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Renewable sources of energy for domestic use: Attitudes and perceived implications for quality of life

by

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But I said, 'I have laboured to no purpose; I have spent my strength in vain and for nothing. Yet what is due me is in the Lord's hand, and my reward is with MY GOD!' Isaiah 49:4

Here, dankie vir die genade wat u my en my man geskenk het deur hierdie jaar. Dankie vir die ouers wat ons geweldig ondersteun het en die boeties, sussies en vriende wat geduldig was toe ons te besig was om hulle te sien. Dankie dat hierdie jaar verby is, en vir U seën waaraan ons geen oomblik kon twyfel nie.

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Abstract

In this study, attitudes and perceived implications for quality of life of environmentalists were explored, with a specific focus on the domestic use of renewable energy sources. A systems theoretical approach was followed in conjunction with a qualitative methodology in order to place the attitudes and perceived implications for quality of life in context with the systems in which they exist. The in-depth data that was collected by means of face-to-face interviews was analysed in a qualitative and systems theoretical framework. The three stages of analysis of the data are described and this culminates in a discussion of the six identified pattern categories. The conceptual discussion that follows are based on these six pattern categories. The participants' learned attitude toward the environment, the role of responsibility and its influence on perceived quality of life, risk perception as inhibitor of action, renewable energy and the perception of self, renewable energy as available medium and the possibility of change of attitude toward renewable energy sources are discussed in depth. The interaction between the energy-consumer system and the energy-environment system is explored and placed within the larger context. The recognition of a difference in a system, the interactive parts thereof, the transactional process between the systems and the collateral energy added by either or both of the systems, transactional processes and the required feedback loops, the difference that makes a difference and the description of transformation processes expose a hierarchy of logical types inherent in the system.

Keywords

Systems theory
Environmental Psychology
Renewable energy
Environmentally Responsible Behaviour
Perceived imlications for quality of life
Qualitative methodology
South African Environmental attitudes

Opsomming

In hierdie studie is omgewingsdeskundiges se houdings en waargenome implikasies vir die huishoudelike gebruik van herwinbare energië ondersoek. ‘n Sisteem teoretiese aanslag is gevolg, in samewerking met ’n kwalitatiewe ondersoek om houdings en implikasies in konteks te stel met die sisteme waarin dit bestaan. Die in-diepte inligting wat deur middel van een-tot-een onderhoude ingesamel is, is kwalitatief en in ’n sistemiese raamwerk geanaliseer. Die drie fases van analise word beskryf en kulmineer in ses patroonkategorieë. Hierdie patroonkategorieë dien as samevatting van die geïdentifiseerde kategorieë en dien dan ook as basis vir die konseptuele bespreking wat daarop volg. Die aangeleerde houdings teenoor die omgewing, die rol wat verantwoordelikheid en aanspreeklikheid speel, sowel as die invloed daarvan op lewenskwaliteit word ondersoek. Aspekte soos die waarneembaarheid van risiko en ook van die self, die toeganklikheid tot herwinbare energië vir die persoon op die straat en die moontlike verandering van houdings word ook ondersoek. Die interaksie tussen die energie verbruiker sisteem en die energie omgewing sisteem word ook ondersoek en in die breër konteks geplaas. Die herkenning van veranderinge in ‘n sisteem, die tussenspel tussen dele van die sisteem, die interaktiewe transaksies was plaasvind en die energie wat die verg sowel as die terugvoer lusse wat vorm kulmineer in ’n herkenbare verskil wat hierargies aangetref word inherent tot die sisteem.

Sleutelwoorde

Sisteemteorie
Omgewingsielkunde
Herwinbareenergie
Omgewingsverantwoordelike gedrag
Waargenome implikasies vir lewenskwaliteit
Kwaliatiewe Metodologie
Siud-Afrikaanse omgewingshoudings

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CHAPTER 1

Introduction

1.1 Introduction

In this chapter, justifications for this study are provided. An investigation into the need for renewable sources of energy for domestic use in South Africa is motivated in part by a lack of previous research, the recent speculation about energy wars and resource-sharing, and very high levels of energy consumption. Further considerations are the availability of renewable technology, the lack of legislation to enforce the use thereof and global negative environmental effects.

1.2 Justification for This Study

> In South Africa, our most abundant source of energy is coal. Most of our coal is low quality with a low heat value and [a] high ash content. Eskom relies on coal-fired power stations to produce approximately 90% of its electricity. Eskom uses over 90 million tons of coal per annum. Coal mining in South Africa is relatively cheap compared to the rest of the world. In Europe, by contrast, [electricity] costs are almost four times higher (http://www.eskom.co.za).

According to Herman Scheer, chairperson of the World Council for Renewable Energy, the current world dependence on the provision of energy through the burning of fossil fuels cannot be sustained for much longer than 40 years (Olivier, 2004). It has become necessary to find alternative means of energy generation. Considerable resources are spent in developing and marketing sustainable and efficient solutions for energy provision; however, the best method in which to sustain development at this stage is to use less energy (Bothma, 2004). Napier (2000, p. 13) notes that "[t]he most elementary and effective method in beginning to make an environmental contribution… is by saving energy". The obstacles faced in South Africa to saving energy and converting to renewable energy use appear to be "[t]he cheapness of electricity to the consumer and the virtual non-existence of appropriate legislation…" (Bothma, 2004, p. ii).

Scheer contends that for as long as members of parliament, journalists, scientists and the general public believe that renewable energy cannot replace conventional energy, fossil fuels will not be replaceable. He also notes that the reason renewable energy is not implemented as soon as possible is because most people believe it is impossible (Olivier, 2004).

This research is necessary from several points of view. Research conducted specifically in Europe and the United States, together with a lack of South African research, is cited as a motivation for the study. Political influences on resource sharing, the energy consumption crisis and the available sustainable technology are discussed as further justifications. Similarly, the implementation of legislation and the contexts of energy in the world and its impacts on the individual are briefly examined. These will be discussed in the following sections.

1.2.1 Lack of Previous Research in South Africa

There is not a wealth of literature available on South African attitudes toward the environment. Environmental issues are coming to the fore and the small theoretical base inhibits research in this area. The purpose of this research is to build a description of South Africans' attitudes toward the environment and renewable energy that can inform research and highlight other aspects that need to be investigated.

The importance of the environment and the concept that there are limits to the growth that the earth can handle is becoming an important issue. However, progress in South Africa on governing individual environmentally responsible behaviour is slow. There are no laws forcing South African citizens to recycle or even to separate their household waste (Bothma, 2004). The attitudes towards renewable sources of energy and energy efficiency in South Africa may serve as an important source of information, enabling researchers and government alike to determine what the average informed citizen thinks the issues are and how to incorporate these concerns into plans of action or policy. It is important to take note of various other studies done using the theory of planned behaviour. The theory of reasoned action, amongst many others, has been applied to describe, determine and predict individuals' behaviour (Knussen, Yule, MacKenzie & Wells, 2004). These authors indicate an intricate relationship between attitude and behaviour. The topic of this study, although closely related to behaviour, focuses on the attitudes of individuals. Behaviour and attitude are reciprocal with reference to the intentions and actions of the individual and can in practice not be separated. However, for the purposes of this study, attitude and behaviour will be considered as different aspects of the same individual, and only attitudes will form the focus of this study.

Many people and companies in South Africa may still claim that the protection of the environment is not their responsibility. If appropriate laws are put in place that make recycling, reducing, re-using and energy efficiency mandatory and impose fines when the laws are not adhered to, it will become everybody's responsibility. Carley and Christie (1992) state that the "main problems facing policy makers [are]: the externalisation … of problems by producers and consumers, the displacement of environmental problems…" (p.255). It thus becomes

important for government, companies and environmental activists of all calibres to know what informed individuals think, what they are willing to give up, what they cherish and why. To understand the importance that individuals ascribe to the environment, a brief overview of the history of resource sharing in South Africa will be discussed in the next section.

1.2.2 Resource Sharing

South Africa has a history of war and conflict pertaining specifically to the distribution of resources. The British Empire declared war on the Boer republics in 1899, mainly because keeping the sterling underpinned by gold would preserve Britain as the centre of the world's money market (Oakes, 1995). Apartheid, which commenced in the 1950s and ended when South Africa became a democratic state in 1994, was also distinctly characterised by segregation and the specific allocation of resources and the rights to these resources (Oakes, 1995). War in the world is characterised by the inability to share resources.

Natural resources have been an important motivator for conflict throughout the ages, and will probably always be. Shiva (1998, p. 118), brings our attention to a "continuum between, and indivisibility, of justice, peace and sustainability – without sustainability and a just sharing out of the earth's bounties there is no justice, and without justice there can be no peace". Many will also attribute tensions in current world affairs to a need for fossil fuels. Conflict over these needs has been named the energy wars. Haugestad (2003), from whose work this research idea stemmed, focuses mainly on equal distribution to all. She explores the Norwegian "dugnad tradition", a tradition in which "everybody is supposed to contribute with his or her time and work to the common good" (Haugestad, 2003, p. 2), and examines the attitudes of the Norwegian people toward consumption, distribution and resource sharing. She investigates aspects such as quotas for usage and taxation on over consumption. Equal rights to all resources is bound to have far-reaching effects; the rich will have to cut down on their usage or pay tax on over-consumption, and the poor will receive aid from the money paid on over-consumption mostly coming from first world countries.

However, the Norwegians are several steps ahead of South Africans. Looking at South Africa as being a globally or even nationally responsible consumer, may be a bit presumptuous. Water use, land reform, fossil fuels, minerals, access to transport, communication and human resources are all contentious issues in South Africa at present. South Africa is a country rich in resources, and from these it is important to focus on a specific one in order to limit this study appropriately. Ample international literature is available on renewable sources of energy, discussed in Chapter 3, and many companies and governments alike have come up with ingenious ideas for the reduction of energy usage, but little information on the perception on the use of these renewable forms of energy is available. The lack of literature on South Africans' attitudes on recycling, reusing and reducing the number of resources used, suggests the need for an exploration of problems experienced by environmentally inclined individuals in

exhibiting environmentally friendly behaviour. The decision to explore the perceptions and attitudes surrounding the domestic use of renewable sources of energy followed from this.

