned off properly after using them?	6.5	91.5	0.5	3.73	0.63
Do you use low flush toilet option when available?	24.9	64.7	8.5	3.15	0.98
Do you report leaking taps to maintenance staff even if it is not your responsibility?	27.3	64.7	6.5	3.03	1.04

4.6.3. As Built Green Star SA Building Occupants' Recycling and Waste Reduction Practices

The overall mean for recycling and waste reduction practices (M=2.97; M_{Max}=4 excluding, "not applicable" responses) indicates a positive tendency toward these type of practices and based on a Cronbach α = .83 it can be deduced that a high level of internal consistency is prevalent in the responses to these items. As can be gathered from Table 4.12, three items in particular achieved a higher percentage of "not applicable" responses. In referring back to Section C (question v18.2), 90% of the respondents noted that they have not been allocated a printer for their own individual use. This may explain why 26.9% (n=54) responded "not applicable" to the practice of returning used printer cartridge for toner/ink refilling and a further 30.8% (n=62) seldom engaged in practice of recycling printer cartridges. It is speculated that

respondents may have simultaneously indicated "seldom" and "not applicable" in response to their limited control over the recycling of printer cartridges. Similarly, respondents seem to be less inclined to use draft printer settings to save cartridges since 41.8% (n=84) indicated that they seldom or never use such settings and a high percentage (17.9%, n=36) noted that it was not applicable. A further explanation may relate to the fact that they are simply not familiar with draft printing settings and do not know how to activate such settings. However, in response to another question, 65.7% (n=132) indicated that they do in fact use printer settings to save paper, and therefore the different response rates may be attributed to the underlying reason for using such settings i.e. saving paper or cartridges.

TABLE 4.12: BUILDING OCCUPANTS' RECYCLING AND WASTE REDUCTION PRACTICES (N=201; Missing: n=3)

Please indicate to what extent you engage in the following practises…..	**Seldom (%)**	**Often (%)**	**Not applicable (%)**	**Mean**	**Standard deviation**
Do you utilize printer settings that save on paper?	27.8	65.7	5	3.09	1.07
Do you save documents on your computer (e-filling) rather that printing them?	19.4	76.7	2.5	3.28	0.82
Do you utilize draft printer settings to save printer cartridges?	41.8	38.8	17.9	2.48	1.20
Do you dispose of paper in a paper recycle bin?	16.4	80.6	1.5	3.49	0.82
Do you re-use paper printed only one side for other purposes (e.g. taking notes)?	38.3	56.7	3.5	2.81	1.03
Do you electronically achieve important e-mail communications?	19.4	77.6	1.5	3.38	0.89
Do you print documents only if it is necessary?	24.9	73.7	0	3.23	0.86
Do you print on both sides of the paper whenever possible?	30.9	64.2	3.5	3.07	0.99
Do you return excess stationary items for re-use by others?	44.8	35.8	17.9	2.45	1.12
Do you return used printer cartridges for toner/ink refilling?	30.8	40.8	26.9	2.78	1.22

On a positive note, for most of the items related to paper saving/ recycling initiatives, 56.7% to 80.6 % of the respondents indicated that they often engage in such practices. This is especially true for paper recycling practices, which may be attributed to the systems of provision in the As Built Green Star SA buildings (e.g. the availability of per recycling bins) that

facilitate the required pro-environmental practices. Existing literature pertaining to recycling initiatives highlight the importance of convenience and ease of execution to promote the required behaviour (Sierra Club, 2007). Yet, more effort is required to facilitate other waste reduction and recycling practices such as returning excess stationary. Only 35.8% (n=72) of the respondents indicated that they return excess stationary for re-use by other office workers. A high percentage (17.9) stated that this practice is not applicable and 44.8 % (n=36) indicate that they seldom engage in such practises. This could be because they only order stationary on a need-to-have basis, but further exploration is needed in this regard. To provide further insight with regards to the interrelation of variables measured in Section C (question 18) and respondents' actual practices (Section E) cross tabulations were done on selected items. A contingency table was compiled to summarise the results, as well as association measures that were performed to test the significance of the relationships between the selected categorical variables.

As indicated in Table 4.13, the response categories of variables from Section C was defined as rows, whereas the response categories of questions from Section E were defined as columns to compile the contingency matrix. As pointed out by Mazzocchi (2008), the stronger the association between the selected variables, the more concentrated the frequencies will be in specific cells. In the first two sets of items, high frequencies are observed in cells that relate to "yes" and "often" responses (indicated in bold). The association measures provide further evidence of association with the probability values well below the 0.05 and 0.01 thresholds. Thus it can be assumed that the availability of paper recycling bins, is significantly associated with the practice of disposing paper in a paper recycling bin. Also, if allocated their own computers, respondents would switch off their computer screens when leaving the office for extended periods of time. The last two sets of items reflect high frequencies under the "no" response category although a more dispersed distribution is observed among the "seldom", "often" and "not applicable" response categories. The association measures indicate strong degrees of association with probability values well below the 0.05 and 0.01 thresholds. In other words, if respondents' are unable to control their lights in their office space, the practice of switching off lights to make use of natural daylight is less certain. Similarly, when respondents' are unable to adjust the window treatments in their office space, they are less likely to open window coverings to allow natural light into their office space.

TABLE 4.13: CONTINGENCY TABLE BETWEEN SELECTED VARIABLES (N FREQUENCIES) AND ASSOCIATION MEASURES

Item	V18.10 I have a paper recycling bin in my office				Association measure	Value	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
V20.7 Do you dispose of paper in a paper recycle bin?	Response category	Yes	No	Total	Pearson Chi-Square	26.077	0.001		
	Seldom	23	10	33	Likelihood Ratio	17.36	0.001		
	Often	**151**	11	162	Fisher's Exact Test	19.03	<0.0001		
	Not applicable	2	1	3	Linear-by-Linear Association	16.779	0.000	0.000	0.000
	Total	174	21	198	No. of valid cases	198			
Item	V18.1: I have been allocated my own computer								
V20.13: Do you turn your computer screen off when leaving the office?	Response category	Yes	No	Total	Pearson Chi-Square	14.664	.013		
	Seldom	52	6	58	Likelihood Ratio	11.364	.019		
	Often	**127**	4	131	Fisher's Exact Test	10.627	.014		
	Not applicable	7	1	8	Linear-by-Linear Association	6.406[d]	.013	.012	.005
	Total	186	11	197	No. of valid cases	197			
Item	V18.3: I am able to control the lights in my office space								
V20.8: Do you switch off lights when there is sufficient natural light in your office?	Response category	Yes	No	Total	Pearson Chi-Square	16.150	.004		
	Seldom	4	**39**	43	Likelihood Ratio	20.071	.001		
	Often	17	**80**	97	Fisher's Exact Test	16.876	.001		
	Not applicable	1	**57**	58	Linear-by-Linear Association	12.252	.000	.000	.000
	Total	22	176	198	No. of valid cases	198			
Item	V18.8: I can adjust/open the window treatment(s) in my office								
V20.23: Do you open window coverings to allow natural light into your office?	Response category	Yes	No	Total	Pearson Chi-Square	13.381	.009		
	Seldom	7	**42**	49	Likelihood Ratio	14.496	.009		
	Often	22	**63**	85	Fisher's Exact Test	14.092	.005		
	Not applicable	3	**61**	64	Linear-by-Linear Association	11.171	.001	.000	.000
	Total	32	166	198	No. of valid cases	198			

4.6.4. Investigation of pro-environmental practices

EFA with an extraction method known as Principal axis factoring was performed using Varimax rotation with Kaiser Normalization. Based on Kaiser's criterion (i.e. retaining all factors that are above the eigenvalue of 1), eight factors emerged. It has however been argued that Kaiser's criterion may lead to an overestimation of the number of factors extracted and for this reason the Scree test should be used in addition to the eigenvalues to determine the number of factors to retain (Costello & Osborne, 2005; Field 2009). For this particular data matrix, the point of inflexion on the Scree plot revealed a two factor solution.

A process was initiated to determine a solution that would provide the best possible rotated factor structure. Factors that have less than three variables, complex variables (i.e. an item that is in the situation of cross loading) and item loadings less than .32 on all of the factors are considered less desirable (Yong & Pearce, 2013). At this point it should be noted that the 25-item scale was developed with the idea of measuring actual practices that relate to three sets /categories of behaviour namely, water saving, energy saving as well as recycling and waste reduction practices. This categorisation was however not evident in the EFA results and since the three factor solution did not comply with the fore-mentioned criteria, a two factor solution was pursued. The resulting two factor solution is presented in Table 4.13. The factors were labelled as (1) "Personal practices" and (2) "Shared practices". Rather than to perceive energy saving, water saving and recycling/ waste reduction practises as three separate categories, respondents seem to view these practises either in terms of their own ability to engage in such practises on a more personal level (i.e. factor 1) or as the responsibility of the larger office block community in terms of a shared level of commitment to pro-environmental principles (i.e. factor 2). These factors relate to the findings derived from Section C of the questionnaire, specifically in terms of As Built Green Star SA building occupants' level of control over their physical office environment.

Factor loadings are indicative of the importance of a variable to the factor; therefore the higher the factor loading for a specific factor, the more relevant it is in terms of that factor (StatSoft, 2013). In general, cross loadings (i.e. when an item loads high on two or more factors) are eliminated so that each factor defines a distinct cluster of interrelated variables (Costello &

Osborne, 2005; Yong & Pearce, 2013), but as pointed out by Yong and Pearce (2013), depending on the type of study, items that cross load can be retained based on the latent nature of the variables. In this particular study, certain practises may be viewed as behaviour that depends on the individual's own personal ability/ commitment or conversely, such practises are influenced and controlled by the larger office community due to the type of office environment and the facilitating factors (i.e. systems of provision) within that environment. As an example, utilizing draft printer settings to save printer cartridges may depend on whether the individual has been allocated his/ her own printer, in which case the behaviour relates to a personal level commitment. When using a communal printer, saving printer cartridges depends on a shared commitment of the larger office community to utilize draft printer settings. It may therefore seem plausible to have certain items cross load on both personal practices and shared practices.

Based on the fore mentioned criteria and to reflect on the communality of the variables, none of the 25 items in the scale were omitted, with 18 items loading onto factor 1 (i.e. personal practices) and seven items loading onto factor 2 (i.e. shared practices). The Cronbach α's for personal practices (α =0.90) and shared practices (α = 0.76) indicated internal consistency within the factors. "Not applicable" responses were eliminated from the data set before proceeding with the EFA, to reflect on responses based on the four-point Likert-scale ranging from "never" to "always". The two factors only explained a cumulative variance of 36.85, but must be considered in light of the smaller sample size due to the elimination of "not applicable" responses (n=120). Further scale development is thus needed whereby the variables are measured among a larger sample to establish the relevance of these factors for future studies. These findings are presented in Table 4.14.

With regard to this study, the factor means suggest that respondents are more inclined to engage in personal practises ($M_{Factor\ 1}$=3.17) than shared practices ($M_{Factor\ 2}$=2.81). This may indicate that respondents were more likely to engage in practices if they perceived a higher level of personal control in their ability to engage in such behaviour. Cropanzano and Mitchell (2005) found that pro-environmental behaviour at work require a high degree of commitment toward a consolidated team effort as opposed to private sphere environmentalism whereby behaviour is mostly determined by the individual's personal pro-environmental obligation.

Achieving a committed team effort is however more intricate than encouraging a single person to engage in pro-environmental action (Cropanzano & Mitchell, 2005).

Table 4.14: BUILDING OCCUPANTS' ACTUAL OFFICE PRACTICES

Please indicate to what extent you engage in the following practises....	Factor 1: Personal practices	Factor 2: Shared practices
*Do you activate energy saving features on your computer equipment?	.71	.29
**Do you leave taps closed while dispensing soap onto your hands?	.70	.35
***Do you utilize printer settings that save on paper?	.65	.05
*Do you switch off office equipment such as computers when it is not in use?	.64	.40
*Do you turn your computer equipment off when you leave the office for the day?	.64	.39
***Do you save documents on your computer (e-filing) rather than printing them?	.61	.40
***Do you utilize draft print settings to save printer cartridges?	**.60**	**.50**
***Do you dispose of paper in a paper recycle bin?	.59	.41
**Do you make an effort to use water sparingly at work?	**.57**	**.54**
*Do you turn your computer screen off when leaving the office for more than 15 min?	.56	.38
***Do you re-use paper printed on only one side for other purposes (e.g. taking notes)?	.56	.25
*Do you ensure that taps are turned off properly after using them?	.55	.17
***Do you electronically archive important e-mail communication?	.54	.33
**Do you use low flush toilet options when available?	**.54**	**.52**
*Do you fill the kettle with just the amount of water you require?	.53	.31
***Do you print documents only if it is necessary?	.51	.13
***Do you print on both sides of the paper whenever possible?	**.46**	**.44**
*Do you unplug chargers when it has finished charging (e.g. cell phones / lap tops)?	.45	.34
***Do you return excess stationary items for re-use by others?	.30	.68
*Do you open window coverings to allow natural light into your office?	.19	.67
**Do you report leaking taps to maintenance staff even if it is not your responsibility?	.42	.62
*Do you switch off lights when you leave your office for extended periods of time?	.35	.61
*Do you switch off lights when there is sufficient natural light in your office?	**.50**	**.52**
***Do you return used printer cartridges for toner/ink refilling?	**.43**	**.48**
*Do you open windows instead of using air conditioning where possible?	.27	.47
Mean	**3.17**	**2.81**
Standard Deviation	**0.07**	**0.09**
% Variance Explained	**30.8**	**6.05**
Cronbach α	**0.90**	**0.76**

Note: *Initially categorized as energy saving practice; **Initially categorized as water saving practice; ***Initially categorized as waste reduction/ recycling practice. Max=4.

In accordance with the above, Paillé and Boiral (2013) explain that in order to contribute to "organisational greening", individuals must engage in three different types of behaviours, namely eco-helping, eco-civic engagement and eco-initiatives. Eco-helping would typically involve an explanation of environmental procedures to new building occupants or by helping co-building occupants to improve their environmental knowledge and skills within the work environment. Eco-civic engagement would manifest in building occupants' contribution to the organisation's eco-friendly image by participating in green campaigns and committees. Eco-initiatives would involve personal green initiatives undertaken by individuals in the workplace i.e. leading by example and voluntarily adopting more pro-environmental behaviours with in their everyday work environment. It is thus apparent that most of the items listed as personal practices (Factor 1) could be classified as eco-initiatives, since it involves personal initiative and responsibility for acting in a more pro-environmental manner. According to Paillé and Boiral (2013) such initiatives may lead to eco-civic engagement and eco-helping behaviour. Building occupants could for example share "best practices" with others such as informing them about the correct printer settings to save on paper and ink. Based on the assumptions of the structuration theory, sharing information with others involves a process whereby practical consciousness is made explicit and transformed into discursive consciousness (Nonaka & Toyama, 2003) which is an important step toward realising the long term goals of As Built Green Star SA buildings. Shared practices (Factor 2) represent a higher level of shared commitment toward achieving pro-environmental practices within As Built Green Star SA buildings and thus require more stringent effort toward cultivating eco-civic engagement and eco-helping behaviour.

In addition to the above, empirical evidence derived from the studies of Ones and Dilchert (2012a; 2012b), reveal that employees who work for green industries tend to engage in pro-environmental behaviours to a much larger extend than those who work in other traditional industries, since it forms part of their job description. Although the respondents that were recruited for this study were all employed by so-called "traditional" organisations, these organisations did subscribe to a more pro-environmental ethos by accommodating their employees in As Built Green Star SA buildings with the necessary infrastructure to facilitate pro-environmental behaviour. As employees of such organisations, they are expected to

demonstrate more willingness to engage in pro-environmental action (Ones & Dilchert, 2012a; 2012b; Paillé & Boiral, 2013).

4.7. AS BUILT GREEN STAR SA BUILDING OCCUPANTS' DISCURSIVE CONSCIOUSNESS PERTAINING TO PRO-ENVIRONMENTAL PRACTICES (Objective 4)

Social interaction of building occupants in the structures of the As Built Green Star SA building can be explained in terms of an building occupant's consciousness and knowledge (Nonaka, 1990, 1991, 1994; Lyytinen & Ngwenyama, 1992; Nonaka & Takeuchi, 1995). Most agree that the practical consciousness of an agent is difficult to change, but at the same time, building occupants also have the ability to engage in reasoning when asked to expand upon the underlying reasons for routine actions within the office space. In such instances, discursive consciousness is addressed (Stirk, 1998; Jackson, 2005; Lippuner & Werlen, 2009). In order to measure the concept of discursive consciousness, respondents were confronted with statements that addressed the underlying reasons/ outcomes for specific pro-environmental practices to which they had to indicate their agreement. As in Section 4.6, to simplify the interpretation and analysis of data, the "strongly disagree" and the "disagree" response options were combined and labelled as "disagree" as well as the "agree" and "strongly agree" were combined and labelled as "agree".

4.7.1 Building Occupant's Discursive Consciousness Pertaining to Energy Saving Practices

Table 4.15 shows that more than 80% of the respondents agreed with all of the statements that relate to energy saving practices and the Cronbach α =.89 suggests a high level of internal consistency in responses to the scale items.

The overall mean (M=3.43; M_{Max}=4) for these items indicate strong agreement with the specified reasons for energy saving practices. Statements that obtained agreement from most respondents (>90%) seem to once again relate to an increased level of personal control and individual responsibility i.e. it may be argued that if respondents are in control of such practices

(e.g. turning computers off when leaving the office for the day) they were more certain of the outcome (e.g. saving energy) for such behaviour.

TABLE 4.15: BUILDING OCCUPANTS' DISCURSIVE CONSCIOUSNESS PERTAINING TO ENERGY SAVING PRACTICES (N=201; Missing: n=8)

Circle the number that best describes your answer to the following statements….	Disagree (%)	Agree (%)	Mean	Standard deviation
I save energy by switching off office equipment when it is not in use	10.5	86.6	3.32	0.719
I save energy by switching off my lights when there is sufficient natural light in my office	14.4	82.6	3.26	0.784
I save energy when I open windows instead of using air conditioning where possible	12.9	83.6	3.34	0.759
I save energy when I turn off my computer equipment when I leave the office for the day	4.5	92.5	3.55	0.618
I save energy by turning my computer screen off when I leave the office	4.0	92.5	3.55	0.611
I save energy when I open window coverings to allow natural light into my office to reduce the artificial light	8.5	88.5	3.41	0.736
I save energy when I fill the kettle with just the amount of water that I require	6.0	91.0	3.49	0.676
I save energy by switching off my office lights when I leave my office for more than 15 minutes	8.5	88.5	3.41	0.736
I save energy by activating energy saving features on my computer equipment	5.0	91.0	3.48	0.645
I save energy by unplugging chargers when it has finished charging (e.g. cell phones/laptops)	8.5	88.5	3.48	0.699

4.7.2 Building Occupant's Discursive Consciousness Pertaining to Water Saving Practices

Table 4.16 reveals that the vast majority of respondents (≥93 %) agreed with statements that captured their agreement with statements relating to water saving practices. The Cronbach α =.86 suggests a high level of internal consistency and reliability of the scale items. The overall mean (M=3.55; M_{Max}=4) for these items further emphasise a strong agreement among respondents that engaging in the specified practices would contribute to the outcome of saving water. This may be attributed to informational campaigns that have for many years emphasized the importance of saving water because the supply thereof is not infinite and the

survival of human society would very much depend on our current intervention (Turpie, Marais & Blignaut, 2008).

TABLE 4.16: BUILDING OCCUPANTS' DISCURSIVE CONSCIOUSNESS PERTAINING TO WATER SAVING PRACTICES (N=201; Missing: n=8)

Circle the number that best describes your answer to the following statements....	Disagree (%)	Agree (%)	Mean	Standard deviation
I save water by leaving taps closed while disposing soap onto your hands	4.0	93.0	3.54	0.627
I save water when I ensure taps are turned off properly after using them	1.5	95.0	3.63	0.553
I save water when I repost leaking taps to maintenance staff even if it is not your responsibility	3.5	93.5	3.54	0.603
I save water when I make an effort to use water sparingly at work	4.0	93.0	3.51	0.629
I reduce water usage by using the low flush options when available	3.5	93.5	3.53	0.586

4.7.3 Building occupant's discursive consciousness pertaining to recycling and waste reduction practices

Similar to the results reported in Table 4.15 and 4.16, Table 4.17 also indicates a high percentage of respondents (≥88.6%) who agreed with statements pertaining to the waste and recycling practices. The Cronbach α = .92 is a clear indication of internal consistency in the responses and the overall mean (M=3.51; M_{Max}=4) demonstrates a strong level of agreement among the respondents about the recycling and waste reduction outcomes of certain practices. Although recycling and waste reduction initiatives have not yet gained the same momentum in South Africa as found abroad in other more developed countries, there has been increased efforts over the past few years to promote an understanding of the environmental repercussions of excessive waste production in the local context (Paper Recycles, 2011).

TABLE 4.17: BUILDING OCCUPANTS' DISCURSIVE COSNCIOUSNESS PERTAINING TO RECYCLING AND WASTE REDUCTION PRACTICES (N=201; Missing: n=8)

Circle the number that best describes your answer to the following statements….	Disagree (%)	Agree (%)	Mean	Standard deviation
I reduce waste when I save documents on my computer (e-filling) rather than printing them	4.0	93.0	3.52	0.595
I reduce waste when I return used printer cartridges for toner/ink refilling	7.5	88.6	3.39	0.661
I reduce waste it I print on both sides of the paper whenever possible	3.0	93.5	3.59	0.571
I reduce waste when I re-use paper printed on one side only for other purposes (i.e. taking notes)	4.0	93.0	3.53	0.577
I reduce waste when I dispose of paper in a paper recycling bin	4.0	93.0	3.56	0.575
I reduce waste when I utilize draft print settings to save printer cartridges	7.5	89.6	3.37	0.701
I reduce waste when I change printer settings that save on paper	6.0	91.0	3.45	0.627
I reduce waste by electronically archive important e-mail communications	3.5	93.5	3.57	0.582
I reduce waste by printing only documents if is necessary	3.0	93.6	3.62	0.601
I reduce waste when I return excess stationary items for re-use by others	6.5	90.5	3.45	0.667

In summary, it is evident that respondents' agree with the underlying reasons for certain routine actions within the office space that could contribute to saving energy and water as well as reduce the amount of waste that is generated in the As Built Green Star SA buildings. Their agreement reflects a level of discursive consciousness that would enable them to consciously reason and explicitly explain the motivation and intentions behind specific pro-environmental practices in their office environment (Lyytinen & Ngwenyama, 1992). The ability to articulate and rationalise why power and resources are allocated to greener principles within an organisation may form an important basis for eco-helping behaviour, eco-civic engagement and eco-initiatives as explained by Paillé and Boiral (2013). Eco-civic engagement and eco-initiatives such as the willingness to engage in certain pro-environmental practices in the As Built Green Star SA building, calls for reflection and such reflection is facilitated by the building occupant's discursive consciouness that allows him/ her to question ways of executing daily

office routines (Bartiaux, 2007). Furthermore, eco-helping behaviour requires the articulation of explicit knowledge through the process of externalisation. During the externalisation stage, building occupants use their discursive consciousness to rationalise and articulate the world around them (Nonaka & Toyama, 2003). As an example, building occupants may share their understanding of why it is important to save energy and water or to reduce waste in their everyday practices, which may encourage others to engage in pro-environmental practices in the built environment.

It is however a well known fact that changing practical consiouness into discursive consiousness is not a easy task: the results reported in the previous section pertaining to respondents' practical consciouness (in terms of its manifestation in routine office practices) does not entirely reflect the high levels of agreement expressed by respondents about the underlying reasons for engaging in specific pro-environmental practices as reported in this section. Thus far, much debate has focused on the level of control that respondents have over the execution of specific practices, which was further substantiated by the previous EFA results. It was thus decided to also subject the current data to an EFA procedure, to establish whether there would be marked similarities/ differences in the underlying factor structure of the two sets of data.

4.7.4 Exploring of building occupants' discursive consciousness

The EFA procedure produced a three factor solution which could not be interpreted in a logical manner. The Scree plot revealed a two factor solution, which was subsequently pursued and delivered a solution which could be interpreted in much the same manner as the EFA described in section 4.6.4. The resulting two factor solution is presented in Table 4.18. The factors were labelled as (1) "internal locus of control" and (2) "external locus of control". The underlying differentiation between these factors in relation to those described in section 4.6.4 is the additional ascription of outcomes that accompany each practice which explains why a person would engage in such practices (i.e. discursive consciousness). However, similar to the EFA results described in section 4.6.4, the issue of control is again relevant since respondents may believe that the degree to which the outcomes of a particular practice is achieved could depend on the amount of control that they have over the behaviour in question. For example, saving

energy by unplugging chargers is a practice which can be easily performed by the individual without much external interference.

Existing literature defines internal locus of control as the knowledge, skills and will-power that building occupants have over their actual office environment (Ajzen & Madden, 1986), which measures the extent to which building occupants believe they have control over their own routine office behaviour (Levenson, 1981). Literature also suggests that building occupants see behavioural outcomes as dependent on their own decisions and behaviour and also tend to set higher goals, perseverance in challenging situations and be more likely to achieve successful outcomes (Strauser, Ketz & Keim, 2002). Higher levels of openness, extraversion and significantly lower levels of Neuroticism will be seen when building occupants (Caliendo, Cobb-Clark & Uhlendorff, 2010). External locus of control, on the other hand, describes external perceptions of the building occupants such as time, availability and the cooperation of others as very important (Ajzen & Madden, 1986). External locus of control have two sides such as powerful others which concerns the believe that other building occupants control the events in one's life or chance which measures the degree to which a person believes that chance affects his or her experiences and outcomes (Levenson, 1981). Building occupants with external locus of control also believe that much of what happens in life is beyond their control, they also are more likely to avoid situations in which they feel unable to cope such an newly As Built Green Star SA office environment (Strauser, Ketz & Keim, 2002; Caliendo, Cobb-Clark & Uhlendorff, 2010).

For the purpose of this discussion and based on the latent nature of the variables (Yong & Pearce, 2013), cross loaded items were retained, but it is emphasized that further scale development is needed to further refine the underlying components of each factor. The outcome of certain practises may be subject to the influence of both internal and external locus of control and therefore it may seem probable that some items would cross load on both factors.

As indicated in Table 4.18, the Cronbach α's for the internal locus of control factor (α =0.95) and external locus of control (α =0.87) indicated internal consistency within the factors. The two factors explained a cumulative variance of 54.12. The factor means suggest that respondents were more convinced about the outcome of practices that are subject to an

internal locus of control ($M_{Factor\ 1}$=3.53) than those that involve external locus of control ($M_{Factor\ 2}$=3.38) and therefore more likely to engage in social practices that fall under factor one than those that fall under factor two i.e. external locus of control.