The widespread tendency of South Africans to use resources extensively emanated from “an older generation who enjoyed the plenitude of the 1950s and 1960s” (Napier, 2000, p.1), despite the availability of alternative sources of energy. Implementation of these methods is slow and “[w]here a single individual makes the effort for improvement, little difference will be made to the whole. However, if we all make a practical effort, a great and beneficial change will become evident” (Napier, 2000, p. 2). For this reason, this research specifically focuses on domestic use, rather than other contentious issues such as the provision of electricity to the grid by means of hydro-power and nuclear energy. Furthermore, this research does not focus on distribution of energy but rather on the consumption thereof.

1.2.3 Energy Consumption Crisis

Three aspects of conventional energy generation pose problems for South Africa at present. These pertain to the limited nature of resources, pollution and the distribution of energy. In terms of resources, Scheer (in Olivier, 2004) warns that fossil fuels are limited and will be depleted within the next 40 years. Depletion of fossil fuels in various countries will inevitably lead to war if other means of energy generation are not implemented (Olivier, 2004). The cost to the environment is not realistically reflected in the price of energy as fossil fuels have to be mined and emit harmful gases during the process of energy generation. The price often only reflects the generation costs incurred by generation companies.

A natural consequence of generating energy from fossil fuels is pollution. Ward (2002) indicates that South African coal is low in sulphur, which causes acid rain, but high in ash, which causes health problems. Another consequence is that concentrations of carbon dioxide are also increasing globally by 0.6% per year, according to the Department of Environmental Affairs and Tourism (DEAT, 2004). Because of health problems, the quality of life for urban dwellers greatly decreases with increased pollution, as does the quality of the urban region itself.

The distribution of the energy generated by fossil fuel also poses a problem for many South Africans. Two-thirds of the country (66% of households) do not have access to the existing grid, with little possibility of ever being connected because of high demands to the existing grid (http://www.eskom.co.za). Decentralised generation of energy by renewable sources will decrease demands on the grid, and increase the accessibility to energy and a higher quality of life for more South Africans. The full extent of the energy crisis in South Africa has not been fully realised, and alternatives will soon need to be considered.

1.2.4 Alternative Methods Available in South Africa

Bothma (2004) points out that the "South African climate is virtually ideal for several climate-responsive energy-efficient techniques. Especially due to the high solar radiation levels there is potential for various active and passive solar design techniques and technologies" (p. ii). South Africa has a wealth of opportunity, available technology, and knowledge to be able to convert to renewable sources of energy.

The main problem is not with the technology. Bothma (2004) and Gibberd (in Bothma, 2004) contend that South Africa's main difficulty in implementing renewable energy sources is the cheapness of electricity and the lack of legislation in this regard. Attitudes toward the use of renewable energy sources also play a significant role.

1.2.5 Legislation on Consumption and Distribution

Sharing resources and the wasteful use thereof correlate with a lack of legislation enforcing more responsible use. It is not within the scope of this study to attend to legislation in detail, although the attitudes of environmentalists do form part of the political and legislative contexts. These are therefore acknowledged and identified as contexts that can possibly have great implications for the description of attitudes and the interpretation of results.

Policies are used at national level to drive change, enforce or encourage specific actions and discourage others. Policy helps decision-makers to allocate resources and set priorities (DEAT, 2004). The South African constitution is still young and there are not many locally applicable environmental policies specifically pertaining to resources use. Practical guidelines have not yet been formulated, which leaves room for confusion over rights and responsibilities, and results in undesirable actions and disputes priorities (DEAT, 2004). The development of environmental policies should be followed by translation into law so that government and other parties are forced to take protective measures, implement actions that will promote sustainable development, and ensure that such laws are enforced (DEAT, 2004). Gibberd (in Bothma, 2004) believes that energy-efficient technologies should be heavily subsidised by government and general patterns of behaviour changed by "creating greater public awareness of their [energy-efficient technologies'] benefits and the need to support them" (p. 3). Knowledge of the government expects from individuals may influence attitudes toward the issues addressed.

1.2.6 The Global Context

Another context of this research topic, as indicated by Haugestad (2003), pertains to the human, environmental and developmental concerns implied in the World Commission on

Environment and Development (WCED, 1987). Haugestad (2003) centres her attention on globally responsible behaviour and South Africa is possibly a long way off from becoming globally responsible. These goals are intrinsic in the minds of the experts, various stakeholders and the general public. Haugestad (2003) investigated the attitudes of "grass roots politicians" on these and other issues in Norway. Her interviews "dealt with attitudes to consumption and distribution in today's world" (p. 1), where she spoke mainly to politicians from various political parties, although none was represented in government. The question she then asks is "whether an apparent potential for changing norms toward globally responsible consumption is due to specific traits in Norwegian political culture or whether similar discursive resources might be expected to be readily available within other political cultures as well" (Haugestad, 2003, p. 1). The research idea stemmed from this.

1.2.7 The Context of the Individual

It is important to keep in mind that although the researcher may focus on specific individuals in society and specific aspects of the individual, these individuals and aspects are not separate from influences such as family, work environment, religion and values, for all form part of an intricate system. This study will focus primarily on individuals and the attitudes they hold towards the domestic use of renewable sources of energy and the perceived implication to quality of life. This study will probe the reasons for these attitudes to uncover important aspects that may influence potential changes in expected environmental standards and more responsible behaviour. The objectives of this study are stipulated in the following section.

1.3 Objectives of This Study

This research aims to explore people's attitudes and perceptions towards renewable energy to explore its lack of implementation from a psychological perspective. It focuses on South African environmentalists' perceptions of the implications of using renewable sources of energy in the home for quality of life, as well as their more general attitudes towards renewable sources, in an attempt to identify key issues that will enable further investigation. Environmentalists are defined as professionals who work with environmental issues on a daily basis. Environmental issues would include aspects of sustainability and conservation of finite natural resources. Environmental issues refer, for instance, to the impact of large-scale pollution on communities, the mitigation of this impact as well as the prevention thereof. From the nature of their work, it is assumed that the attitudes of environmentalists may be more indicative of prevalent environmental issues and constraints for implementation of renewable energy sources than the attitudes of the general public. It is not assumed that environmentalists tend to have positive attitudes toward the use of renewable energy sources, however, but rather that their exposure to inhibitors to environmentally friendly behaviour could be a rich source of information. They are therefore seen as informed individuals.

Knowledge of the issues, the potential for change and how it could be instigated could be very important to various organisations active in environmental affairs in South Africa, including both non-governmental organisations and government. Providing this knowledge to these organisations may increase their effectiveness, change their approach toward action, influence action planned and inform their decision-making process.

1.3.1 Primary Objectives

The research question is as follows:
What are the attitudes of environmentalists toward the domestic use of renewable energy sources and the perceived implications for quality of life?

The primary objective is thus to explore the attitudes of environmentalists toward renewable energy sources and their perceptions of the implications of the domestic use of renewable resources for quality of life.

1.3.2 Secondary Objectives

The secondary objectives are to

- inform policy frameworks that could incorporate sustainability considerations;
- provide information to government and other agencies on the perceptions of people regarding more efficient energy use;
- provide a basis for subsequent research by indicating aspects that need to be researched; and
- provide indications to practitioners in the energy environment on how to implement change.

The researcher attempted at all times to give a detailed description of the process followed in order to allow the reader to grasp the rationale of the research methodology, the stages of analysis and the discussions.

1.4 Overview of the Study

In chapter 2, the systems theoretical approach that forms the theoretical basis for this study is summarised and explained. The choice of systems theory as a theoretical basis is explained with specific reference to the ethics of the researcher. The components of the subsystems within an individual are described in an attempt to illustrate how these subsystems combine to allow the individual to become part of the ecosystem. Lastly, the structural (systemic) nature of the natural world is discussed, and the importance of the context of this research is emphasised.

Chapter 3 further supports the rationale of the systems theoretical approach by giving an overview of how human systems and ecosystem co-exist. The energy environment is discussed by means of a description of the trends in the natural environment particularly pertaining to energy as well as a separate section on the energy environment in South Africa. The energy environment includes aspects such as legislation, political will, the social realm and financial feasibility. This chapter concludes with a look at theories from environmental psychology that pertain specifically to the formation of habits, the important role of attitudes and intended behaviour, the acceptance of environmental responsibility, the perception of risk, the possibility of attitude change and quality of life.

A detailed description of the research methodology is given in chapter 4. The choice of the research design is motivated, and the epistemology of the researcher and its influence on the research is discussed. The development and use of the interview guide is explained along with the selection and sampling of respondents. The data collection phase is explained in detail and the chapter concludes with a description of the methods used to analyse the data.

The first stage of analysis is explained in chapter 5 and the biographical information of the respondents is presented. A detailed explanation of the identified topics and categories follows, allowing the reader insight into the preliminary findings.

The second stage of analysis follows in chapter 6, in which pattern categories are derived from the topics and categories identified in the first stage of analysis. These pattern categories identified in the second stage of analysis are based on environmental theories in psychology and are already categories that are described as parts of a larger system, which is described in chapter 7.

An integrated conceptual discussion of the research findings in a systemic framework is discussed in chapter 7, and the link between the individual and the ecosystem is explored. Recommendations regarding the use of environmental psychology in South Africa and environmental awareness levels are discussed before the chapter concludes with a critique on the research, with a focus on the credibility of this research.

1.5 Conclusion

This study was justified by focussing on several important aspects of energy use and conservation, as well as previous research and the lack thereof in South Africa. A brief overview of the history of resource sharing in South Africa, and the accompanying energy crisis in the world was given, followed by a short explanation of renewable energy sources available in South Africa. The role of legislation on the implementation of renewable energy sources was also discussed and linked to the global and individual context. Following this, the

primary and secondary objectives of the study were outlined, and an overview of the chapters was given.

In the following chapter the systems theoretical approach is discussed focussing specifically on the history of systems theory, the fundamentals thereof and why it was chosen as the theoretical basis for this study. The perceptual components that make the individual part of the system, how the individual interacts with other systems, and the connection between the individual systems, larger systems and nature are also discussed.