Table 4.18: BUILDING OCCUPANTS' DISCURSIVE CONSIOUSNESS (n=201)

Circle the number that best describes your answer to the following statements....	**Factor 1: Internal locus of control**	**Factor 2: External locus of control**
***I reduce waste by archiving important e-mail communication electronically	.77	.21
***I reduce waste by printing only necessary documents	.77	.22
**I reduce water usage by using the low flush toilet options when available	.72	.38
**I save water when I ensure that taps are turned off properly after using them	.71	.24
**I save water by leaving taps closed while dispensing soap onto your hands	.67	.26
***I reduce waste when I dispose of paper in a paper recycle bin	.66	.38
***I reduce waste when I return excess stationary items for re-use by others	**.65**	**.42**
*I save energy when I fill the kettle with the just the amount of water that I require	.65	.30
***I reduce waste when I save documents on my computer (e-filing) rather than printing them.	.65	.37
*I save energy by unplugging chargers when it has finished charging (e.g. cell phones / laptops)	.64	.36
***I reduce waste if I print on both sides of the paper whenever possible	**.62**	**.44**
**I save water when I make an effort to use water sparingly at work	**.61**	**.48**
*I save energy when I turn off my computer equipment when I leave the office for the day	**.58**	**.40**
***I reduce waste when I re-use paper printed on only one side for other purposes (e.g. notes)	**.58**	**.46**
**I save water when I report leaking taps to maintenance staff even if it is not my responsibility	**.54**	**.47**
*I save energy by turning my computer screen off when I leave the office	**.51**	**.48**
***I reduce waste when I utilize draft print settings to save printer cartridges	**.49**	**.49**
*I save energy by switching off my office lights when I leave my office for more than 15 minutes	.26	.70
*I save energy by switching off my lights when there is sufficient natural light in my office	.11	.69
***I reduce waste when I return used printer cartridges for toner/ ink refilling	.33	.67
***I reduce waste when I change printer settings that save on paper	**.56**	**.59**
*I save energy by switching off office equipment when it is not in use	.31	.58
*I save energy when I open windows instead of using air conditioning where possible	.30	.55
*I save energy by activating energy saving features on my computer equipment	**.52**	**.54**
*I save energy when I open window coverings to allow natural light into my office to reduce the artificial light	.33	.51
Mean	3.53	3.38
Standard Deviation	0.08	0.07
% Variance Explained	49.78	4.34
Cronbach α	0.95	0.87

Note: *Initially categorized as energy saving practice; **Initially categorized as water saving practice; ***Initially categorized as waste reduction/ recycling practice. Max=4.

4.8. COMPARING BUILDING OCCUPANTS' PRACTICAL- AND DISCURSIVE CONSCIOUSNESS

As a final step in the analysis of the data for this study, a comparison was done between the means for building occupants' actual practices (i.e. practical consciousness) and their discursive consciousness. The "not applicable" responses were eliminated from the actual practices data set, thus ensuring $M_{Max}=4$ for both the practical- and discursive data set. As depicted in Figure 4.4, corresponding items from Section E and F were compared in terms of their means. For the most part the means for discursive consciousness was higher than those of corresponding items in the actual practises data set. There was one exception, namely closing taps, whereby the mean value for the actual practice was higher than the mean value for the discursive consciousness. This may be attributed to the fact that closing taps have become such an ingrained routine behaviour that many people do not have to consciously reason about it. Some items achieved very similar means e.g. recycling paper. With the increased availability of recycling bins in the green buildings, in addition to constant reminders of the outcome of recycling, it might be a practice that is fast becoming routine behaviour that requires limited further articulation and reasoning (i.e. discursive consciousness). There is however a few examples, where the actual practices had much lower mean scores that the discursive consciousness. One good example is the returning of excess stationary with the intention of reducing waste and sharing of consumables with fellow workers. This might be a new concept within green buildings which requires a mind shift to become routine behaviour.

Overall it would seem that respondents' actual practices did not entirely match up with their reasoning and thoughts about their behaviour. For many years, the discrepancy between what people think or say and what they do has been the topic of much debate in the environmental domain (Ferreira, 2014). Much of the research effort to date has focused on bridging the gap between these two continuums, and would therefore also seem relevant in the context of As Built Green Star SA buildings. Based on the findings of this research, continued effort is required to instil a deeper sense of understanding of the importance of following through with actual behaviour so that the long term goals of a green building environment can be accomplished.

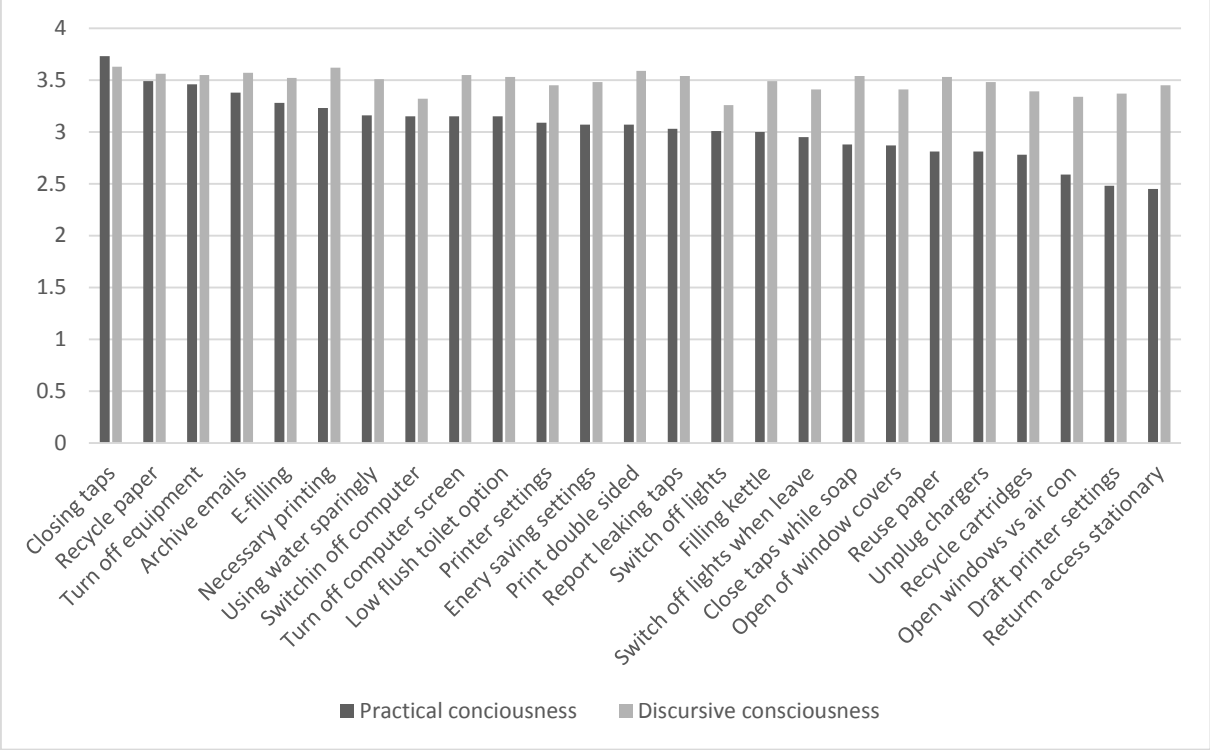

Figure 4.5: Practical- versus Discursive Consciousness of building occupant practices (N=201)

4.9. CONCLUSION

This chapter provided an overview of the results of the study according to the specified objectives. Data was collected by means of a purposive non-probability sampling technique and therefore the results cannot be generalised to the larger South African population. However, the study does provide valuable insight into the perspectives of building occupants who are familiar with the infrastructure and surroundings of As Built Green Star SA buildings. The results described in this chapter involved descriptive and inferential data analyses techniques, with discussions that were substantiated on the basis of existing empirical evidence. The following chapter highlights the overall conclusions that were drawn from the results and recommendations are made for future research.

CHAPTER 5

CONCLUSIONS OF THE STUDY

5.1. INTRODUCTION

The overall aim of the study was to explore and describe AS Built Green Star SA certified building occupants' environmental knowledge as well as their practical and discursive consciousness that relate to pro-environmental practices in their office environments. In other words, the intention was to understand how occupants make use of the facilities and equipment included in the design of the building and to establish their underlying knowledge and consciousness of the importance of environmentally responsible practices in realising the long-term benefits of these buildings. This chapter will look at the entire research process in order to give an overview on the findings of the study in terms of the research problem and proposed objectives and general aim that inspired the investigation. This chapter will also further expand on the challenges that were encountered along the way as well as the limitations, future research recommendations and implications of the study.

5.2. SUMMARY OF FINDINGS

In achieving the overall aim of this study, a purposive sample of As Built Green Star SA building occupants (N=201) were recruited, who were familiar with the green building infrastructures and surroundings. Most of the respondents were 25 years and older, full time employed, earned higher incomes with a high level of education and belonged to the higher LSM groups. These individuals therefore have the ability to significantly contribute to the ecological footprint in terms of their wealth and standard of living.

The first objective of the study was focused on assessing and discussing As Built Green Star SA building occupants' knowledge about broader environmental issues and factors that will affect the sustainability of global resources that have implications for future generations such as climate change. Such knowledge fulfil an important role with regards to building occupants'

discursive consciousness and their ability to articulate and reason about the underlying reasons and outcomes of pro-environmental practices. In order to determine the level of knowledge a combination of three knowledge scales was used and adopted for the purpose for this study and another study (Ferreira, 2014). The items were derived from combining the following scales namely: 8 items form Stone, Barnes and Montgomery's Eco-scale (1995), two item from the Social Responsible Consumption Scale (Antil & Bennett, 1979) to determine respondents' level of environmental knowledge.

The outcome of the building occupants' level of knowledge on climate change was average, and the critical area of concern is that only a disappointing small percentage of all respondents think that an average citizen can have a significant contribution to reduce climate change. This level of knowledge of the building occupants specifically shows that the general building occupant does not have the necessary knowledge needed to be able to use the building in the correct way as required as the respondents' overall explicit knowledge about climate change and general environmental facts are average (M=53.36%). Thus the discursive consciousness of the building occupant is really limited to change behaviour due to the low level of general climate change knowledge, however some findings concerning individual scale items did however reveal some positive insights. Respondents scored very high (above 80%) on issues such as the environmental strain caused by the growing South African population, the role of saving electricity and the fact that pollution is currently a critical problem worldwide. Respondents were however less convinced about the eco-friendliness of locally produced products and/or whether the world's resources are infinite. Concern relates to the six items for which respondents obtained scores below 50%. These items tap into respondents' understanding of the USA's contribution to air pollution, the role of methane and organic materials such as compost heaps, climate change and the depletion of the ozone layer as well as the presence of greenhouse gasses. But, the item that obtained the lowest score (7.6%) is perhaps the most discouraging result of this knowledge test. Considering that the respondents work in an environment where pro-environmental effort is promoted and facilitated, it is rather disappointing that the majority misunderstand the relevance of individual effort in lowering the effects of climate change.

The second objective was to investigate and describe the level of control that As Built Green Star SA building occupants have over their physical office environment including their use of energy, water and the consumption of other resources such as paper and ink. In terms of the level of control an As Built Green Star SA building occupant has over his/ her office environment, results showed that it has a significant impact on how the building occupant can 'use' the building in a practical consciousness manner. As seen in Section C of the questionnaire and the results in Section 4.4, these As Built Green Star SA buildings are designed in certain ways so that the building occupant may or may not have control over their office environment. Section C investigated to what extend the building occupant has control over practices that entail the use of energy, water and consumption of other resources within its immediate office environment.

According to the literature, central lighting and/or intellectual lighting systems as well as central HVAC systems are installed in most of the new green buildings internationally. Thus these central systems do not allow for building occupants' interference or personal control because these central systems are engineered in such a way so to ensure optimal resource consumption. This could influence building occupants' level of personal control over their office space. The results showed that the majority of the building occupants have no control over the light settings in their office space, neither do they have control over HVAC systems and the majority of windows are not operable in these As Built Green Star SA buildings. It seemed plausible that when a building occupants have window treatments in their offices and when they are able to open window treatments close to their desks, they can influence the amount of energy that is saved in the building, because they can then utilise natural light rather than the artificial light whenever possible. Due to the fact that almost all of the respondents worked in an open-plan office space they have little control over their direct office environment thus only a few of the building occupants can adjust window treatments. In terms of paper recycling results showed that almost all respondents who have access to paper recycling bins made use of them.

The third objective was to investigate and describe As Built Green Star SA building occupants' practical consciousness in terms of its manifestation in routine office practices that contribute to energy saving, water saving and recycling and waste reduction. In terms of the practical

consciousness investigation, the data of Section E, which presented a 25 item 5-point Likert-type scale, ranging from never to always and an option of "Not Applicable (NA)". The not applicable option was included to accommodate responses from participants who were not familiar with certain practices in their office environment or it gives a respondent an option to express his/her view that the actual practice cannot be controlled by the respondent. There were a few items that ranked high on the "not applicable" option that stated the fact that the building occupants cannot control those actual practices. These office practices are related to energy saving, water saving and waste reduction.

In terms of the other energy saving actual practices of the building occupants where the "not applicable" option was not high, the results indicated that respondents did engage in energy saving practices, especially with regard to office equipment that were allocated on an individual basis. The mean of the energy saving practices indicate a positive level of engagement in these practices and a high internal consistency. However more can be done to educate building occupants to some practices such as unplugging chargers when not in use. Information campaigns can help in this regard, as building occupants lack the appropriate knowledge. Based on the results respondents seemed to be quite conscientious in their efforts to save water as the mean was substantially higher that those reported for energy saving and the "not applicable" options was also substantially lower. The majority of building occupants do make an effort to use water sparingly, as it is a known fact that South Africa is a semi desert area with limited water sources. When recycling and waste reduction practices is looked at, it is clear in the results that the overall mean indicated a positive tendency towards recycling and waste reduction practices. Three items in this section achieved a high percentage of "not applicable" responses that emphasised the fact that they do not have control over them. In referring back to Section C, the majority building occupants indicated that they have not been allocated a printer for individual use, which will explain the fact that the majority of the building occupants did indicate that they either seldom ("Never" to "Sometimes") engage in the practice of recycling printer cartridges or responded "not applicable" to returning printer cartridges practice. Respondents also indicate that they are less inclined to use draft printer settings however they do in fact use the printer setting to save on paper. The majority of building occupants did indicate that they often engage in paper saving/ recycling initiatives which may be attributed to the systems of provision in the As Built Green Star SA building.