CHAPTER 2

Systems theoretical approach

2.1 Introduction

This chapter serves as an introduction to the fundamentals of the systems theoretical approach. In this chapter the epistemology of the researcher is discussed. The manner in which perception takes place is explored through a description of the components of perception to illustrate how the respondents and the researcher alike become part of the system and contexts in which they operate. Lastly, the link between nature and human systems is discussed and the importance of context is highlighted.

2.2 History of Systems Theory

The origins of the thoughts that would eventually lead to systems theory started two centuries ago, in the early 1800s, when Lamarck "turned the ladder of explanation upside down" (Bateson, 1972, p. 427). Traditionally, reasoning happened through a deductive process from the "Supreme, to man to the apes, and so on, down to the infusoria" (Bateson, 1972, p. 427), or "any of numerous microscopic organisms" (Morris, 1973, p. 675). Lamarck's questioning focused on a description of organisms consisting of parts made up of smaller parts, which altered the general way of thinking. Approximately 150 years later, Lamarck's revolutionary way of thinking started to be formalised when scientists sought to learn about systems (Bateson, 1972), first moving toward a reductionist way of thinking, followed in the early 1940s by a focus on systems rather than the parts thereof.

Before the 1930s, scientists broke systems into parts that were then subjected to vigorous investigation. They believed that the more they knew about the parts, the more they would know about the system as a whole. This method of studying was especially useful in the physical sciences, chemistry and biology. It was also widely used as a means to understand psychological illnesses. It thus became common practice to reduce systems to their smallest parts and analyse these, disregarding the relationships between the parts and with the larger system. This method of analysis became known as reductionism, which is defined by Hergenhahn (2001) as "the attempt to explain objects or events in one domain by using terminology, concepts, laws or principles from another domain" (p. 53). A system, as seen by the reductionists, is thus nothing more than a sum of parts, parts which could transcend systems and sciences in explanation (AECT Council on Systemic Change, 1999).

The 1940s and 1950s gave rise to scientists such as von Bertalanffy, Ashby and von Foerster, who began to consider the characteristics of whole systems (AECT Council on

Systemic Change, 1999). Von Bertalanffy's exploration of systems thinking was later expanded upon by von Neumann and Ashby who focussed more on the field of cybernetics (http://wikipedia.org/wiki/Systems_theory).

Systems theory focuses on the levels of organisation that are visible within any system, regardless of how complex it may seem. It is assumed that general laws underlie situations and phenomena that could be used to explain not only these, but other, more complex systems. Systems theory focuses specifically on the interconnectedness of the parts of a system, and generally on "complex, adaptive, self-regulating systems which we might call 'cybernetic' " (Heylinghen, Joslyn & Turchin, 1999, p. 1).

Norbert Wiener popularised cybernetics in 1943 with the publishing of his first book. The school of cybernetic thought gained support from all over the world, especially in France. Similarly to systems theory, cybernetic theory focuses on the transfer of information and the circular relations that result in self-organisation. In systems theory these concepts would be known as rules of transformations and either positive or negative feedback loops (http://wikipedia.org/wiki/cybernetics.html). Cybernetics differs from system theory in that cybernetics aims to understand and explain the minimised deviation between the desired and perceived situation resulting from goal-directed or purposeful behaviour as a reaction to a negative feedback loop (http://wikipedia.org/wiki/cybernetics.html). Heylinghen et al. (1999, p. 1) add, however, that "cybernetics and systems theory study essentially the same problem."

In this study, the system theoretical approach is followed, emphasising the connections and interrelatedness between systems. In the following section the fundamentals of systems theory is discussed to allow the reader a fair understanding of what systems theory entails, after which a justification for the selection of the systems theoretical approach is given.

2.3 Fundamentals of a Systems Theoretical Approach

The systems theoretical approach's main focus is on the interrelatedness of systems. It is a meta science, meaning that it focuses less on a specific aspect, as has traditionally been done, but on the systems that are made from these aspects. These aspects could include anything from scientific phenomena to psychological illnesses. System theory holds that these aspects should not be viewed in isolation from those that surround them.

These aspects are thus understood in terms of the systems in which they occur, react and interact. The relationship between the systems has become much more important and may even contain more information than what is derivable from looking at the parts in isolation. In order to explain this further a short summary of systems theory follows.

Capra (1997) emphasises several aspects that form the basis of systems theory. Firstly, systems theory is more concerned with the whole than with the parts of any system. Even more so, he states that the whole has characteristics that none of the parts have - hence the well known phrase: "The whole is more than the mere sum of its parts."

Secondly, this description of parts and wholes inevitably leads to a consideration of levels of wholeness. According to Capra, another key criterion of systems theory is that attention should be able to shift from one level to another in both directions. This facilitates important insights into the system, because a phenomenon that is obvious at one level may be less obvious at another, although it may still be applicable.

Thirdly, the relationship between different levels becomes important. The way in which different levels of a system relate to each other, in other words, the context in which they occur simultaneously, also allow insight into the system itself.

Capra (1997) explains the systems theoretical approach in the following way:

> Nature is seen as an interconnected web of relationships, in which the identification of specific patterns as 'objects' depends on the human observer and the process of knowing. This web of relationships is described in terms of a corresponding network of concepts and models, none of which is any more fundamental than the others. (p. 40)

The question thus is: how can research be done without using fundamental concepts and models on which to base explanations? Capra (1997, p. 40) asks, "[i]f everything is connected to everything else, how can we ever hope to understand anything?" Unlike the physical sciences, the systems theoretical approach is not based on discovering in isolation. Systems theory departs from the premise that the discovery of anything - even science - occurs through approximate knowledge, which may contain aspects of truth and disregard others. Thus no explanation is ever definite and final, but may be a more accurate approximation than the theory that went before it. Capra (1997) states that "[n]o matter how many connections we take into account in our scientific description of a phenomenon, we will always be forced to leave others out" (p. 41). He furthers his explanation of systems theory in stating that scientists can never be sure that they are dealing with truth - truth being the precise correspondence between a phenomenon and the description thereof. We could, however, deal with approximate descriptions of what we as researchers perceive. Louis Pasteur (cited in Capra, 1997) explains this very aptly: "Science advances through tentative answers to reach a series of more and more subtle questions which reach deeper and deeper into the essence of natural phenomena" (p. 42).

The researcher uses systems theory to explain perceived implications for quality of life brought about by the use of renewable energy. The researcher makes use of several other

psychological theories to explain attitudes and behaviour, as described in Chapter 3. These theories do not exist separately from one another, and none of these theories is used as the sole fundamental basis on which the outcomes of this research are based.

2.4 The Six Criteria of Mind

Bateson (1979) and Capra (1997) discuss six criteria of mind by which the individual become a part of the larger system, and the rules by which the interaction takes place. These criteria are used in chapter 7 to explain the integration between the energy-consumer-system, the energy-environment-system and the system in which both are only a part. Below is a short description of the six criteria of mind.

2.4.1 A Mind is an Aggregate of Interacting Parts or Components

The concept of mind is implicit in the systems theory in which the whole is more than the sum of the parts, and in which the parts interact on a continual basis. As is explained in chapter 7, this is integral to the concept of systems and how they interact.

2.4.2 The Interaction between Parts is Triggered by Difference

Interaction between the parts of the system happens for a reason. When another system perceives a difference in one system, it reacts to the difference. Bateson (1979) argues that differences occur continually; however, the recognition of these differences does not always occur. Sometimes the difference in one system is so small that no difference is recognised, thus not triggering any action. In another instance, a difference could be so gradual that it is not perceived as a difference at all. All action and thus interaction between systems is triggered by perceived differences between systems.

2.4.3 Mental Processes Require Collateral Energy

Bateson (1979) distinguishes between living and non-living systems with this criterion, which states that energy inherent to the living system has the ability to react to another. Bateson (1979) argues: "When I kick a stone…I give energy to the stone, and it moves with that energy…When I kick a dog, it responds with energy [it receives] from [its] metabolism" (p. 101).

2.4.4 Feedback Loops are Part of the Mental Process

Circular chains of determination and communication on the differences perceived and the reactions to the differences are fed back into the original system. These feedback loops are the basis of human systems and learning. Feedback often creates new differences to which a system reacts, thus causing an interaction between the various systems (Capra, 1997).

2.4.5 Perceivable Differences are Regarded as Methods of Interpretation

As part of this criterion, "Bateson explicitly assumes the existence of an independent world, consisting of objective features such as objects, events, and differences. This independently existing 'outer' reality is then 'transformed', or 'encoded' into an inner reality" (Capra, 1997, p. 299). Bateson thus describes the way in which a living system (or human) interprets the world. Bateson's final criterion pertains specifically to this idea of "representationalism" (Capra, 1997, p. 299).

2.4.6 A Hierarchy of Logical Types

Bateson (1979) argues that messages or interactions between systems occur on a continual basis. He adds that these interactions not only contain messages, but also contain messages about the messages. These are called 'meta-messages'. Bateson also reasons that if there are messages about the messages, then there should also be messages about the meta-messages. In such an instance a hierarchy develops according to the importance of the level of the message.

The six criteria discussed above form part of an integrated discussion on which this research is based. Chapter 7 places in context the criteria used and the systems explored in this study. In the following section the choice of systems theory as the theoretical foundation is discussed.

2.5 Systems Theory as Theoretical Foundation

Systems theory demands a new thought process from the researcher, focussing on systems and the relations between systems rather than, as has traditionally been done, isolating certain interesting phenomena and theorising about these. The context in which the phenomena, attitudes, perceptions and behaviour are observed forms as much a part of the data as the phenomena, attitudes, perceptions or behaviour themselves. Bateson (1972, p. 462) says that:

> The most important task today is, perhaps, to learn to think in a new way. Let me say that *I* don't know how to think that way. Intellectually, I can stand here and give you a reasoned exposition of this matter; but if I am cutting down a tree, I still think "Gregory Bateson" is cutting down a tree. I am cutting down the tree. 'Myself' is still to me an excessively concrete object."