The raw data was subjected to exploratory factor analysis to distinguish coherent factors and to establish the components of each factor pertaining to pro-environmental practices in an office environment. Exploratory factor analysis was conducted for the experiential design of the practical consciousness of As Built Green Star SA building occupants. EFA's extraction method known as the Principal axis factoring was performed, using Varimax rotation with Kaiser Normalization and Eigen values above 1 was used to identify coherent factors with components that made sense in terms of their meaning. Two factors were distinguished through factor analysis and were labelled as follows: Factor 1: "Personal practices" and Factor 2: "Shared practices". Rather than perceive energy saving, water saving and recycling/ waste reduction practices as three separate categories, respondents seemed to view these practices either in terms of their own ability to engage in such practices on a more personal level (i.e. factor 1) or as the responsibility of the larger office block community in terms of a shared level of commitment to pro-environmental practices (i.e. factor 2). These factors relate to the findings derived from Section C of the questionnaire, specifically in terms of the As Built Green Star SA building occupant's level of control over their physical environment.

Practices that fall under factor 1 may be viewed as behaviour that depends on the building occupants own personal ability/ commitment and measured all the items in the scale that had a high level of personal control over the actual behaviour in the office environment. In contrast, factor 2 that relates to shared practices are influenced and controlled by the larger office community due to the type of office environment and the facilitating factors (i.e. systems of provision) within that environment.

The Cronbach α's for personal practices was 0.90 and for shared practices was 0.76, which are above the acceptable range and indicate internal consistency within the factors. The factor means suggest that building occupants more frequently engage in personal practices ($M_{Factor\ 1}$=3.17) than shared practices ($M_{Factor\ 2}$=2.81) which in turn may indicate that building occupants are participating in more green social practices when they perceive a higher level of personal control in comparison to when the practices are subject to shared control. This can also have an influence because of the fact that the participants just do not have the explicit knowledge to engage in the action or just do not want to change behaviour to act more responsible. Cross loading on both factors were found and all the items were retained based

on the nature of the variables. According to Cropanzano and Mitchell (2005) pro-environmental behaviour at work require a high degree of commitment toward a consolidated team effort as opposed to private sphere environmentalism whereby behaviour is mostly determined by the individual's personal pro-environmental obligation. Achieving a committed team effort is however more intricate than encouraging a single person to engage in pro-environmental action (Cropanzano & Mitchell, 2005). In accordance with this, Paillé and Boiral (2013) explain that individuals must engage in eco-initiatives since it involves personal initiative and responsibility for acting in a more pro-environmental manner. Paillé and Boiral (2013) also stated the fact that such initiatives may lead to eco-civic engagement and eco-helping behaviour. Based on the assumptions of the structuration theory, sharing information with others involves a process whereby practical consciousness is made explicit and transformed into discursive consciousness (Nonaka & Toyama, 2003) which is an important step toward realising the long term goals of As Built Green Star SA buildings. Shared practices (Factor 2) represent a higher level of shared commitment toward achieving pro-environmental practices within As Built Green Star SA buildings and thus require more stringent effort toward cultivating eco-civic engagement and eco-helping behaviour.

The fourth objective was to explore and describe As Built Green Star SA building occupants' discursive consciousness towards greener office practices. In other words the question at hand is to understand what the building occupant's intent is to do on a daily routine. In order to measure the concept of discursive consciousness, respondents were confronted with statements that addressed the underlying reasons/outcomes for specific pro-environmental practices to which they had to indicate their agreement. Similar to the scale developed for Section E, Section F included 25 self-developed items: ten items tapped into respondents' understanding of the underlying energy saving outcomes of certain office practices, five items measured their understanding of the water saving outcomes of specified practices and ten items focused on the underlying recycling/waste reduction reasons for particular office practices. A four-point Likert-type agreement scale was used, which presented a 25 items Eco-scale, with increments varying from "strongly Disagree" to "strongly Agree".

Results indicated that more than 80% of the respondents agreed with all of the statements that relate to energy saving practices. The overall mean for these items indicate strong agreement with the specified reasons for energy saving practices. Statements that obtained agreement from most respondents seem to once again relate to an increased level of personal control and individual responsibility i.e. it may be argued that if respondents are in control of such practices (e.g. turning computers off when leaving the office for the day) they were more certain of the outcome (e.g. saving energy) for such behaviour. The vast majority of respondents agreed with statements that captured their agreement with statements relating to water saving practices. The overall mean emphasise a strong agreement among respondents that engaging in the specified practices would contribute to the outcome of saving water. Similar to the results reported in the last section, results also indicates a high percentage of respondents who agreed with statements pertaining to the waste and recycling practices. The overall mean demonstrates a strong level of agreement among the respondents about the recycling and waste reduction outcomes of certain practices. Although recycling and waste reduction initiatives have not yet gained the same momentum in South Africa as found abroad in other more developed countries, there has been increased efforts over the past few years to promote an understanding of the environmental repercussions of excessive waste production in the local context (Paper Recycles, 2011).

A similar process that of the practical consciousness above was done for the discursive consciousness of building occupants. These scale items were also subjected to EFA's to distinguish coherent factors and to establish the components of each factor. EFA, specifically the extraction method of Principal Axis Factory using the rotation method of Varimax with Kaiser Normalization and the rotation converged in three iterations to identify coherent factors with components that made sense in terms of their meaning. A two factor solution was presented with factor labelling as (1) "internal locus of control" and (2) "external locus of control". The underlying differentiation between these factors in relation to those described at the practical consciousness is the additional ascription of outcomes that accompany each practice which explains "why" a building occupant would engage in such practices. However, similar to the EFA results of the practical consciousness, the issue of control is again relevant since respondents may believe that the degree to which the outcomes of a particular practice is achieved could depend on the amount of control that a building occupant have over the

behaviour in question. The factor means suggest that respondents were more convinced about the outcome of practices that are subject to an internal locus of control ($M_{Factor\ 1}$=3.53) where the building occupant believe they have control over their own routine office behaviour than those that involve external locus of control ($M_{Factor\ 2}$=3.38). For example, saving energy by unplugging chargers is a practice which can be easily performed by the individual without much external interference. For the purposes of this discussion and based on the latent nature of the variables cross loaded items were retained. The outcome of certain practises may be subject to the influence of both internal and external locus of control and therefore it may seem probable that some items would cross load on both factors.

In terms of the relationship between the practical and discursive consciousness of building occupants this study from the point of departure wanted to better understand whether the building occupants of a Green Start SA building utilises it to the best of their ability in order to reach the operational targets set out be the designers during the design phase of the building. When comparing actual office behaviours (practical consciousness) to building occupant's intent (discursive consciousness) the following conclusion can be made. The actual practices (practical consciousness) were constantly lower than the intent of the building occupant's practices (discursive consciousness). Except for three instances where the actual practices were higher or almost the same than the consciousness practices were for example the item that asked about the closings of taps, practice of dispose paper in a recycle bin and the practice of switching off computers at the close of the business day. One of the items in the comparison of practical consciousness and discursive consciousness that measured very low was that of sharing stationary with fellow workers, as it is a brand new concept within green building office environments. The second item was when the building occupants' response was measured towards office behaviour regarding utilization of draft paper settings. Here the lack of explicit knowledge of the building occupants is evident. They do not know how to set draft settings on the computer and expect someone else to make the setting. That emphasizes that fact that the practical consciousness is constantly lower than the intentions of the building occupant.
Some of the EFA's of Section E and Section F did not have the same outcome and thus the only explanation was the fact that the actual office environment does not cater for the specific action to take place. Another reason may be that the explicit knowledge of the building

occupant is very low. This was also the item that measured almost that same on the practical and discursive consciousness.

5.3. CONCLUSION

The study indicate that consumers' overall explicit knowledge of climate change, general environmental facts and personal knowledge on environmental issues are average. This implicates that the vast majority of employees in these buildings have no personal conviction to live greener lifestyle themselves or don't believe that their change in behaviour can have an impact on the broader society. The lower the general knowledge of building occupants the lower their actual behaviour will be in relation to environmental guidelines set in place by the company's management. Knowledge and actual behaviour are directly linked to each other. If the occupants have the correct knowledge regarding green lifestyle, changes are much easier that behaviour could change accordingly.

It can be concluded that the majority of the building occupants work in a large open-plan office space and thus have limited to no control over their direct office environment. This may have a direct influence on their routine office practices in the sense that they are not reminded of what is expected from them in terms of the application of their explicit knowledge. Although the building design supplies the necessary green infrastructure it seems as if the building occupants are not willing or do not have explicit knowledge to 'use' the building in the correct way in terms of the light, HVAC or window treatments. On the other hand the building infrastructure does not have a direct influence on some routine office practices such and draft printing settings and recycling practices which also contribute to green office practice.

Findings furthermore confirm that the building occupants do not use the building correctly so that the As Built Green Star SA building operational targets are not met. For objective 4 it can be concluded that the willingness was constantly higher than the actual routine office behaviour. Thus the building occupant does not have a positive intention but the commitment to go through with the actual practices thus lack a bit. This study confirmed that the actual behaviour of a building occupant of an As Built Green Star SA certified building is lower than the building occupant's consciousness toward the same office practice. Thus the intention of

the building occupants may be to be more environmentally friendlier in their conduct but their actual office behaviour does unfortunately not show the same intention on a practical level. This can be the reason why the buildings do not perform as they should have performed according to the design studies done.

5.4. IMPLICATIONS FOR INDUSTRY AND POLICY FORMULATION

The findings described in this study may contribute to the information framework used by the academic community, interior design, interior architecture and green construction industries or other consumer industries. The nature of the study was exploratory and the findings may be used as a foundation for further research as will be explained in detail in the next section (5.5 recommendations for further research).

Interior designers and interior architects may find the information in this study useful as it indicates to what extent the building occupants influence the eventual success of their office designs. If occupants are not properly trained to use these highly designed buildings in an appropriate manner it will result in the underperformance of the proposed targets set out by professionals during the design process. Building owners, developers and facility managers can use the research findings when they plan the operationalization of the newly built Green Star SA building. The findings can illustrate the impact that untrained occupants may have on their building's performance and provide impetus for further training and knowledge development to accomplish the envisaged long term benefits of green buildings. In summary, the above mentioned groups of people may benefit from this research as it identifies shortcomings in building occupants' practical and discursive consciousness and to what extend practices can be adjusted so that the certified Green Star SA buildings can be used more effectively.

In terms of policy, international pressure from the World Green Building Council and the reality of strained resources worldwide, compels the South African Green Building Council and the South African government to enforce the Green Star SA rating system as well as to change the South African General Building regulations to higher green ratings to ensure better use of natural resources.

5.5. THEORETICAL CONTRIBUTION

This study aimed to contribute to literature pertaining to consumer behaviour and sustainable consumption practices by examining building occupants' knowledge on routine pro-environmental office practices. The findings of this research can be analysed with different focuses and may even provide insight to phenomenon that do not necessarily form part of the research objectives but were collective thoughts derived from the research process. The theory of structuration was well implemented in this research and supports other literature that examines the interconnected relationship of human agents and the systems of provision within their immediate environment (i.e. structure). However with the bigger field of research in mind, finer office behavioural characteristics may be identified, allowing empirical reference to a more credible basis from which to describe the practices of As Built Green Star SA building occupants.

The constructs of the structuration theory was confirmed in a number of the results in this study. One example is that the As Built Green Star SA building structure does have an influence on how the building occupant can 'use' the building and enforcing more environmentally friendlier office behaviour because of the structures that are set in place. The building itself does not only have an influence on the building occupant alone but the building occupant also exerts a large influence on whether the structures that are set in place are effective or not and whether behaviours can be adjusted in order to accommodate pro-environmental principles.

5.6. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

As explained in the previous chapters, care was taken throughout the study to obtain the most accurate data in the reliable and ethical way. Although all intentions were good to conduct the study in the best possible way, the project was still restricted by certain limitations. The main limitation of this study was that the population that was available for the study was very limited and it was therefore difficult to include a large group of respondents. The criteria for inclusion for the study were that the respondents had to work in a certified As Built Green Star SA buildings' office space within the South Africa boarder. It sounds easy but at the time the study

was conducted, only six certified As Built Green Star SA buildings was available in South Africa and two buildings' management did not allow any research at that time. Thus the population for the study only consisted of four buildings.

The next limitation was to gain access to the remaining buildings as some of the buildings were financial institutions and had high security restrictions. The initial plan for data gathering was to send out an electronic survey link to all employees in these buildings, unfortunately because of security reasons the servers of one of the buildings was not compatible with the online survey software that was used for this study namely Survey Monkey. Thus a combination of electronic and paper-based questionnaires was used. In the buildings were the electronic link was acceptable an e-mail was sent out to the facility manager or building owner's office in the hope that they will distribute the e-mail to all building occupants. E-mail addresses are confidential and therefore facility managers/ building owners are not permitted to give outside people access to occupants' e-mail addresses. This was another significant limitation as the data collection for the study was dependent on other people to distribute the electronic survey.

Fortunately the researcher gained access, albeit restricted, to one of the facilities to distribute paper-based questionnaires. Access was granted on grounds of the non-compatibility of the Survey Monkey software with the building's server. The researcher targeted passers-by in the foyer of the building and then ascertained whether they were building occupants. Suitable participants were asked to fill in the questionnaire with the incentive of a cappuccino voucher after the completion of the questionnaire. More than half of the potential respondents took a questionnaire which they did not return, and since no access was granted to the offices to collect the questionnaires, the researcher was forced to return several times with more paper-based questionnaires to eventually obtain a large enough sample. Difficulties were also encountered in terms of the length of the questionnaire. The questionnaire took approximately 15-20 minutes to complete. As the majority of the respondents were on lunch or just came down for a quick coffee or so, the time frame was very limited. A few of the respondents started to fill in the questionnaire but decided it took too long and therefore opted to terminate their participation. The incentive (i.e. cappuccino voucher) did however encourage many respondents to complete the questionnaires.

Initially, a prerequisite for participation was the respondents' ability to access internet and e-mail, but as the situation changed and paper-based questionnaires was also used, it was difficult to exclude occupants who that did not fit the criteria. For these reasons, any willing participant who occupied space in the building, whether they had access to internet or not was included in the sample. The questionnaires were however checked to ensure that all of the questions were answered and that it could be used for data analysis purposes.

The next major limitation for this study was that the researcher was also the co-owner of an Interior Design company which exerted pressure in terms of her daily time frame and work based responsibilities versus the study time frames. The researcher was however able to allocate enough time free to do the data collection herself as it contributed to the accuracy, reliability and validity of the study.

During the course of this study, the researcher identified opportunities for further research: Further research opportunities exist whereby more As Built Green Star SA buildings can be included in the sampling frame as the number of green buildings has rapidly increased in the South African context over the past two years. Follow up studies need to be done, as the scale and number of buildings increase on a yearly basis and therefore also the number of green building occupants in the South African context. Further research may include qualitative techniques such as focus group discussions to supplement the qualitative findings. Information yield from focus groups discussions or in-depth interviews may enrich this study field and fill gaps or answer questions that were left unanswered by the numerical data of this study.

Since this study was conducted at the inception of the Green Building movement in SA and the beginning of the Green Building Council of South Africa's existence, design flaws and other teething problems were still prevalent in the first few As Built Green Star SA buildings. Future buildings could include design improvements, especially if information that is gathered through studies of this nature are incorporated into the facilitation of pro-environmental practices in these buildings. Follow-up studies should therefore be conducted to provide further evidence that would allow better understandings of people's behaviour in green building environments and continually improve on environmentally responsible efforts. In-depth studies that include focus groups or in-depth interviews can be done so that the building occupants' feedback on existing designs can be incorporated into future building designs. Further studies can also

focus more on the discrepancy between occupants' actual practices (i.e. practical consciousness) and their discursive consciousness, specifically focusing on ways to overcome the gap between environmental concern and actual behaviour.

5.7. THE RESEARCH IN RETROSPECT

This research topic first came to mind when the researcher was attending the Annual Green Building Council Conference in 2011 in Cape Town. After three days of international key note speakers, discussion groups and workshops the main question brought forward revolved around the influence of the human beings and their behaviour when occupying these buildings. Concern was expressed about the manner in which these green buildings were used and to what extend green targets were achieved based on the influence of people who occupy them. After this conference the ground work for this study was done by extensively reviewing extant literature on the important constructs contained in the proposed research problem. After the reviewing of the literature the structuring and the formulation of the research objectives, conceptual framework and lastly the compilation of the research instrument, which in this case was a questionnaire, lead to a quantitative based study. This study adopted an exploratory and descriptive approach and included a survey based, cross sectional, case study on the environmental consciousness and practices of occupants in Green Star SA certified As Built buildings. The structured questionnaire was developed featuring close-ended questions by the help of a professional statistician at the University of Pretoria. The questionnaire items were mainly self-developed although some established scales were also incorporated and slightly adapted for the purposes of this study. A pre-test on all scales was done to confirm the reliability in the context of the study and the final questionnaire was submitted to the Department of Statistics at the University of Pretoria to ensure validity. After the pilot test the issues that followed was corrected to ensure all issues were resolved before continuing with the data capturing process. A cover letter was included in the final questionnaire to indicate to the respondents that information generated by the study would be for academic purposes, that participation in the study was voluntary and the all information would be kept anonymous and treated confidentially.

The Questionnaire was submitted to the Ethical Committee of the University of Pretoria's Department of Consumer Science and the Faculty of Natural and Agricultural Science's for approval before the proposed questionnaire was send out to respondents. Data were collected over a period of 3 weeks. As a result of the limited As Built Green Star SA certified buildings in South Africa, the sampling procedures used for this study were somewhat constrained and a purposive sampling technique was chosen for this study. The purposive sampling technique includes participants who complied with the criteria as set out and a combination of electronic and paper-based questionnaires was thus used in the study. For the first three buildings the electronic survey link was e-mailed and a very low response rate was obtained. For the fourth buildings only restricted access was granted, which compelled the researcher to make use of a non-probability convenience based sampling approach, to gather primary data in the building. Convenience or accidental sampling involves recruiting any individuals who are willing to participate in the study on a voluntary basis. Employees were approached in the building cafeteria/deli area and asked to complete the survey questionnaire. As a token of appreciation, individuals who volunteered and completed a questionnaire were offered a cappuccino voucher which they could then redeem at the building deli.

Due to the sampling method and limitation of such a small population group, the findings of the study can unfortunately not be generalized to a population greater that of the As Built Green Star SA buildings who participated in the research project. Another limitation of the study was the sample size of 203, which is not representative to all Green Star SA buildings in South Africa, but for the purpose of Master's Degree, due to the limited buildings available, the statisticians however approved the sample size.

The data capturing for the research took about one month as a combination of electronic and paper-based questionnaires was distributed, all of the paper-based questionnaires needed to be read in to the software used namely Survey Monkey. After all the electronic and paper-based questionnaires data was on Survey Monkey, the raw data was exported and adjusted into MS Excel format for analysis. The first round of descriptive statistical analysis was done by the researcher and supervisor. And the rest of the data was then sent to the Department of Statistics for inferential statistical procedures (i.e. exploratory factor analysis). Special

attention was given to accuracy, reliability and validity through the research project as explained in Chapter 3.

REFERENCE LIST

Abbaszadeh, S., Zagreus, I., Lehrer, D. & Huizenga, C. 2006. *Occupant satisfaction with indoor environmental quality in green buildings.* Healthy Buildings. Lisbon.

AECOM. 2012/2013. *Quick guide to green design attributes: taking sustainability to the next level*. 5th ed.

Aguirre, B.E. 2002. "Sustainable Development" as collective surge. *Social Science Quarterly,* 83(1):101-103.

Ajzen, I. & Madden, T.J. 1986. Prediction of goal-directed behaviour: Attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology,* 22:453-474.

Alt, E. 2011. *Who is more "sustainable", Rich or Poor?* [Online] Available from: http://www.triplepundit.com/2011/05/rich-poor-sustainable/ [Accessed: 2014-04-07].

Anderson, B.A., Romani J.H., Phillips, H., Wentzel, M. & Tlabela, K. 2007. Exploring Environmental perceptions behaviour and awareness, water and water pollution in South Africa. *Population and Environment,* 28(3):133-161.

Antil, J.H. & Bennett, P.D. 1979. Construction and validation of a scale to measure socially responsible consumption behavior. *The conserver society*, 51-68.

Armitage, L., Murugan, A. & Kato, H. 2011. Green office in Australia: a user perception survey. *Journal of Corporate Real Estate,* 13(3):169-180.

Ashton, P.J. 2002. Avoiding conflicts over Africa;s water resources. Ambio, 31:236-242.

Autio, M. & Wilska, T.A. 2005. Young people in knowledge society: possibilities to fulfill ecological goals. *Progress in Industrial Ecology – an International Journal*, 2:403-426.

Avetisyan, M., Hertel, T. & Sampson, G. 2013. Is local food more environmentally friendly? The GHG emissions impact of consuming imported versus domestically produced food. *Environmental & Resource Economics,* 58(3):415-462.

Babbie, E. 2001. *The practices of social research.* 9th ed. Belmont: Wadsworth.

Babbie, E. & Mouton, J. 2001. *The practices of social research*. Cape Town: Oxford University Press.

Barber, N., Almanza, B.A. & Donovan, J.R. 2006. Motivational factors of Gender, Income and Age on selecting a bottle of wine. *International Journal of Wine Marketing*, 18(3):218-232.

Barker, G., Hill, R.C., Bowen, P.A. & Evans, K. 2004. Economic and regulatory approaches to improve the environmental performance of buildings in South Africa*. Journal for the Physical Development Sciences*, 11(1&2):1-25.

Bartiaux, F. 2007. Does environmental information overcome practice compartmentalization and change consumers' behaviours? *Journal of cleaner Production,* 16:1170-1180.

Botes, A. 2012. *Printer cartridges and the environment*. [Online] Available from: http://urbanearth. co.za/2012/04/04/printer-cartridges-and-the-environment/ [Accessed: 2012-04-10].

Boudreau, M., Chen, A. & Huber, M. 2008. Green IS: building sustainable business practices. *Information Systems: A Global Text*.

Brill, M., Weidemann, S., Alard, L., Olson, J. & Keable, E. 2001. Disproving widespread myths about workplace design. Jasper, In: Kimball International; 2001.

Brown, Z. & Cole, R.J. 2009. Influence of occupants' knowledge on comfort expectations and behaviour. Building Research and Information, 37(3):227-245.

Brundtland, G.H. 1987. *Our common future: report of the World Commissions on Environment and Development*. Oxford: Oxford University Press.

Burgan, B.A. & Sansom, M.R. 2006. Sustainable steel construction. *Journal of Constructional steel Research,* 62(11):1178-1183.

Caliendo, M., Cobb-Clark, D. & Uhlendorff, A. 2010. Locus of control and job search strategies, Discussion Paper. *German Institute for Economic Research*, 979.

Carrico, A.R. & Riemer, M. 2011. Motivating energy conservation in the workplace: an evaluation of the use of group-level feedback and peer education. *Journal of Environmental Psychology,* 31:1-13.

Cheng, C.L. 2002. Study of the inter-relationship between water use and energy conservation for a building. *Energy and building,* 34(3):261-266.

Clean-up South Africa. 2011. [Online] Available from: www.cleanup-sa.co.za [Accessed: 2012-02-21].

Clements-Croome, D. 2000. *Creating the productive workplace*. 2nd ed. E & FN Spon: London

Cohen, L., Manion, L. & Morrison, K. 2007. *Research methods in education*. 6th ed. London: Routledge-Falmer.

Cole, R.J. 2005. Building environmental assessment methods: redefining intentions and roles. *Building Research & Information,* 35(5):455-467.

Cole, R.J., Robertson, J., Brown, Z. & O'Shea, M. 2008. Re-contextualizing the notion of the comfort. *Building Research and Information,* 36(4):323-336.

Cooper, D.R. & Schindler, P.S. 1998. *Business research methods* (6th ed.). Boston, USA: Irwin McGraw-Hill.

Costello, A.B. & Osborne, J.W. 2005. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation,* 10(7):1-9

Creswell, J.W. 1998. *Qualitative inquiry and research design: choosing among five traditions.* Thousand Oaks: Sage.

Cropanzano, R. & Mitchell, M.S. 2005. Social exchange theory: an interdisciplinary review. *Journal of Management,* 31:874-900.

Davis, M. & Challenger, R. 2009. Climate change: warning to the risk. *The Psychologist*, 22:122-114.

Delport, C.S.L. 2009. Quantitative data collection methods. In: De Vos, A.S., Strydom, H., Fouchè, C.B. & Delport, C.S.L. (eds.) *Research at Grass roots: For the social science and human service professions.* 3rd ed. Van Schaik Publishers: Pretoria.

Delport, C.S.L. & Fouché, C.B. 2009. The place of theory and literature review in the qualitative approach to research. In: De Vos, A.S., Strydom, H., Fouchè, C.B. & Delport, C.S.L. (eds.) *Research at Grass roots: For the social science and human service professions.* 3rd ed. Van Schaik Publishers: Pretoria.

Denscombe, M. 2007. *The good research guide for small-scale social research projects.* 3rd ed. Berkshire:McGraw-Hill.

Department of Environmental Affairs and Tourism [DEAT]. 2009. *Green Buildings in South Africa: Emerging Trends.* Council of Scientific and Industrial Research (CSIR).

Department of Water Affairs and Forestry [DWAF]. 2002. *Using water wisely: a national water resource strategy for South Africa: information document.* [Online] Available from: http://www.dwaf.gov.za/Docs/NWRS/Information/ENGLISH%20INFO%20DOC.pdf [Accessed: 2014-09-03].

D'Souza, C., Taghian, M. & Khosla, R. 2007. Examination of environmental beliefs and its impact in the influence op price, quality and demographic characteristics with respect to green purchase intention. *Journal of Targeting, Measurement and analysis for marketing*, 15(2):69-78.

Dunlap, R.E. & Catton, W.R. 1994. Struggling with human exemptionalism: the rise, decline and revitalization of environmental sociology*. American Sociologist*, 25:5-30.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. 2000. New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. *Journal of social issues*, 56(3), 425-442.

Du Plessis, M. 2009. The state of the planet: your company's role*.* In *The Environmental Handbook* (eds by) A.Freemantle*,* H.De Wet,P.Brink *&* J.Koeman*,.* Trialogue, Cape Town, South Africa*.* pp. 6–71.

Rousseau, D. 2003. Cosumerism and social responsibility. In *Buyer behaviour, a multi-cultural approach* (eds by) P.J. Du Plessis & G.G. Rouseau. 3rd ed. Oxford University press, Southern Africa. Cape Town. pp. 373-394.

Edwards, B. & Hyett, P.R. 2001. *Guide to sustainability*. RIBA: London.

Energy and Resource Institute. 2004. *Sustainable Building Design Manual: Sustainable building design practices.* Vol 2. Energy and Resource Institute. P.34

Ferreira, D. 2014. An exploratory investigation into Tshwane postmodern consumers' consciousness and practices that relate to sustainable food procurement. Unpublished master's dissertation. Pretoria: University of Pretoria.

Field, A.P. 2009. Exploring factor analysis. In: Field, A.P. (ed.) *Discovering Statistics using SPSS*. pp.1-36.

Fisk, W.J. 2000a. Health and productivity gains from better indoor environments and their relationship with building energy efficiency. *Annual Review of Energy and the Environment,* 25(1):537-566.

Fisk, W. J. 2000b. Review *of health and productivity gains from better IEQ.* Paper presented at the Proceedings of Health Buildings, Helsinki, 6-10 August: 23-34.

Fouché, C.B. 2009. Qualitative research design. In: De Vos, A.S., Strydom, H., Fouchè, C.B. & Delport, C.S.L. (eds.) *Research at Grass roots: For the social science and human service professions.* 3rd ed. Van Schaik Publishers: Pretoria.