Discussing epistemology becomes difficult because, as Bateson states, "myself is still to me an excessively concrete object".

The researcher is thus always part of the research he or she conducts. The discoveries made by the researcher depend on the perceptions of the researcher. The perceptions of researchers colour their discoveries and interpretations, thus the method in which researchers come to draw these interpretations becomes important. This method of knowing would help

others to understand why that which they know is different from what someone else may know using the same data. Capra (1997) simply describes epistemology as the "understanding of the process of knowing" (p. 39).

The description of the epistemology of the researcher is thus important to enable others to understand the process that researchers employ to come to know what they write and why. The current researcher believes that no interpretation of reality exists without the interpreter being part of the reality described. As Capra (1987, p. 67) describes, "[t]he patterns scientists observe in nature are intimately connected with patterns of their minds; with their concepts, thoughts and values. Thus the scientific results they obtain…will be conditioned by their frame of mind."

No research can be conducted without the researcher forming an integral part of the research and the conclusions derived from the data. This in itself implies that the researcher has a responsibility to adequately describe the way in which the conclusions were derived, and the implied consequences of the conclusions of the research.

Keeney (1983, p. 80) indicates the necessity of recognising the "necessary connection of the observer with the observed, which leads to examining *how* the observer participates in the observed." The current researcher identifies with systems theory as a description of her epistemology and thus recognises the role that she plays in the research. The researcher also considers it important to provide the perspective that the conclusions suggested by the researcher are researcher-specific, and acknowledges that the conclusions that other researchers may draw from the same data may be different. From an ethical point of view, as stated in chapter 4, it is important to emphasis the interrelatedness of the researcher with the research outcomes. This should be kept in mind when reading the conclusions in chapter 7.

The following section contains a description of how the researcher becomes part of the research. This description also applies to the respondents who participated in this research. The subsystems of perception (viz., sensory, cognitive, emotive, biological and the self) are discussed to allow the reader to grasp the underlying factors that contribute to perception.

2.6 Components of Perception

Jordaan and Jordaan (1998) discuss components of perceptions within the systems theoretical framework. These components are discussed below in different sections although it should be kept in mind that they are interconnected with one another and that, even though they are discussed separately, they are part of a larger whole.

2.6.1 Perceptual Subsystem

According to Keeney (1983, p. 2),

> [t]here is no direct correspondence between an event occurring 'outside' of us and our inner experience of it. Thus, how we relate to the world around us and how we interpret what we see is not a linear relationship between the self and the world.

Wapner (1987) states that "[t]he experienced environment, rather than the physical environment, is the effective environment within which an experiencing person functions" (p. 1442). Bateson (1972) agrees with this statement by saying that "the mental world – the mind – the world of information processing – is not limited by the skin" (p. 454).

The process by which a person perceives concerns itself with the reception and interpretation of information. Bateson (1972) notes that a person becomes aware of something as it contrasts with what surrounds it. He says that "what we mean by information – is a difference which makes a difference" (p. 453). Maturana (in Paslack, 1991, p. 156) states that "the nervous system operates as a closed network of interaction, in which every change in the interactive relations between certain components always results in a change of the interactive relations of the same or other components." Thus, one of the conclusions Maturana draws is that perception happens through a circular process of organising. He adds that this organisation of messages through the nervous system is "continually self-referring" (cited in Capra, 1997, p. 96). This is a very significant statement, because the self-referring nervous system causes the representation of reality to be a continual creation of new relationships within the existing neural network. Maturana (in Paslack, 1991) states that "the activities of the nerve cells do not reflect an environment independent of the living organism and hence do not allow for the construction of an absolutely existing external world" (p. 155).

Perception of the environment has been defined by Bell, Greene, Fisher and Baum (2001) as not only human sensory systems causing sensations, but as "the more complicated processing, integration, and interpretation of complex, often meaningful stimuli like those we encounter in everyday life" (p. 57). We thus form a map of our external world, which we often confuse with reality (an absolutely existing external world), in order to make sense of the happenings around us.

2.6.2 Cognitive Subsystem

Maturana (in Capra, 1997, p. 259) states that "living systems are cognitive systems and living as a process is a process of cognition." Cognitive perception is the means by which people come to understand their environment. Adults' perceptions tend to be more complex than those of children because adults have more experience and learned associations with which they appreciate the environment around them in sensory and cognitive terms (Ulrich, 1983). Capra (1997) states that

> cognition is an integral part of the way a living organism interacts with its environment. It does not react to environmental stimuli through a linear chain of cause and effect, but responds with structural changes in its non-linear, organizationally closed, organization… the organism's cognitive interaction with its environment is intelligent interaction. (p. 262)

Cognitive interaction with the environment is thus cyclical and, similar to the sensory perceptions of the environment, does not occur independently of the individual. This idea is supported by Maturana (1991) when he states that "knowledge is not an operation through which we refer to some sort of independent reality, but an operation of co-ordination of behaviour between observers through which we human beings bring forth a world of acceptable actions" (p. 383).

It is with this in mind that the respondents' attitudes and perceived implications for quality of life are discussed. Although the research attempts to discover the ways in which respondents perceive, the researcher herself also perceives and interprets. The cognitive perception of both the researcher and the respondents are interlinked and highly individual. In the following section the emotional subsystem of perception will be explored from a systems theoretical approach.

2.6.3 Emotional Subsystem

Capra (1997) connects the cognitive subsystem and the emotional subsystem by stating that

> [e]motions are an integral part of this domain [cognitive]. For example, when we respond to an insult by getting angry, that entire pattern of physiological processes - a red face, faster breathing, trembling, etc. - is part of cognition. In fact, recent research strongly indicates that there is an emotional colouring to every cognitive act. (p. 262)

Ulrich (1983) agrees that emotions are precognitive and that they set the scene for the reactions to the environment that influence and are directly followed by cognitive processes. Bateson (1972) also supports this idea in saying that confusion between the map (perception) and the territory (reality) could evoke emotional reactions.

2.6.4 Biological Subsystem

Capra (1997) indicates that all systems interact and that the biological subsystem is as important as the cognitive, perceptual and emotional systems. Ulrich (1981) also indicates that physiological arousal by means of positive experiences increases alertness, heart rate, and brain wave activity. Again, emotional, cognitive and perceptual experiences, as well as the physiological experience, are interlinked with one another.

Capra (1997, p. 277) points out two interesting concepts: that "this would mean that all sensory perceptions, all thoughts and in fact all bodily functions, are emotionally coloured" and that "ultimately, this implies that cognition is a phenomenon that expands throughout the organism, operating through an intricately chemical network of peptides, that integrates our mental, emotional, and biological activities". The self as a subsystem also forms part of the intricate network illustrated above, and is discussed below.

2.6.5 The Self as Subsystem

The self is the perception the people have about themselves. Capra (1997) states that "[a]s humans we are not only aware of our environment, we are also aware of ourselves and our inner world. In other words we are aware that we are aware. We not only know, we also know that we know" (p. 278). In this awareness of being aware, we are human. We are also conscious. Bateson (1972) comments that consciousness is organised in terms of purpose: "It is a short-cut device to enable you to get quickly at what you want; not to act with maximum wisdom in order to live, but to follow the shortest logical or causal path to get what you next want…" (p. 433).

This ability to be aware of being aware and being conscious is the golden thread that runs through all of these subsystems. Ultimately none of the systems can function in isolation of each other and all of the subsystems work in collaboration in order to form perceptions and attitudes and determine a course of action.

In this section it became apparent that the individual is part of an intricate system, with attitudes formed by means of interweaving sensory perceptions with cognitive, emotional and biological experiences, interpreted by the self. These interpretations and subsequent experiences are so intertwined that they cannot be separated. They form part of a system.

2.7 Feedback Loops

The abovementioned subsystems react to one another to enable them to form a system. The way in which these subsystems react is by means of feedback, which is a form of interaction. New information is often available when the focus is on the interactions between these subsystems rather than the subsystem itself. Bateson (1972) describes two types of feedback loops: negative homeostatic feedback loops, and self-amplifying feedback loops.

Negative homeostatic feedback loops are characterised by the balance which allows them to ‘react’ to information in such a way as to either compensate for the resulting imbalance or to offer an action contrary to the incident that caused imbalance, thus restoring stability to the system. This system is thus self-reinforcing. A self-amplifying feedback loop occurs when parts of a system react to other parts in the same system, or when smaller systems in a larger

system react to other smaller systems in ways that are contrary to maintaining the stability of the system.

An example of a self-amplifying loop is the amount of energy used in the home. If an energy consumer leaves the lights on in his home for some time, and at the end of the month no serious indication of this is reflected on his electricity bill, he might be inclined to forget more often to switch off the lights. The more he forgets to switch off the lights, and the more this is not reflected on his electricity account (because electricity is cheap), the more he might leave on the lights.

An example of a negative feedback loop is if the energy consumer is kept in balance by an electricity account that reminds her that efficient use of electricity is important. The over-consumption and unnecessary use of electricity in the home would be restricted by the energy consumer in order to avoid receiving a large electricity bill at the end of the month.

A discussion on the interaction between humans and nature follows in section 2.7 below, while an integration of this system with the data may be found in chapter 7. The interaction between humans and nature is not always in balance. Bateson (1972) agrees with this when he states that humans now have the power (by means of the use of machines) and the purpose to overcome the ability of nature to restore balance. This creates a positive (self-amplifying) feedback loop.

2.8 The Structural Nature of Nature

The systems discussed above all influence one another, although not in any specific order. Cognition, perception, emotion, as well as the biological and self subsystems interact and interweave to such an extent that it becomes impossible to delineate the course. The way in which these systems fit into one another, and the interconnectedness between humans and nature, also form part of the larger system in which the research was conducted. All of these systems are located into relation with one another by considering the context in which they occur. The link between humans and nature as well as the role of context are discussed below.

2.8.1 The Human-Nature Connection

Bateson (1972) holds that natural systems consist of three complex systems. The first is the human individual. Individuals perceive the world around them through the subsystems described above. This human system aims to conserve the status quo of the system. The second natural system is the one in which the human system finds itself. It is constituted by the society in which numerous human systems interact. All attempt to conserve the status quo, although several disruptions occur in these systems as a result of the interaction. The

third system is the natural, biological system: the ecosystem. This has also undergone extensive disruptions because of other systems with which it interacts.

According to Dell (1985), every living system has an identity that determines the interactions that a particular living system has with other living systems. This structural nature of the system "fully specifies how the system will behave under any and all interactions" (Dell, 1985, p. 6). Following the description by Capra on systems, however, these systems could influence one another to such an extent that they may change how they react (Capra, 1997). Maturana and Varela (1987) explain that "the changes that result from the interaction between the living being and its environment are brought about by the disturbing agent but *determined by the structure of the disturbed system*" (p. 96, italics in original).

Wapner (1988) describes the human system as one with multiple intentions, thus the human system has the ability to focus on various aspects with differing intensity. Bateson (1972) argues along the same lines when he says that humans are conscious beings, and that their consciousness is organised in terms of purpose. Humans have purposeful behaviour that distinguishes them from the rest of nature. Bateson (1972. p. 434) furthers this argument in saying that "[c]onscious purpose is now empowered [by modern technology] to upset the balances of the body, the society, and of the biological world around us". We have become accustomed to unbalanced systems because of our use of technology. Bateson (1972) insists that by acting in accordance with the larger systems, the balances of most other systems will be disrupted much less than what we have become accustomed to. He supports this by saying that a lack of systemic wisdom (through disrupting the systems) is always punished. "The flexible environment must also be included along with the flexible organism because…the organism which destroys its environment, destroys itself. The unit of survival is a flexible organism-in-its-environment" (Bateson, 1972, p. 451).

2.8.2 Context

Context is nothing other than "a pattern through time" (Bateson, 1979, p. 14) which also creates meaning, for "[w]ithout context, words and actions have no meaning at all" (p.15). In this research the researcher attempts to represent the findings of the research in the context of the aspects to which it has specific relations. The rules for context as identified by Jordaan and Jordaan (1998) are explained below. These rules are used in chapter 7 in an attempt to link the energy consumer environment and the energy environment through the context of this study.

As suggested by Jordaan and Jordaan (1998), these rules also form a theory in a context as part of several other theories, which are approximations of reality. Theories are useful in our attempts to describe phenomena. These rules on context are as follows:

a) A context is a prerequisite for understanding experiences, behaviour, phenomena and problems.
b) Experiences, behaviour, phenomena and problems occur in more than one context.
c) If experiences, behaviour, phenomena and problems can occur in more than one context, it means that such experiences, behaviour, phenomena and problems can be described in different but equally valid ways.
d) The relationship between lesser contexts and the larger context (context of the whole) is based on the interdependence of the parts of the whole, from which a specific pattern or organisation emerges.
e) The interdependence of lesser contexts (parts) and larger contexts (whole), and the pattern or organisation that emerges from it, form a contextual spiral.

These rules are used through interviews in the phases of analysis of the data collected in this research, in order to discover the context of the research. The three stages of analysis each attempt to explore a larger context moving from parts toward a description of the whole. The first level of analysis attempts to identify the individual context and that of society, the second focuses more exclusively on the individual as part of society and the third examines the relations between the identified contexts, as described in Chapter 4.

This exploration of context is important in order to give the research meaning. Keeney (1983, p. 38) states that the "double description is an epistemological tool that enables one to generate and discern different orders of pattern." The purpose of the double description is to relate the identified topics, categories and pattern categories with one another. This relationship between the various levels of description becomes important because it creates the system in which they interact. This system is the object of scrutiny in this study and the conceptual discussion in chapter 7 serves the purpose of this double description.

2.9 Conclusion

The purpose of this chapter was to offer a description of the fundamental of the systems theoretical approach. This was done through a short description of the three main systems: the self, the society and the biological system. The interaction and relation between these systems was also discussed.

The second aim of this chapter was to describe why the researcher chose the systems theoretical approach. The systems theoretical approach was deemed to be representative of all the contributing aspects that form part of this specific study. The researcher also believes that the systems theoretical approach allows her a more ethical approach because of the acknowledgement of the researcher as part of the system.

The discussion went on to explain how both the researcher and the respondents in this study become part of the system through a consideration of several subsystems of perception. These perceptions couple the respondent and the researcher alike to the systems that they experience.

Finally, the way in which the human and natural systems link was illustrated, and it was shown that the context that is created from interaction between these systems is important. Jordaan and Jordaan's (1998) rules for describing context were discussed in order to provide a framework for the discussion of context in chapter 7.

In the following chapter, the literature regarding energy use and current energy trends will be explored. Psychological theories that are used in subsequent chapters to categorise and discuss respondents' behaviour will also be discussed.

CHAPTER 3

Literature Study

3.1 Introduction

In recent years the world has started to direct its attention toward being more environmentally friendly and living more sustainably. Many recent publications focus explicitly on environmental issues (see Gore, 1992; Hawken, 1993; and the State of the World Series of annual publications published by the Worldwatch Institute). Nations attend conferences such as the Johannesburg World Summit on Sustainable Development in 2002, and agendas and protocols are drawn up and ratified, making visible efforts to reduce the impact of our way of life on the earth. Companies are conducting green audits in which they assess their impact on the environment, and "consensus is growing among scientists, governments and business that they must act fast to combat climate change" (Carey, 2004, p. 48).

Many people are looking at renewable energy as a feasible solution to the problems the world is facing, and indeed many argue that "[i]t stands to reason that renewable energies will eventually occupy a central space in the world's energy generation" (Greyling, 2004, p. 9). Ten years ago it was wondered whether it was public misunderstanding of solar technology or the low price of oil and other -based products that inhibit the installation of renewable energy on a large scale. In recent years, the price of oil has gone up considerably; however, the use of solar technology has not increased noticeably. Dr Scheer (in Olivier, 2004), chairperson of the World Council for Renewable Energy, contends that as long as members of parliament, journalists, scientists and the general public believe that renewable energy cannot replace conventional energy, fossil fuels will not be replaceable: "[t]he reason renewable energy is not implemented as soon as possible is because most people believe it is impossible" (Olivier, 2004, p. 17).

Energy forms an integral part of the lives of everyone on earth, whether this be through the burning of biomass in order to keep warm during winter, or the electricity computers need to enable us to work. Understanding the intricate details of the world energy system would be impossible, but it remains important to attempt to grasp the system in which energy operates and the implications that current energy generation methods hold for the world, and specifically South African.

The literature study briefly explores the current world trends concerning human impact on the natural environment. The significance of and interaction between various systems as part of the ecosystem are of paramount importance, thus justifying a discussion on the interaction between energy use, global moves toward the use of renewable energy sources and global warming. These issues are explored with a specific focus on the South African situation. The cost to the environment and the economic impact of the use of renewable energy is surveyed as well as the impact legislation has on the implementation of renewable energy. The impact that regulations can have on actual implementation should not be underestimated, and therefore a short legislative overview is necessary. Psychological aspects pertaining specifically to how attitudes are acquired, the functions of attitudes and how attitudes may be changed is discussed in the latter section of this chapter. Finally, an overview of the systems involved in energy precedes a description of the energy situation of the world.

3.2 Ecosystems and Human Systems

> As the century draws to a close, environmental concerns have become of paramount importance. We are faced with a whole series of global problems, which are harming the biosphere and human life in alarming ways that may soon become irreversible. (Capra, 1997, p. 3)

The state of the ecosystems of our world was assessed in a large-scale project launched in 2000, the Pilot Analysis of Global Ecosystems (PAGE). According to Linden (2000), the United Nations (UN) launched PAGE in order to establish the true state of the ecosystems of the world and determine whether they are able to support “nature and civilisation” (p. 19). Five major types of ecosystems were assessed: forests, freshwater systems, coastal/marine habitats, grasslands and agricultural lands, and it was found that all of these show serious signs of deterioration. Four million dollars were spent on this particular study and it is only one example of the kind of research being done in the field of ecosystems, environments and the policies implied in these findings. In their editorial announcement of the PAGE findings, the heads of the World Bank, the UN Development Program, the UN Environment Program and the World Resources Institute confirmed their “commitment to making the viability of the world’s ecosystems a critical development priority for the 21st century” (Linden, 2000, p. 24).

The rising importance of ecosystems and the relationship between natural systems and human systems are evident in the following statements:

> To understand global environmental change, it is necessary to focus on the interactions of environmental systems, including the atmosphere, the biosphere, the geosphere, and the hydrosphere, and the human systems, including economic, political, cultural and social technical systems. Human systems and environmental systems meet in two places: where human actions proximately cause environmental change, that is, where they directly alter aspects of the environment, and where environmental changes directly affect what humans value. (National Research Council, 1992, p. 1)

"Meeting basic human needs, slowing the unprecedented growth in human numbers, and protecting vital natural resources such as fresh water, forests, and fisheries are all prerequisites to healthy stable societies." (Flavin, 2001, p. xix).

Links between healthy ecosystems and healthy human systems have been realised, but we are still a far cry from finding solutions in this regard. These living systems are integrated wholes and we need to move away from a reductionist view of the parts and see how these systems fit together. A key concept in systemic thinking is to realise the importance of moving back and forth within systems to determine how they interact. An interaction is always possible, and by moving our attention from small systems to larger ones or vice versa we can gain valuable information about their relationship and influences on one another. A problem can be described in terms of its relationship to other systems, in terms of its context, and in terms of its environment (Capra, 1997).

This realisation that the living world is an intricate network of relations is central to understanding it:

> Without an understanding of human interactions in global environmental change that is based both on empirical observations of human behaviour and on a better understanding of the consequences of human actions, the models of physical and biological processes of change will be incomplete. (National Research Council, 1992, p. v)

The National Research Council of the United States of America (1992) continues to point out the critical need for the "identification of the ways that human, physical and biological systems interact" (p. v). The Council further contends that this is often only possible through complex

feedback mechanisms. An understanding of these mechanisms is necessary to be able to understand the systems in which we operate and to subsequently start doing something about the environmental crises that we face.