Fouché, C.B. & De Vos, A.S. 2009. Problem formulation. In: De Vos, A.S., Strydom, H., Fouchè, C.B. & Delport, C.S.L. (eds.) *Research at Grass roots: For the social science and human service professions.* 3rd ed. Van Schaik Publishers: Pretoria.

Frost Sullivan, PRNE. 2010. *Department of Public Works gets behind South Africa's green building movement*. 3 May 2010 [Online] Available from: http://www.frost.com/srch/catalogsearch.do?queryText=Department+of+Public+Works+gets+Behind+SA's+Green+building+movement [Accessed: 2010-06-27].

Gibberd, J. 2001. *The sustainable building assessment tool: assessing how buildings can support sustainability*. Paper presented at the Developing Countries, Continental shift. IFI International Conference, Johannesburg, 11-14 September 2001.

Giddens, A. 1984. *The constitution of society: outline of the Theory of Structuration*. Cambridge, London: Polity Press.

Gleditsch, N.P. 2012. Whither the weather? Climate change and conflict. *Journal of Peace Research,* 49(1):3-9.

Gravetter, F.J. & Forzano, L.B. 2003. *Research methods for the behavioral sciences.* Belmont: Wadsworth/Thomson Learning.

Greaves, M., Zibarras, L.D. & Stride, C. 2013. Using the theory of planned behavior to explore environmental behavioral interntions in the workplace. *Journal of Environmental Psycology,* 34:109-120.

Green Building Council of Australia [GBCA]. 2006. *The dollars and sense of green buildings: building the business case for green commercial buildings in Australia*. Green Building Council Industry Publications: Sydney.

Green Building Council of Australia [GBCA]. Not dated. *Introducing Green Star*. [Online] Available from: http://www.gbca.org.au/uploads/91/2139/Introducing_Green_Star.pdf [Accessed: 2014-04-05].

Green Building Council of South Africa [GBCSA]. Not dated. About us. [Online] Available from: https://www.gbcsa.org.za/about/what-is-green-building/ [Accessed: 2014-06-20].

Green Building Council of South Africa [GBCSA]. 2010. *The inside guide to Green Star SA.* [Online] Available from: https://www.gbcsa.org.za/wp-content/uploads/2013/05/FACT-SHEET-Green-Star-SA-Oct-2008.pdf [Accessed: 2010-02-20].

Green Building Council of South Africa. 2014. *50 building certification publication.* [Online] Available from: https://www.gbcsa.org.za/wp-content/uploads/2014/05/GBCSA-50-Certification-Publication-Single-page.pdf [Accessed: 2014-06-15].

Greene, C. & Myerson, J. 2011. Space for thought: designing for knowledge workers. *Facilities*, 29(1/2):19-30.

Gustavsson, L., & Sathre, R. 2006. Variability in energy and carbon dioxide balances of wood and concrete building materials. *Building and Environment*, 41(7), 940-951.

Haanpää, L. 2007. Consumers' green commitment: indication of a postmodern lifestyle. *International Journal of Consumer Studies*, 31(5):478-486.

Hargreaves, T., Nye, M. & Burgess, J. 2013. Keeping energy visible? Exploring how householders interact with feedback from smart energy monitors in the longer term, 52:126-134.

Hart, 1997. Beyond greening: strategies for a sustainable world. *Harvard Business Review*, 75(1):66-79.

Heerwagen, J. 2002. Sustainable design can be an asset to the bottom line: expanded internet edition. *Environmental Design & Construction*. [Online] Available from: http://www.edcmag.com/CDA/ArticleInformation/features/BNP_Features_Item/0.4120.80724.00html [Accessed: 2014-04-12].

Heikkinen, M.V.J. & Nurminen, J.K. 2012. Measuring and modeling mobile phone charger energy consumption and environment impact. *Wireless Communications and Networking Conference (WCNC),* IEEE 2012:3194-3198.

Hertzberg, F., Mausner, B. & Bloch Snyderman, B. 2003. The motivation to work. 6th ed. New Brunswick, NJ: Transaction Publishers.

Institute of Directors in Southern Africa. 2002. *Executive summary of the king report II: King Committee on corporate governance*. [Online] Available from: http://www.ecgi.org/codes/documents/executive_summary.pdf [Accessed: 2011-08-06].

International Energy Agency [IEA]. 2012. *CO² emissions from fuel combustion: highlights*. [Online] Available from: https://www.iea.org/co2highlights/co2highlights.pdf [Accessed: 2014-04-08].

International Panel on Climate Change [IPCC]. 2007. *Climate Change 2007: Synthesis report*. Geneva: IPCC.

Jackson, T. 2005. Motivating sustainable consumption: a review of evidence on consumer behaviour and behavioural change. *A report to the Sustainable Development Research Network, Surrey: Centre for Environmental Strategies*.

Jorgenson, A.K. 2003. Consumption and environmental degradation: a cross-national analysis of the ecological footprint. *Social Problems,* 50(3):374-394.

Kats, G.H. 2003. *Green Building Costs and Financial Benefits*. Boston, MA: Massachusetts Technology Collaborative.

Kats, G.H., Alevantis, L., Berman, A., Mills, E. & Perlman, J. 2003. *The cost and financial benefits of green buildings: a report to California's sustainable building task force.* Capital E Analytics. Washington DC.

Kim. J.H., Kim, S.S., Yang, I.H. & Kim, K.W. 2008. A design support system for effective planning of the integrated workplace performance. *Building and Environment,* 43:1286-1300.

Kitzes, S., Peller, A., Goldfinger, S. & Wackernagel, M. 2007. Current methods for calculating national ecological footprint accounts. *Science for Environment & Sustainable Society,* 4(1):1-9.

Kollmuss, A. & Agyeman, J. 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research,* 8(3): 239-260.

Kopec, D. 2006. *Environmental psychology for design.* Fairchild Publications, Inc: China

Kumar, S. & Fisk, W.J. 2002. *Promoting workplace productivity and health: final report*. Lawrence Berkeley National Laboratory, Berkeley. CA.

Laroche, M., Bergeron, J. & Barbaro-Forleo, G. 2001. Targeting comsumers who are willing to pay more for environmental friendly products. *Journal of Consumer Marketing,* 18(6):503-520.

Larsen, L., Adams, J., Deal, B., Kweon, B. & Tyler, E. 1998. Plants in the workplace: the effects of plant density on productivity, attitude and perceptions. *Environment and Behaviour*, 30(3):261-281.

Leaman, A., Thomas, L. & Vandenberg, L. 2007. "'Green" buildings: what Australian building users are saying". Ecolibrium. *The Journal of Airah*, 11:22-30.

Leape, J. 2010. Forward. In World Wide Fund of Nature [WWF]. 2010. *The Living Planet Report: biodiversity, biocapacity and development.* [Online] Available from: http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/living_planet_report_timeline/2010_lpr2/ [Accessed: 2011-09-08].

Lee, Y.S. & Guerin, D.A. 2009. Indoor environmental quality related to occupant satisfaction and performance in LEED- certified buildings. *Journal of Indoor and Built environment,* 18(4):293-300.

Lee, Y.S. & Kim, S.K. 2008. Indoor environmental quality in LEED-certified buildings in the U.S. *Journal of Asian Architecture and Building Engineering,* 7(2):293-300.

Leedy, P.D. & Ormrod, J.E. 2005. *Practical research: planning and design.* 8th ed. New Jersey: Pearson Merril Prentice Hall.

Leng, H. 1997. Methodology: the meaning of life is to see. In: Ward, R.C. (ed.) *The chaos of convergence: a study of the process of decay, change, and transformation within the telephone policy subsystem of the United States.* Diss. Virginia Polytechnic Institute and State University.

Lerario, A. & Maiellaro, N. 1990. Tool for sustainable building. *In sharing knowledge on sustainable building conference, Bari.* [Online] Available from: http://www.iris.ba.cnr.it/sksb/PAPERS/35-570.pdf [Accessed: 2011-08-07].

Levenson, H. 1981. Differentiating amoung internally, power other and chance. In: H.M.Lefcourn (ed.), *Research with the locus of control constant. Vol1.* New York: Academic Press, pp.15-63.

Lippuner, R. & Werlen, B. 2009. Structuration Theory*. International Encylopedia of Human Geography*, 39-40p.

Lockwood, C. 2006. Building the green way. *Harvard Business Review.* June*.* [Online] Available from: www.hbr.org [Accessed: 2014-01-25].

Lyytinen, K.J. & Ngwenyama, O.K. 1992. What does computers support for cooperative mean?: a structuraltional analysis of computer support cooperative work. *Accounting, Management and Information Technology,* 2(1):19-37.

Mackenzie, D. 1997. *Green design: design for the environment.* London: Laurence King.

Mayer, N. & Robinson, B. 2013. *Nedbank green living guide: sustainable living is a commitment to an abundant future*. Ed1. Sustainability Institute. [Online] Available from: http://www.gbcsa.org.za/wp-content/uploads/2013/10/Nedbank_Green_Living_ Guide.pdf [Accessed: 2014-06-15].

Mazzocchi, M. 2008. *Statistics for marketing and consumer research*. Los Angeles: Sage Publications.

McCracken, G. 1988. *Culture and Consumption: new approaches to the symbolic Character of consumer goods and activities.* Indiana University Press: Bloomington and Indianapolis, IN.

McKinsey Global Institute. 2007. *Curbing global energy demand growth: the energy productivity opportunity.* [Online] Available from: file:///C:/Documents%20and%20Settings/Marie-louis/ My%20Documents/Downloads/MGI_Curbing_Global_Energy_Demand_full_report.pdf [Accessed: 13-04-2014].

Mendler, S., Odell, W. & Lazarus, M. 2005. *The HOK guidebook to sustainable design.* 2nd ed. Indianapolis. IN. Winley.

Miles, S. 2000. *Youth lifestyles in a changing world.* Open University: Buckingham.

Milford, R. 2009. *Greenhouse gas emission baselines and reduction potentials from buildings in South Africa: a discussion document*. [Online] Available from: http://www.unep.org/sbci/pdfs/SBCI-SAreport.pdf [Accessed: 2014-01-25].

Millock, K. & Nauges, C. 2010. Household adoption of water-efficient equipment: the role of socio-economic factors environmental attitudes and policy. *Environmental and Resource Economics,* 46(4):539-565.

Milne, N. 2012. The rands and sense of green buildings: building the business case for green commercial buildings in South Africa. *Green Building Council of South Africa [GBCSA].*

Mol, A.P.J. & Sonnenfeld, D.A. 2000. Ecological Modernization around the world: an introduction. *Environmental Politics,* 9(1):3-16.

Mol, A.P.J. & Spaargaren, G. 2002. *Ecological Modernization and the environmental state*. In: Buttel, F.H. & Mol, A.P.J. (eds.). The Environmental State Under Pressure. Oxford: Elsevier.

Monette, D.R., Sullivan, T.J. & Dejong, C.R. 1998. *Applied social research: tool for the human services.* 4th ed. Fort Worth: Harcourt Brace.

Motau, D. 2010. *R150m green building project under way*. Engineering News. [Online] Available from: www.engineeringnews.co.za/article/R150m-green-building-project-under-way- 2010-08-13 [Accessed: 2010-08-13].

Mouton, J. & Marias, H.C. 1990. *Basic concepts in the methodology of the social sciences.* Pretoria: Human Sciences Research Council.

Mulholland, C. & Matshe, L. 2009. *Going Green Pays Off.* Eversheds [Online] Available from: www.hg.org/article.asp?id=7336 [Accessed: 2010-06-27].

Munton, R. 1997. Engaging sustainable development: some observations on progress in the UK. In the progress in human geography: Lecture given at the RGS (IBG) Annual Conference held in Glasgow, UK, January 1996. Glasgow. P. 147-163.

Naidoo, B. 2009. *Energy crisis could aid SA sustainable development push*. Engineering News. [Online] Available from: www.engineeringnews.co.za/article/energy-crisis-couldaid-sa-sustainble-development-push [Accessed: 2010-08-24].

Neuman, W.L. 2011. *Social Research Methods: Qualitative and Quantitative approaches.* 7th ed. Pearson Education, inc. Publiching as Ally &Bacon: Boston.

Neuman, W.L. & Kreuger, L.W. 2003. *Social work research methods: qualitative and quantitative approaches.* Boston: Allyn & Bacon.

Nonaka, I. 1990. *A theory of organizational knowledge creation*. Nihon Keizai Shimbun-sha: Tokyo.

Nonaka, I. 1991. *The knowledge-creating company*. Harvard Business review.

Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Organizational Science*, 5(1):14-37.

Nonaka, I. & Takeuchi, H. 1995. *The knowledge-creating company*. Oxford University press: New York.

Nonaka, I. & Toyama, R. 2003. The knowledge-creating theory revisited: knowledge creation as a synthesizing process*. Knowledge management research and practice*, 1:2-10.

Ones, D.S. & Dilchert, S. 2012a. Employee green behaviours. In Jackson, S.E., Ones, D.S. & Dilchert, S. (eds.) *Managing human resource for environmental sustainability.* San Francisco, CA: Jossey-Bass.

Ones, D.S. & Dilchert, S. 2012b. Environmental sustainability at work: a call to action. *Industrial and Organizational Psychology,* 5:444-466.

Oskamp, S. 1995. Applying social psychology to avoid ecological disaster. *Journal of Social Issues,* 51:217-239.

Oskamp, S. 2000. Psychological contributions to achieving an ecological sustainable future for humanity. *Journal of Social Issues,* 56:373-390.

Owens, S. & Cowell, R. 2002. *Land and limits: interpreting in sustainability in the planning process.* Routledge: London.

Paillé, P. & Boiral, O. 2013. Pro-environmental behaviour at work: construct validity and determinants. *Journal of Environmental Psychology,* 36:118-128.

Palmer, M. & Mariscal, A. 2002. *Green buildings and worker productivity: review of the literature*. San Francisco Environment: San Francisco. CA.