The human causes for global change have largely been ascribed to population growth, economic growth, technological change, political-economic institutions and attitudes and beliefs. Human responses to global change occur in seven systems, which with each other, as illustrated in table 3-1. Each system poses questions of its own; and in addition, the interaction of these systems is also not yet understood (National Research Council, 1992).

It is important to note that each system has the potential to influence any of the others. Capra (1997, p. 290) states that "[a]ll members of an ecological community are interconnected in a vast and intricate network of relationships, the web of life. They derive their essential properties and, in fact, their very existence from their relationship to other things". Even though table 3.1 below is structured in a hierarchical manner, it is important to realise that these systems are in continuous interaction with one another.

Table 3.1 Human responses to global change
(Adapted from the National Research Council, 1992, pp. 5, 6)

Change	**Result**
Individual perception, judgement and action	- all decisions are based upon individual input - individual actions have major effects - individuals can be organised to influence collective and political responses
Markets	- global change influences prices
Sociocultural Systems	- ways of interacting with environment as a group - possible influences on policy and responses to global change
National policies	- make international agreements possible - affect the ability to respond at local and individual levels
International cooperation	- enables concentration on large scale environmental changes - formation of institutions in order to solve global problems
Global social change	- expansion of global markets, communication and knowledge - surfacing of cultural identity as a social force that could respond positively or negatively in instigating global change

The aspects that play a role here are all extensive and complex systems on their own. Understanding their interactions is an enormous task, but without a proper understanding thereof noteworthy solutions cannot be proposed. Aspects such as resource usage and recycling also come into play, making this a tangled web that we need to extricate ourselves from if we want to have any natural resources left.

According to the National Research Council (1992, p. 1) of the United States of America "[t]he world has entered a period of hydrological, climatological, and biological change that differs from previous episodes of global change in the extent to which it is human in origin." Many changes have taken place in recent years concerning the environment and development with regards to energy and renewable energy systems. An examination of world trends concerning the human impact and the human response to global change is justified. In the following section I will discuss the various environmental trends, with particular emphasis on energy use and generation over the past three decades. I will also briefly discuss the available alternative sources of renewable energy and then proceed to examine the policies and protocols that have been developed globally in order to remedy the present situation.

3.3 Trends in the Natural Environment

According to annual reports on the state of the world, the world's natural environment situation is as follows (Gardner, Assadaurian & Sarin, 2004):

3.3.1 Fossil Fuels and Atmosphere

The world is still greatly dependent on fossil fuels. South Africa is 90% dependent on coal for the generation of energy (www.eskom.co.za). Globally the use of coal, oil, and natural gas was 4.7 times higher in 2002 than in 1950. Carbon dioxide levels, the main culprit in global warming, were 18% higher in 2002 than in 1960, and estimated to be 31% higher since the onset of the industrial revolution in 1750. Scientists have linked the warming trend during the twentieth century to the build-up of carbon dioxide and other heat-trapping gases.

3.3.2 Ecosystem Degradation

More than half of the Earth's wetlands, from coastal swamps to inland floodplains, have been lost, mainly due to draining or filling for human settlements or agriculture. About half of the world's original forest cover is also gone, while another 30% of it is degraded or fragmented. In 1999,

global use of wood for fuel, lumber, paper and other wood products was more than double that in 1950.

3.3.3 Sea Level

According to Gardner et al. (2004), the sea level rose 10-20 centimetres in the twentieth century, an average of 1-2 millimetres per year, as a result of melting ice masses and the expansion of oceans due to climate change. Small island nations, though accounting for less than 1% of global greenhouse emissions, are at risk of being inundated by rising sea levels. Floods are more common and droughts threaten life as we know it.

3.3.4 Soil/Land

Some 10-20% of the world's cropland suffers from some form of degradation, while over 70% of the world's veld is degraded. Over the past half-century, land degradation has reduced food production by an estimated 13% on cropland and 4% on pasture.

3.3.5 Fisheries

In 1999, the total fish catch was 4.8 times the amount than in 1950. In just 50 years, industrial fleets have fished out at least 90% of all large ocean predators: tuna, marlin, swordfish, cod, halibut, and flounder.

3.3.6 Water

Over-pumping of groundwater is causing water tables to decline in key agricultural regions in Asia, Africa, the Middle East and the United States. The quality of groundwater is also deteriorating as a result of runoff of fertilisers and pesticides, petro-chemicals that leak out of storage tanks, chlorinated solvents and heavy metals discarded by industries, and radioactive wastes from nuclear facilities. The discharges of human waste into water sources for humans have become a great source of concern in South Africa in particular. These incidents should, however, not be seen in isolation from one another, as Capra (1987, p. 316) suggests: "If we separate phenomena from the systems in which they were imminent and confine them to human individuals, we will see the environment as mindless and we will exploit it. Our attitudes will be very different when we realise that the environment is not only alive, but also mindful, like ourselves."

Many of these trends can be slowed and possibly eventually stopped and re-established by means of responsible energy management and overall environmental concern. The ecosystems

and environments of the world are good indicators of the things to come. Energy generation is probably one of the biggest culprits in causing the situation and world energy trends are indicative of this. Capra (1987) states, however, that "[o]ur evolution continues to offer us freedom of choice. We can consciously alter our behaviour by changing our values and attitudes to regain the spirituality and ecological awareness we have lost" (p. 326).

3.4 Trends in Energy Use

World trends specifically pertaining to energy also paint a bleak picture. Fossil fuel accounts for 77% of energy use in the world. Major uncertainties exist about the extent to which fossil fuels can remain the primary source of energy. Alternative electricity-generating techniques could be complicated by weather changes which may alter rainfall patterns and bring about higher temperatures, resulting in difficulties with hydropower production (Sawin, 2003b). The Lesotho Highlands Water Project, for instance, has seen ups and downs in their ability to supply the Gauteng region of South Africa with power, because of severe droughts (van der Merwe, 2004).

3.5 Renewable Energy

3.5.1 Nuclear Power

Nuclear power plants have increased to 437 worldwide, and provided 357 gigawatts of energy in 2002 compared to 340 in 1995, 328 in 1990, 250 in 1985, and 121 in 1980. These figures show staggering increases in the demand for electricity and energy especially in countries like China, South Korea and India where industrial development is booming (Lenssen, 2003).

3.5.2 Wind Power

The production of power has changed rapidly in the last decade with the increased effectiveness of wind turbines, which provided a mere 10 megawatts of power in 1980 compared to the 31 650 they currently yield (Sawin, 2003b). Wind farms have been a boost to the economy in many small towns where they have been established, with vast positive implications for the environment and economy alike. Sawin (2003b, p.38) notes that "Europe installed an estimated 5 870 mega watts of [wind] capacity in 2002, 31% more than in 2001. Europe has nearly 73% of global wind capacity – thanks to strong, consistent policies driving demand for renewable energy technologies, particularly in Germany." The role played by politics and policies are evident in this

statement and are of incalculable importance for renewable energy to come into effect. Policies and legislation are discussed further in a subsequent section of this chapter.

3.5.3 Solar Power

Solar power, whether it is passive, active, thermal or photovoltaic energy systems, has improved immensely in functionality over the past years and is the fastest growing source of power in the world (Sawin, 2003b; Walton & Warren, 1982). An in-depth discussion on the various types of renewable energies available for domestic use in South Africa are presented in a subsequent section of this chapter.

3.6 Trends in Environmental Change

3.6.1 Global Warming

The importance of and interaction between various systems has already been emphasised. Changes in the global environment are connected to changes in the natural systems (National Research Council, 1992), but these are very complex and difficult to identify. It is therefore challenging to pinpoint the cause of a macro phenomenon such as global warming.

Global warming has become a popular concept in environmental circles, and the actual implication of this phrase needs to be explored in order to understand the underlying problem we face. Many human activities, such as the burning of fossil fuels, release carbon dioxide (CO_2) into the atmosphere. Carbon dioxide is not a stranger to the atmosphere, but due to human intervention the release of this gas (and others, such as methane, CFCs and nitrous dioxide) is unnaturally increased. All these gases tend to increase the proportion of the solar heat that is retained in the atmosphere. Therefore, more heat gathers in the atmosphere, thus slightly increasing the average temperature, creating what has become known as the ‘greenhouse’ effect (National Research Council, 1992).

These emissions occur mainly because of the burning of fossil fuels in order to produce energy (National Research Council, 1992). A clear link between industrial development and greenhouse gas emissions can be drawn. Carey (2004, p.48) states that “consensus is growing among scientists, governments and business that they must act fast to combat climate change. This has already sparked efforts to limit CO_2 emissions many companies are now preparing for a carbon-constrained world.”

The graphs and tables below depict the serious problem the world is facing.

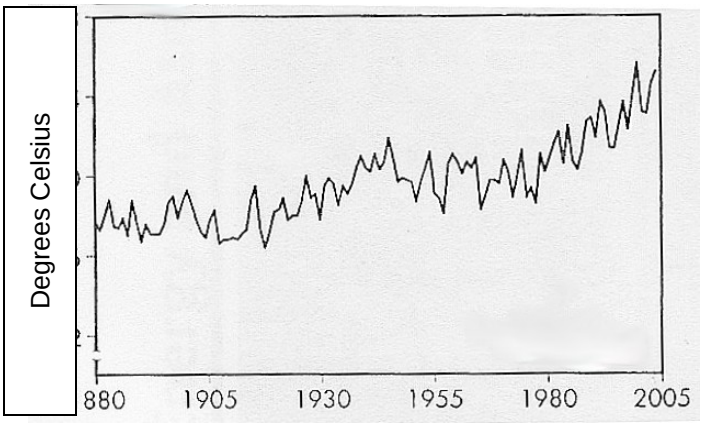


Figure 3.1 Global average temperature at Earth's surface, 1880-2002 (Sheehan, 2003)

In most cases it is agreed that the increased CO_2 emissions, as seen below in figure 3.2, are the greatest contributor to the increase in world temperature. The increase in temperature may seem slight, but "even the minimum predicted shifts in climate for the 21st century are likely to be significant and disruptive" (www.unfccc.feeling_the_heat/items/2905.htm). Global temperature is predicted to rise between 1.4 and 5.8 degrees in the next century, and although this is a rough estimate, it is definitely a serious matter. The forecast minimum increase in the next 100 years is more than twice the increase of 0.6 degrees Celsius since 1900 (www.unfccc.feeling_the_heat/items/2905.htm).