Paper Recycles. 2011. *Recycling: it starts with you*. [Online] Available from: http://www.paperrecycles.org/members/material_documents/workplacerecycling 2008.pdf [Accessed: 2012-02-21].

Parker, J. 2000. *Structuration*. Open University Press: Buckingham.

Petronzio, M. 2014. *Average U.S. office worker uses 10 000 sheets of paper per year.* [Online] Available from: http://mashable.com/2014/04/22/earth-day-paper-infographic/ [Accessed: 2014-09-03].

Portman, A., Clevenger, C. & France, C. 2006. Using LEED-NC in Colorado: tips, resources and examples. *Colorado Governor's Office of energy and Management and Conservations.*

Pogue, D.L. 2010. *Do green buildings make dollars and sense? an analysis of operating costs, worker productivity and the benefits of LEED certification in a commercial office portfolio.* [Online] Available from: http://marketing.cbre.com/Sustainability/GreenBuildingStudy/ DoGreenBuildingsMakeDollarsAndSense.pdf [Accessed at: 2014-02-20].

Property Council of Australia [PCA]. 2001. *Sustainable development: a roadmap for the commercial property industry.* Property Council of Australia: Sydney.

Prensky, M. 2001. *Digital Natives, Digital Immigrants Part 1.* On the Horizon, 9(5):1-6. [Online] Available from: http://www.emeralsdinsight.com/journals.htm?articleid=1532742&show= abstract [Accessed: 2014-05-24].

Rask, A. & Kato, H. 2008. *Enhancing performance of green buildings: report 2008. Occupiers of Green Star rated buildings experience on how to make the best use of it.* Bond University's Mirvac School of Sustainable Development in collaboration with the Green building Council Australia, Gold Coast. [Online] Available from: www.bond.edu.au/prod_ext/groups/public/ @pub-burch-gen/documents/genericwebcontent/bd3_015058.pdf [Accessed: 15-06-2011].

Rajecki, D.W. 1982. *Attitudes: themes and advances.* Sunderland, MA: Sinauer.

Rajgor, G. 2004. *Working in harmony: Gail Rajgor reports on the latest prime examples of high quality, green office design.* Refocus. September/October 2004.

Recycling Day SA. 2011. [Online] Available from: www.RECYCLINGDAY-SA.co.za [Accessed: 2012-02-21].

Roodman, D.M. & Lenssen, N. 1995. Worldwatch paper #124: *a building revolution: how ecology and health concerns are transforming construction*. [Online] Available from: http://www.worldwatch.org/node/866 [Accessed: 2014-02-18].

Rose, J. & Scheepers, R. 2001. Structuration Theory and information system development: frameworks for practice. *Global Co-Operation in the New Millennium.* The 9th European Conference in Information Systems. Bled. Slovenia. June 27-29. 2001. 217-231p.

Rossouw, D. (ED.). 2003. *Intellectual tools: Skills for the human sciences.* 2nd ed. Pretoria: Van Schaik.

Runeson-Broberg, R. & Norbäck, D. 2013. Sick building syndrome (SBS) and sick house syndrome (SHS) in relation to psychosocial stress at work in Swedish workforce. *International archives of occupational and environmental health,* 86(8):915-922.

Rwelamila, P.D., Talukhaba, A.A. & Ngowi, A.B. 2000. Project procurement systems in the attainment of sustainable construction. *Sustainable Development,* 8(1):39-50.

Sack-Min, J. 2007. Districts reap cost savings by building 'green schools'. *Education Digest*, 73(2):19-21.

Sanne, C. 2002. Willing consumers – or locked – in?: policies for a sustainable consumption. *Ecological Economics*, 42(2-3):127-140 & 273-287.

Sev, A. 2009. How can the construction industry contribute to sustainable development?: a conceptual framework. *Sustainable Development,* 17(3):161-173.

Schiffman, L.G., Kanuk, L.L. & Wisenblits, J. 2010*. Consumer Behaviour: Global edition*. 10th ed. Pearson, Prentice Hall, New Jersey.

Scholes, R. 2001. Global Terrestrial Observing System: Regional Implementation Plan for Southern Africa, GTOS-21.

Sierra Club. 2007. *10 Ways to Go Green at Work*. The Green Life: Ideas for living well and doing good from Sierra Magazine. 8 March 2007.

Singh, A., Syal, M., Grady, S. & Korkmaz, S. 2010. Effect of green buildings on employee health and productivity. *American Journal of Public Health,* 100(9):1665-1668.

Singleton, R., Straits, B.C., Straits, M.M. & McAllister, R.J. 1988. *Approaches to social research.* New York: Oxford University press.

Sorrell, S. 2003. Making the link: climate policy and the reform of the UK construction industry. *Energy Policy,* 9(31):865-878.

South Africa Audience Research Foundation (SAARF). 2011. *Do-it-yourself LSM classification.* [Online] Available from: http://www.saarf.co.za/LSM/lsm-diy.asp [Accessed: 2013-03-06].

South Africa Property Review. 2009. *Green in the Mainstream*. 15p, November.

Southerton, D., Warde, A. & Hand, M. 2004. The limited autonomy of the consumer: implications for sustainable consumption. *Sustainable Consumption: the implications of changing infrastructures of provision*, 32-48.

Spaargaren, G. 1998. *The Ecological Modernization of domestic consumption.* Wageningen University. The Netherlands.

Spaargaren, G. & Van Vliet, B. 2000. Lifestyles, consumption and the environment: the ecological modernization of domestic consumption. In: Mol, A.P.J. & Sonnefeld, D.A. (eds.) *Ecological Modernization around the world: perspectives and critical debates*. Frank Cass Publishers: London.

Starik, M. & Marcus, A.A. 2000. Introduction to the special research forum on the management of organizations in the natural environment: a field emerging from multiple paths, with many challenges ahead. *Academy of Management Journal*, 43:539-546.

Statistics South Africa. 2011a. *Census 2011:* census in brief. [Online]. Available from: https://www.statssa.gov.za/Census2011/Products/Census_2011_Census_in_brief.pdf [Accessed: 2014-04-27].

Statistics South Africa. 2011b. Census 2011, Profile of elder persons in South Africa. [Online] Available from: http://beta2.statssa.gov.za/publications/Report-03-01-60/Report-03-01-602011.pdf [Accessed: 2015-01-16].

Statistics South Africa. 2011c. City of Tshwane. [Online] Available from: http://beta2.statssa.gov.za/?page_id=1021&id=city-of-tshwane-municipality [Accessed: 2015-01-16].

Statistics South Africa. 2014. Quarterly labour force survey. Quarter 3, 2014. [Online] Available form: http://beta2.statssa.gov.za/publications/P0211/P02113rdQuarter2014.pdf [Accessed: 2015-01-16].

StatSoft, Inc. 2013. How to Reduce Number of Variables and Detect Relationships, Principal Components and Factor Analysis. *Electronic Statistics Textbook*. Tulsa, OK: StatSoft. [Online] Available from: http://www.statsoft.com/textbook/ [Accessed: 14/03/2015].

Stirk, N. 1998. Wittgenstein and social practices. *Environmental and planning D: Society and Space,* 17:35-50.

Stone, G., Barnes, J.H. & Montgomery, C. 1995. Ecoscale: a scale for the measurement of environmentally responsible consumers. *Psychology and Marketing,* 12(7):595-612.

Strauser, D. Ketz, K. & Keim, J. 2002. The relationship between self-efficancy. Locus of control and work personality. *Journal of Rehabilitation*, 68(1):20-26.

Strydom, H. 2009. The pilot study. In *Research at Grass roots: For the social science and human service professions.* De Vos, A.S., Strydom, H., Fouchè, C.B. & Delport, C.S.L. (eds.). 3rd ed. Van Schaik Publishers, Pretoria. pp. 205-215

Sundstorm, E., Town, J., Rice, R., Osborn, D. & Brill, M. 1994. Office noise, satisfaction and performance. *Environment and Behaviour,* 26(2):195-222.

Surendran, S. & Wheatley, A.D. 1998. Grey-water reclamation for non-potable re-use. *Water and Environment Journal*, 12(6):406-413.

Sustainable Solutions (Pty) Ltd. 2001. *Green office guide: a guide to help you buy and use environmentally friendly office equipment*. [Online] Available from: http://www.environment.gov.au/settlements/publications/government/purchasing/green-office-guide/index.html [Accessed: 2010-06-26].

Sustainable Sources. n.d. Lighting. Online [Available from: lighting.sustainablesources.com] [Accessed: 2015-01-19]

Tempelhoff, E. 2014. *20 000 trek elke maand na Goudstad: Aanwas en uitleg lei tot baie CO_2.* Beeld. 7 February:8.

Troy, M. 2008. Just how green are consumers? *Retailing today,* 47(3):19.

Thatcher, A. & Milner, K. 2012. *The impact of a 'green' building on employees' physical and psychological wellbeing.* IOS Press

The Media. 2012. SAARF reveals the truth behind Soweto's LSM 10s. The Media. May 2012.

Tshoukas, H. 2002. Introduction: Knowledge-based perspectives on organizations: Situated knowledge, novelty, and communities of practice. *Management Learning*, 33(4):419-426.

Turpie, J.K., Marais, C. & Blignaut, J.N. 2008. The working for water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa. *Ecological Economics*, 65(4):788-798.

Ungar, S. 2000. Knowlegde, ignorance and the popular culture: climate change versus the ozone hole. *Public Understanding Science,* 9:297-312.

United Nations Conference on Sustainable Development [UNCSD]. 2012. *Report of the United Nations conference on Sustainable development.* [Online] Available from: http://www.uncsd2012.org/content/documents/814UNCSD%20REPORT%20final%20revs.pdf [Accessed: 2014-04-11].

United Nations Environment Programme [UNEP]. 2009. Greenhouse gas emissions baselines and reduction potentials from buildings in South Africa: a discussion document. [Online] Available from: http://www.unep.org/sbci/pdfs/SBCI-SAreport.pdf [Accessed: 2014-04-09].

United Nations Environment Programme [UNEP]. 2013. *Green Economy Scoping Study: South Africa green economy modeling report.* [Online] Available from: http://www.unep.org/greeneconomy/portals/88/Modelling%20Report%20SA/SAModellingReport.pdf [Accessed: 2014-04-10].

United States Green Building Council [USGBC]. *Introductory presentation*. [Online] Available from: www.usgbc.org [Accessed: 2013-11-25].

United States Environmental Protection Agency [USEPA]. 2003a. *Indoor Air Quality*. [Online] Available from: http://www.epa.gov/iaq/ [Accessed: 21-01-2014].

United States Environmental Protection Agency [USEPA]. 2003b. *Green buildings*. [Online] Available from: http://www.epa.gov/greenbuilding/pubs/faqs.htm [Accessed: 2014-01-30].

United States Environmental Protection Agency [USEPA]. 2011. *Property Management Giant in "Greening" Offices*. [Online] Available from: http://www.epa.gov/wastes/inforesources/news/2008news/09-paper.htm [Accessed: 2011-08-22].

United States Environmental Protection Agency [USEPA]. 2013. *Wastes-WasteWise: Measure your progress.* [Online] Available from: http://www.epa.gov/smm/wastewise/measure-progress.htm [Accessed: 2014-09-03].

University of Notre Dome. n.d. *Green guide sustainable office practices*. [Online] Available from: file:///C:/Documents%20and%20Settings/Marie-louis/My%20Documents/M%20-%20studies/
Laaste%20artikels%20vir%20Skripsie%202014/officegreenguide.pdf. [Accessed: 2014-09-03].

Vail, B.J. 2008. Ecological Modernization at work?: environmental policy reform in Sweden at the turn of the century. *Scandinavian Studies*, 80(1):85-108.

Van Den Ende, L. 2004. *Corporate social responsibility in South Africa: fact or fiction.* MSc (Business Management) dissertations. Rand Afrikaans University.

Van Der Merwe, C. 2009. *Green building becoming a mainstream global norm: council.* Engineering News. 26 May 2009. [Online] Available from: www.engineeringnews.co.za/ article/green-building-becoming-a-mainstream-global-norm-council-2009-05-26 [Accessed: 2010-08-24].

Van Der Merwe, C. 2010a. *Energy efficiency regulations for new buildings published.* Engineering News. 14 June 2010. [Online] Available from: www.engineeringnews.co.za/ article/energy-efficiency-regulations-for-new-buildings-published-2010-06-14 [Accessed: 2010-08-24].

Van Der Merwe, C. 2010b. *Growing awareness support green building in SA.* Engineering News. 19 July 2010. [Online] Available from: www.engineeringnews.co.za/ article/growing-awareness-support-green-building-in-sa-2010-07-19 [Accessed: 2010-08-24].

Veal, A. J. 2000. Lifestyle and leisure: A review and annotated bibliography. *School of Leisure, Sport and Tourism,* University of Technology: Sydney.

Warde, A. 1990. Introduction to the sociology of consumption. *Sociology,* 24(1):1-4.

Warren, C.M.J. 2009. *Who needs a Green Star?* Paper presented at the Pacific Rim Real Estate Society Conference, Sydney, 19-21 January: 1-9.

Wilkinson, S., Reed, R.G. & Jailani, J. 2011. User satisfaction in sustainable office buildings: a preliminary study. *Proceedings of the 17th PRRES Pacific Rim Real Estate Society Conference*. Gold Coast: Australia.

Walliman, N. 2005. *Your research project.* 2nd ed. Sage publications: London.

Winkler, H., Borchers, M., Hughes, A., Visagie, E. & Heinrich, G. 2006. Polisies and scenarios for Cape Town's energy future: options for sustainable city energy development. *Journal of Energy in Southern Africa,* 17(1):28-41.

Woods, J. 1989. Cost avoidance and productivity in owning and operating buildings. *Occupational Medicine: State of the art Reviews,* 4(4):753-770.

World Green Building Council. 2013. *The business case for green building: a review of the cost and benefits for developers, investors and occupants*. [Online] Available from: http://www.worldgbc.org/files/1513/6608/0674/Business_Case_For_Green_Building_Report_WEB_2013-04-11.pdf [Accessed: 2013-12-15].

Worldwatch Institute. 2006. *The state of consumption today*. [Online] Available from: http://www.worldwatch.org/node/810 [Accessed: 2010-05-03].

World Wide Fund of Nature [WWF]. 2010. *The Living Planet Report: biodiversity, biocapacity and development.* [Online] Available from: http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/living_planet_report_timeline/2010_lpr2/ [Accessed: 2011-09-08].

World Wide Fund of Nature [WWF]. 2012a. *The Living Planet Report: biodiversity, biocapacity and development.* [Online] Available from: http://awsassets.panda.org/downloads/1_lpr_2012_online_full_size_single_pages_final_120516.pdf [Accessed: 2013-10-08].

World Wide Fund of Nature [WWF]. 2012b. *The Living Planet Index Report, 2012*. [Online] Available from: http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/living_planet_report_graphics/lpi_interactive/ [Accessed: 201-01-15].

Yin, R.K. 2012. *Application of Case Study Research.* 3rd ed. Sage Publications Inc., London.

Yong, A.G. & Pearce, S. 2013. A beginner's guide to factor analysis: focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for psychology,* 9(2):79-94.

ADDENDUM 1

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

DEPARTMENT OF CONSUMER SCIENCE

Dear Respondent,

I am currently enrolled for my Masters degree at the University of Pretoria under guidance of Professor Alet Erasmus and Mrs Nadine Sonnenberg. The focus of my study is environmental consciousness and green practices in office buildings. You would be of great assistance to me if you could complete the following questionnaire.

At no time will any attempt be made to identify you. Please fill in the questionnaire anonymously. Your answers will be bulked with those obtained from other people and appropriate statistical analysis will be performed on the bulked data.

The questionnaire consists of a number of sections. Please read the instructions at each section before you indicate your answers. It will take approximately 15 minutes to complete. Should you wish to discontinue your participation, please feel free to do so at any point.

Your input and time is greatly appreciated.

Kind regards,

Marie-Louis Bezuidenhoudt
(Cell number: 082 970 8261)

November 2013

Please answer the questions in the following sections by circling a number in a shaded box appropriate to your answer or by writing your answer into the shaded box provided		For Office Use
		V0

SECTION A: DEMOGRAPHICS

1. What is your **gender**?

Male	1	V1
Female	2	

	Years	
2. What was your **age** at your most recent birthday?		V2

3. What is your preferred **home language**? (Please specify)

	V3

4. What is your ***highest*** level of **education**?

Grade 12 or lower	1	V4
Grade 12 and a degree / diploma	2	
Postgraduate	3	

5. In terms of the Employment Equity Act of South Africa, to which **population group** do you belong?

Black	1	V5
Asian	2	
Coloured	3	
White	4	
Other (Please specify)		

6. Please indicate your **marital status**:

Single / Separated / Divorced / Widowed	1	V6
Married / Couple	2	

7. Do you have **children?**

Yes	1	V7
No	2	

8. How many **members**, including yourself, are in your **household**?

	V8

9. Please indicate your **area of residence**:

	V9

10. What is your approximate total monthly **household income** to the nearest R1000?

	V10

11. Please indicate your current **employment status:**

Employed full time	1	V11
Employed part time	2	
Not employed	3	

SECTION B: LIFESTYLE				
The following section aims to identify which lifestyle category you belong to.				**For office use**
12. Indicate yes or no in each instance. Please complete all the questions		**Yes**	**No**	
I have the following in my house:	TV set	**1**	**2**	V12.1
	Radio set (excl, car radio)	**1**	**2**	V12.2
	Swimming pool	**1**	**2**	V12.3
	DVD player / Blue Ray Player	**1**	**2**	V12.4
	Pay TV (M-Net /DStv /Top TV) subscription	**1**	**2**	V12.5
	Air conditioner (excluding fans)	**1**	**2**	V12.6
	Computer / Desktop / Laptop	**1**	**2**	V12.7
	Vacuum cleaner / Floor polisher	**1**	**2**	V12.8
	Dishwashing machine	**1**	**2**	V12.9
	Washing machine	**1**	**2**	V12.10
	Tumble dryer	**1**	**2**	V12.11
	Home telephone (excluding a cell)	**1**	**2**	V12.12
	Deep freezer – free standing	**1**	**2**	V12.13
	Refrigerator or combined fridge / freezer	**1**	**2**	V12.14
	Electric stove	**1**	**2**	V12.15
	Microwave oven	**1**	**2**	V12.16
	Built-in kitchen sink	**1**	**2**	V12.17
	Home security service	**1**	**2**	V12.18
	3 or more cell phones in household	**1**	**2**	V12.19
	2 or less cell phones in household	**1**	**2**	V12.20
	Home theatre system	**1**	**2**	V12.21
	Tap water	**1**	**2**	V12.22
	Hot running water from a geyser	**1**	**2**	V12.23
	Flush toilet	**1**	**2**	V12.24
	A motor vehicle	**1**	**2**	V12.25
	A domestic worker(s) or gardener(s)	**1**	**2**	V12.26
		Yes	**No**	
13. I live in a private residential free standing house (house/cluster house/ town house)		**1**	**2**	V13
		Yes	**No**	
14. I live in a rural area		**1**	**2**	V14
		Yes	**No**	
15. Do you live in a high dense (highly populated area?		**1**	**2**	V15

SECTION C: OFFICE ENVIRONMENT

For office use

16. Please provide the **name of the building** in which your office is situated:

	V16

17. Please circle only the one statement that best describes your **type of office space**:

I work in a large open-plan office space where a desk and chair is allocated to each employee	**1**	V17
I work in a cubical office space where each employee has a separate cubicle, desk and chair	**2**	
I work in a private office space that is enclosed with walls (glass, brick or drywall)	**3**	
I work in an office environment where employees occupy a desk space and seat on a first-come-first-serve basis (i.e. employees do not have a specific desk space or chairs allocated to them)	**4**	
Other (please specify):		

18. Please circle the appropriate answer (yes or no) to the following statements in the adjacent columns:

	Yes	No	
I have been allocated my own computer (PC, Laptop or Mac) at work	**1**	**2**	V18.1
I have been allocated my own printer at work	**1**	**2**	V18.2
I am able to control the lights in my office space	**1**	**2**	V18.3
I have a central air conditioning system in my office	**1**	**2**	V18.4
I am able to control the temperatures in my office space	**1**	**2**	V18.5
I have a window in close proximity of my desk	**1**	**2**	V18.6
I can open the window(s) in my office space	**1**	**2**	V18.7
I can adjust / open the window treatment(s) in my office	**1**	**2**	V18.8
I order my own stationary according to my needs	**1**	**2**	V18.9
I have a paper recycling bin in my office	**1**	**2**	V18.10

SECTION D: ENVIRONMENTAL KNOWLEDGE					
Please read each statement below and answer by circling the appropriate number in the adjacent columns	**True**	**False**	**I don't know**	**For office use**	
Pollution is currently one of the most critical problems in terms of the sustainability of South Africa's natural resources	**1**	**2**	**3**	V19.1	
Pollution does not affect me personally to the same extent that it affects fellow citizens in South Africa	**1**	**2**	**3**	V19.2	
The USA is the biggest producer of gasses that contribute to air pollution	**1**	**2**	**3**	V19.3	
An increase in the South African population will put further strain on our natural resources	**1**	**2**	**3**	V19.4	
The economic growth of South Africa is influenced by environmental problems	**1**	**2**	**3**	V19.5	
The earth's resources are infinite and should be used to the fullest to increase the standard of living of all South African citizens	**1**	**2**	**3**	V19.6	
The amount of energy used by my household has a significant impact on the environment	**1**	**2**	**3**	V19.7	
The average citizen can do much to reduce climate change	**1**	**2**	**3**	V19.8	
My current purchase decisions will have consequences for product availability of future generations	**1**	**2**	**3**	V19.9	
Environmental pollution taking place in China has an impact on South Africa	**1**	**2**	**3**	V19.10	
I think that global warming is caused by the sun radiating (giving out) more heat	**1**	**2**	**3**	V19.11	
Climate change is caused by the presence of greenhouse gasses in the air	**1**	**2**	**3**	V19.12	
Climate change is a direct consequence of the hole in the ozone layer	**1**	**2**	**3**	V19.13	
Methane, which is responsible for a great deal of environmental damage, is only emitted by cars which are powered by fossil fuels	**1**	**2**	**3**	V19.14	
Organic materials like compost heaps emit green-house gasses that are harmful to the environment	**1**	**2**	**3**	V19.15	
Saving electricity in our everyday living will contribute to saving our planet	**1**	**2**	**3**	V19.16	
All locally produced products are environmentally friendly	**1**	**2**	**3**	V19.17	

SECTION E: OFFICE PRACTISES							
Please indicate to what extent you engage in the following practises by circling the relevant number in the adjacent columns	**Not applicable**	**Never**	**Sometimes**	**Frequently**	**Always**	**For office use**	
1. Do you print documents only if it is necessary?	0	1	2	3	4	V20.1	
2. Do you activate energy saving features on your computer equipment?	0	1	2	3	4	V20.2	
3. Do you utilize printer settings that save on paper?	0	1	2	3	4	V20.3	
4. Do you fill the kettle with the just the amount of water that you require?	0	1	2	3	4	V20.4	
5. Do you switch off office equipment such as computers when it is not in use?	0	1	2	3	4	V20.5	
6. Do you return used printer cartridges for toner/ ink refilling?	0	1	2	3	4	V20.6	
7. Do you dispose of paper in a paper recycle bin?	0	1	2	3	4	V20.7	
8. Do you switch off lights when there is sufficient natural light in your office?	0	1	2	3	4	V20.8	
9. Do you reuse paper printed on only one side for other purposes (e.g. taking notes)?	0	1	2	3	4	V20.9	
10. Do you ensure that taps are turned off properly after using them?	0	1	2	3	4	V20.10	
11. Do you turn your computer equipment off when you leave the office for the day?	0	1	2	3	4	V20.11	
12. Do you utilize draft print settings to save printer cartridges?	0	1	2	3	4	V20.12	
13. Do you turn your computer screen off when leaving the office?	0	1	2	3	4	V20.13	
14. Do you leave taps closed while dispensing soap onto your hands?	0	1	2	3	4	V20.14	
15. Do you use low flush toilet options when available?	0	1	2	3	4	V20.15	
16. Do you make an effort to use water sparingly at work?	0	1	2	3	4	V20.16	
17. Do you open windows instead of using air conditioning where possible?	0	1	2	3	4	V20.17	
18. Do you unplug chargers when it has finished charging (e.g. cell phones / laptops)?	0	1	2	3	4	V20.18	
19. Do you switch off lights when you leave your office for extended periods of time?	0	1	2	3	4	V20.19	
20. Do you print on both sides of the paper whenever possible?	0	1	2	3	4	V20.20	
21. Do you report leaking taps to maintenance staff even if it is not your responsibility?	0	1	2	3	4	V20.21	
22. Do you save documents on your computer (e-filing) rather than printing them?	0	1	2	3	4	V20.22	
23. Do you open window coverings to allow natural light into your office?	0	1	2	3	4	V20.23	
24. Do you return excess stationary items for re-use by others?	0	1	2	3	4	V20.24	
25. Do you electronically archive important e-mail communication?	0	1	2	3	4	V20.25	

SECTION F: OFFICE WORKERS' OBLIGATIONS						
Circle the number in the adjacent column that best describes your answer to the following statements	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**	**For office use**	
Consider each of the following statements regarding environmental impact:						
1. I save energy by switching off office equipment when it is not in use	1	2	3	4	V21.1	
2. I save energy by switching off my lights when there is sufficient natural light in my office	1	2	3	4	V21.2	
3. I reduce waste when I save documents on my computer (e-filing) rather than printing them	1	2	3	4	V21.3	
4. I save energy when I open windows instead of using air conditioning where possible	1	2	3	4	V21.4	
5. I reduce waste when I return used printer cartridges for toner/ ink refilling	1	2	3	4	V21.5	
6. I reduce waste if I print on both sides of the paper whenever possible	1	2	3	4	V21.6	
7. I save energy when I turn off my computer equipment when I leave the office for the day	1	2	3	4	V21.7	
8. I save energy by turning my computer screen off when I leave the office	1	2	3	4	V21.8	
9. I save energy when I open window coverings to allow natural light into my office to reduce the artificial light.	1	2	3	4	V21.9	
10. I save energy when I fill the kettle with the just the amount of water that I require	1	2	3	4	V21.10	
11. I save water by leave taps closed while dispensing soap onto your hands	1	2	3	4	V21.11	
12. I save water when I ensure that taps are turned off properly after using them	1	2	3	4	V21.12	
13. I reduce waste when I re-use paper printed on only one side for other purposes (e.g. notes)	1	2	3	4	V21.13	
14. I reduce waste when I dispose of paper in a paper recycle bin	1	2	3	4	V21.14	
15. I save water when I report leaking taps to maintenance staff even if it is not my responsibility	1	2	3	4	V21.15	
16. I reduce waste when I utilize draft print settings to save printer cartridges	1	2	3	4	V21.16	
17. I reduce waste when I change printer settings that save on paper	1	2	3	4	V21.17	
18. I save energy by switching off my office lights when I leave my office for more than 15 minutes	1	2	3	4	V21.18	
19. I save water when I make an effort to use water sparingly at work	1	2	3	4	V21.19	
20. I save energy by activating energy saving features on my computer equipment	1	2	3	4	V21.20	
21. I reduce waste by archiving important e-mail communication electronically	1	2	3	4	V21.21	
22. I reduce water usage by using the low flush toilet options when available	1	2	3	4	V21.22	
23. I reduce waste by printing only necessary documents	1	2	3	4	V21.23	
24. I reduce waste when I return excess stationary items for re-use by others	1	2	3	4	V21.24	
25. I save energy by unplugging chargers when it has finished charging (e.g. cell phones / laptops)	1	2	3	4	V21.25	

Thank you for your time and co-operation