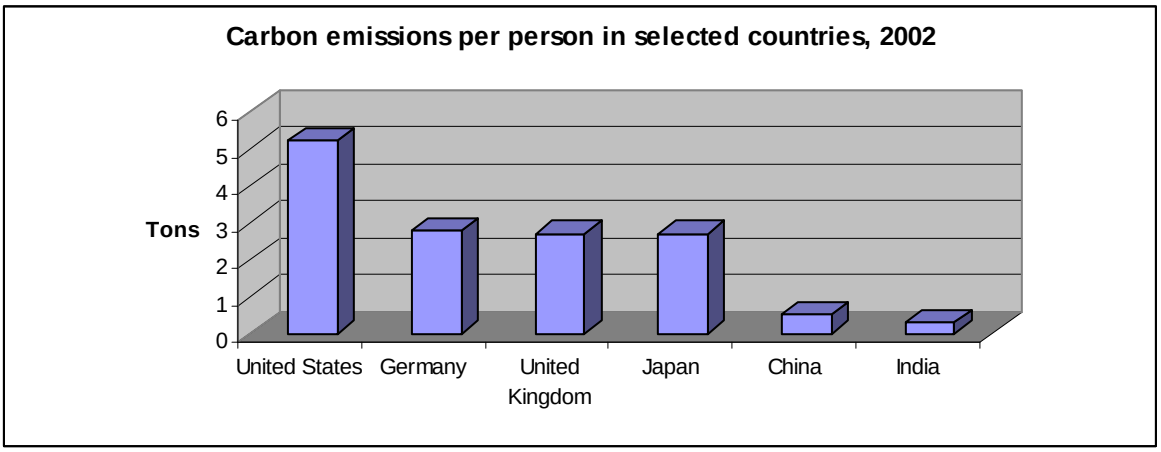


Figure 3.2 Carbon emissions per person in selected countries, 2002 (Sheehan, 2003)

Table 3.2 World CO_2 emissions 1751 – 2000 (Sheehan, 2003)

Year	**1751**	**1775**	**1800**	**1825**	**1850**	**1875**	**1900**	**1925**	**1950**	**1975**	2000
CO_2 emissions	**0**	**4**	**8**	**17**	**54**	**188**	**534**	**975**	**1 630**	**4 613**	**6 611**

South Africa's CO_2 emissions have increased steadily from 1990 to 2001, much like the rest of the world. From table 3-4 it is clear that fossil fuel-related emissions have increased by 20 million metric tons in only 10 years.

Table 3.3 Fossil Fuel-related Carbon Dioxide Emissions in South Africa, 1990-2001 (Lynch, 2004)

(in millions of metric tons of carbon)

Component	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
CO_2 from coal	65.95	68.17	70.10	69.27	76.46	76.29	77.30	86.30	80.35	82.98	84.2	**86.18**
CO_2 from natural gas	0.00	0.00	0.02	0.96	1.04	1.04	0.98	0.96	0.85	0.82	0.96	**1.04**
CO_2 from petroleum	14.93	15.96	16.43	16.11	16.25	16.52	16.85	16.39	17.45	18.25	18.88	**17.97**
Total CO_2 from all fossil fuels	**80.88**	**84.13**	**86.56**	**86.34**	**93.76**	**93.85**	**95.13**	**103.6**	**98.66**	**102.0**	**103.0**	**105.1**

Note: components may not add to total due to rounding

It is clear that CO_2 emissions have greatly increased during the latter part of this century. Massive industrial and economical commitments are being made in order to curb this trend. Large investments are being made by companies like General Electric, Intel and Toyota in efforts to curb these emissions. The Kyoto Protocol is the most recent addition to the world's regulations on power.

3.6.2 Kyoto Protocol

It is evident that the environmental problems that the world faces are enormous, and on 11 December 1997 the Kyoto Protocol was adopted in Japan, which stipulates legally binding targets to limit or reduce greenhouse gas emissions for various countries (www.unfccc.kyoto/protocol/items/2830.htm). The Kyoto Protocol is an international endeavour which commits the participating countries to limiting and reducing greenhouse gas emissions. By signing or ratifying the Kyoto Protocol countries legally bind themselves to these limitations, thus attempting to make significant changes in the greenhouse gas emissions. The accumulated cut in emissions aims at 5% of 1990 levels in the commitment period between 2008 and 2012 (www.unfccc.kyoto/protocol/items/2830.htm). Reductions in CO_2 emissions are mandatory among the 124 countries that have already accepted the accord (Carey, 2004). The Kyoto Protocol should not be considered a small achievement. The majority of the world has agreed that a

problem exists and that something needs to be done about it, and has agreed to participate actively in making a real difference.

Technology needed to reduce greenhouse gas emission already exists, but economic and political structures are not in the position to actively reduce greenhouse gas emissions. Putting the available technology in place will require investment, policy and commitment from governments. It is not an easy commission, but the cost to the environment has become so great that the alternative is no longer an option (www.unfcc/kyoto/protocol/feeling_the_heat/items/2912.htm).

3.7 Environmental Cost

The current world dependence on the provision of energy through the burning of fossil fuels cannot be sustained for much longer than 40 years, according to Dr Herman Scheer, chairperson of the World Council for Renewable Energy (Olivier, 2004). Dr Scheer warned that fossil fuels are limited and will be depleted within the next 40 years (Olivier, 2004).

More than twenty years ago, Walton and Warren (1982) warned that "[r]eserves of our principle energy sources, the fossil fuel (coal, oil, and natural gas) and uranium, are finite and essentially non-renewable. Furthermore, our energy consumption has been growing at a rapid rate. The consequences are unavoidable" (p. 3). Depletion of fossil fuels in various countries will inevitably lead to war over scarce resources if other means of energy generation are not implemented. The cost to the environment is not realistically reflected in the price of energy, as fossil fuels have to be mined and emit harmful gases during the process of energy generation.

In consideration of all the elements involved, the cost of energy cannot easily be determined. Costs that should be calculated include the destruction brought about by resource extraction; pollution to the water, soil and air causing acid rain and biodiversity loss; and the consumption of massive amounts of fresh water (Sawin, 2003a). According to Sawin, the costs of fossil fuels will become increasingly erratic as demand rises and the supply countries suffer under conflict and political pressure. This will inevitably influence the world economy as most countries are still dependent on fossil fuels as their main source of energy.

The accessibility of coal in South Africa lowers the cost of electricity significantly. This could be used to our advantage. As is clear from table 3-4, the cost of producing solar panels is very high; in fact, electricity is the highest input cost in developing photovoltaics (or solar panels) (Greyling,

2004). South Africa, with a climate very suitable for solar power use, has a "huge competitive advantage" (Greyling, 2004, p. 9) because of the low price of electricity. The high cost of producing solar panels, does not, however, defeat the purpose of more efficient energy use. According to Capra (1997), it is important to count the cost of conventional energy production honestly in order to prove that solar energy is efficient, because "the social and environmental cost of production is not part of current economic models. The costs are labelled 'external' variables by corporate and government economists, because they do not fit into their theoretical framework" (p. 292). He continues to state that air, water, and soil are treated as free commodities, which is why coal is currently considered more efficient. These external costs are explored in table 3.4 below. The monetary values are given in American cents because the external cost of conventional energy generation has not been calculated in South Africa.

Table 3.4 Cost of electricity with and without external costs (Sawin, 2003a, p. 89)
(U.S. cents per kilowatt-hour)

Electricity source	**Generating costs**[1]	**External costs**[2]	Total costs
Coal	4.3-4.8	2-15	**6.3-19.8**
Natural gas	3.4-5.0	1-4	**4.4-9.0**
Nuclear	10-14	0.2-0.7	**10.2-14.7**
Biomass	7-9	1-3	**8-12**
Hydropower	2.4-7.7	0-1	**2.4-8.7**
Photovoltaics	25-50	0.6	**25.6-50.6**
Wind	**4-6**	**0.05-0.25**	**4.05-6.25**

[1] For the United States and Europe

[2] Environmental and health costs for 15 countries in Europe

South African statistics on energy generation and consumption could aid in developing an understanding of why the cost to the environment in South Africa is not reflected in the cost of electricity. From table 3.5 it is clear that the total primary energy production (TPEP) and the total primary energy consumption (TPEC) in South Africa (shown in table 3.3) differed for several consecutive years. Bothma (2004) noted that a constant oversupply of energy by Eskom, who made massive investments in their supply capacity during the 1980s, caused electricity to remain at a relatively low price and considerably delayed any efforts directed towards energy-efficient production facilities. Recently, however, Eskom has had to open mothball stations and has plans to build new ones because of an increase in demand.

Table 3.5 South Africa's TPEP and TPEC, 1990-2001 (Lynch, 2004)
(in Quads)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
TPEP	4.05	4.12	4.21	4.30	4.60	4.84	4.86	5.44	5.52	5.43	5.56	**5.59**
TPEC	**3.36**	**3.52**	**3.75**	**3.72**	**4.06**	**4.09**	**4.12**	**4.51**	**4.33**	**4.51**	**4.55**	**4.60**

Note: 1 Quad = 1 quadrillion Btu (British thermal unit)

As an effect, the production and implementation of renewable energy in South Africa has been retarded. Not only is the implementation of renewable energy influenced by the constant oversupply of electricity, but existing legislation may also play a significant role.

3.8 Environmental Legislation in South Africa

The United Nations Development Program (UNDP) has stipulated four energy priorities for the attainment of energy efficiency (http://www.undp.org/seed/eap/html/priorities.htm):

- strengthening National Policy Frameworks by incorporating sustainable energy considerations into three types of policy: a) macro-economic reform, b) energy sector reform and c) sustainable development planning. These will aid in infiltrating national economic and environmental practice in many countries
- promoting rural energy services. Household and productive activities in rural areas are to be supported, focussing mainly on heating, cooking and electricity needs
- promoting clean energy technology. Global environmental protection and local development needs can be addressed by modern energy technologies available
- increasing access to financing for energy. Developing countries' ability to attract foreign investment should be enhanced for sustainable development needs

Industrial and economic sectors worldwide are investing many resources in the conversion from traditional energy sources to renewables. In South Africa, however, the conversion is slow and "[i]t seems our government and Eskom only see renewable energy technology as something they begrudgingly accept to temper the fact that we are the fourteenth biggest producer of greenhouse gasses in the world" (Greyling, 2004).

According to the Constitution of the Republic of South Africa 1996 Act no. 108 of 1996, everyone has the right to

a) an environment that is not harmful to their health or well-being; and
b) have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures that –
    (i) prevent pollution and ecological degradation;
    (ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

It should always be kept in mind that although South Africans have the right to all of the above privileges, we also always have the *responsibility* to ensure these privileges for our community and ourselves. Government should thus not only allow every citizen the right, but also require them to act accordingly through policies and legislation that support this constitutional right.

3.9 Distribution and Demand

The distribution of energy is a contentious issue in South Africa. Many people who live in informal housing do not have access to energy. According to Quin (2004), the Soweto Electricity Crisis Committee (SECC) serves as an excellent example of the South African crisis of distribution, pirating electricity from nearby sources because they cannot afford it. This commission "empowers" people in its community by teaching them how to "connect themselves" (Quin, 2004, p. 143). The fragmented market structure for electricity distribution makes it difficult for the South African government to oversee electricity distribution. Problems are worsened because of the great differences in wealth that exist between municipalities, and price variances. According to Lynch (2004, p. 34), "lack of economies of scale, skill and specialisation" are also included in the list of problems experienced by the Electricity Supply Commission (Eskom) and government alike. Additional problems incurred by government and Eskom are "[p]oor management at many operators, and questionable government cross-subsidies" (Lynch, 2004, p. 34). Plans to change the distribution structure have been on the table since 1997, but few communities have seen any improvement.

The implementation of renewable energy in the domestic environment could assist in, firstly, lowering the demand for electricity in urban areas, for example by minimising the amount of energy used for water heating purposes, which accounts for half of all energy used in the suburban home (http://www.eskom.co.za). Secondly, implementing innovative methods of energy generation in informal and low-cost housing units would decrease the need for a centralised infrastructure while providing access to water and electricity to the many that currently have no access to such services. Although industry remains the largest user of energy (Greyling, 2004), direct, domestic exposure to solar panels may help to increase environmental awareness and may increase the use of solar power in the domestic, small business and industry spheres.

3.10 Energy in the Domestic Environment

3.10.1 Renewable Energies

Various renewable energy sources are available, but most of the techniques work on a large scale. To initially supplement and hopefully eventually replace their current generation techniques, utility companies could use geothermal energy, oceans and hydroelectricity. Other methods such as the use of methane or biogas would work better in medium scale enterprises such as agricultural communities or farms. The use of renewable energy sources in single unit dwellings is limited to the use of solar systems or hybrids using combinations of energy generation techniques to produce the required amount of energy for a household. Both of these are discussed below.

Table 3.6 Principal Energy Resources (Walton & Warren, 1982, p.10)

Non-renewable	Renewable
Fossil fuel - coal - natural gas - petroleum	Biomass
Uranium	Geothermal
	Oceans
	Solar (domestically functional)
	Water
	Wind (domestically functional)

The bulk of the energy used in homes is used for heating or cooling the built environment, and maintaining the lifestyle of the inhabitants (Veitch & Arkkelin, 1995). The type of building and the efficiency of the appliances in the home can greatly influence the efficiency of the household energy use. However, the current situation may be so bad that energy efficiency is no longer a strong enough measure, and that active steps away from conventional energy dependence need to be taken to limit our energy use. Veitch and Russel (1995) pose the question of whether it is public misunderstanding of solar technology or the low price of oil and other fossil fuel-based products that inhibit the installation of renewable energy on a large scale.

3.10.2 Domestic Use of Solar Energy

Solar energy can be used in various ways. Distinctions are made between passive and active solar models in which the energy of the sun is employed in different ways to yield different forms of energy. Passive solar systems include various forms of energy conservation using building

design, siting and landscaping. The elements that form part of passive systems are not distinct. Active solar systems, however, include those energy-producing technologies which apply distinct elements to a building.

Solar water heating systems have come a long way from being an expensive, bulky, high maintenance solution to being affordable, compact and very low maintenance. Eliminating the conventional hot water system (a geyser) decreases domestic energy use by 50%, which makes financial and environmental sense. These systems are small and easily adaptable to various installation situations (www.solahart.co.za). The implementation of such a system in suburban homes should drastically reduce the peak time demand on electricity (caused by the demand for hot water when people get home) and would allow more users to be reached using the same grid (www.eskom.co.za/dm.htm).

Another option available to users is photovoltaic devices. These devices consist of what is commonly known as solar panels. Photovoltaic devices have no moving parts and therefore differ fundamentally from the heat engines used to generate electricity from both sunlight and wind. The full explanation of how photovoltaic cells function is beyond the scope of this chapter (refer to Kelly, 1993), although a very simplified explanation is that sunlight can free an electron in some materials, and when many electrons are freed in the presence of negative and positive poles, a current develops. Solar panels are designed with two opposing poles and are made of material (such as silicon) that frees electrons easily. These very specialised materials are the main contributors to the high cost of solar panels (Kelly, 1993).

Photovoltaics are often used in the following domestically viable ways:

- The most common form of photovoltaic panels is flat panels fixed to roofs and other high structures in the direction of the sun.
- Concentrator systems use optics to concentrate the rays of the sun, and therefore amplify the power of the sun by as much as 5000 times. These high concentrations are only possible through the installation of one-axis or two-axis tracking systems that follow the sun throughout the day (Kelly, 1993).

The cost of solar energy still seems to be a major constraint in the implementation of solar systems, whether these be active or passive systems. More than a decade ago Kelly (1993) listed the cost of solar panels as one of the major barriers to the popular installation of solar panels, a statement that is still relevant today (Bothma, 2004) . The current total cost of electricity

for a household of two people is listed in table 3.7 below. In the second column, the environmental cost is indicated.

Table 3.7 Electricity cost versus environmental cost (Sawin, 2003a, p. 89)

Electricity

Current Cost	*Environmental Cost*[1]	*Total*
4.8c per kilowatt-hour	15c per kilowatt-hour	19.8c
3000 kilowatt-hour per month	3000 kilowatt-hour per month	3000 kwh
R 144.00	R 450.00	**R 594.00**
R 144.00 * 12 = R 1,728.00	Electricity bill for one year	
R 1,728.00 * 30 = R 51,840.00	Electricity price for 30 years considering no price increase	
R 594.00 x 12 = R 7,128.00	Electricity bill per month, environmental costs incorporated	
R 7,128.00 x 30 = R 213,840.00	Electricity bill for 30 years if environmental costs are added in monetary value	

3.10.3 Hybrid Energy

Hybrid energy is used more often in Europe to make renewable energy sources more feasible. A mixture of different energy sources is used to supply a reliable current. In recent developments in Germany, for example, wind energy is combined with solar and conventional energy to provide a home with adequate ventilation, hot water and electricity (Guterl & Romano, 2004). According to these authors, hybrid energy is probably the way of the future as individuals will be able to make use of electricity generated by municipalities and supplemented by energy generated by their own solar panels and micro turbines. Two-way energy grids will be in place allowing individuals to sell electricity to the municipality when they produce more than is needed for their household. Cars will probably be converted to hydrogen or biomass energy in order to limit the use of fossil fuel for transportation. These options are not yet available to any world citizens, but the implementation of renewable energy systems in homes is surely part of the future action to be taken.

In the following section the psychological aspects of people's attitudes toward implementing renewable energy systems in the home is explored. These are explained primarily by

psychological theories that pertain to the psychological reasoning of the energy consumer and how reasoning, attitudes and values influence actual behaviour.

3.11 Psychological Aspects of Attitudes toward the Use of Renewable Energy Sources

The assumption could be made that a positive attitude to renewable sources results in people installing these systems in their homes. This is not always the case, for although many people think it should be done, actually implementing these behaviours, changing habits and accepting changes in lifestyle does not happen so easily. In this section the link between attitudes and behaviour is explored by means of several psychological theories that all interact with one another.

3.11.1 Attitudes and Behaviour

Although this study focuses on attitudes and perceived implications for quality of life, it is important to realise that a positive attitude does not always lead to the implied positive behaviour. Although this study may succeed in accurately identifying people's attitudes and their perceptions of the implications of domestic use of renewable energy sources for quality of life, positive behaviour depends on various other factors and not solely on good intentions. Behaviour may be influenced by the relevance of the attitude to the behaviour, the strength of the attitude, including its stability and importance, as well as the particular situation (Feldman, 2001).

According to classical studies done by Ajzen and Fishbein (1977), the importance of attitude should be considered in a comparison of attitudes and the actual behaviour that follows. It could be that environmental concern does not play a role in making decisions about energy in the home, but that the financial aspect receives substantial consideration. Environmental concern may be an irrelevant attitude in the domestic energy decision-making process, and may be superseded by various alternatives. Therefore the relevance of the attitude should be kept in mind.

A number of behaviours may be influenced by a single underlying attitude which may thus be presented in many forms. Both the strength and the stability of the attitude may influence the extent to which it is realised. The stability of an attitude seems to increase as the time of holding such an attitude increases. Attitudes with strong bases and a lengthy existence is more likely to be enacted into behaviour that is consistent with the attitude (Doll & Ajzen, 1992).

Giles and Cairns (1995) add two more aspects of attitudes that may influence behavioural intention. Firstly, decision-makers consider what is perceived to be socially acceptable behaviour,

and secondly, they evaluate the difficulty of executing the behaviour. If it is not socially acceptable to install solar panels on your roof (e.g., for aesthetic reasons), and the availability of such a system is low, then an attitude of environmental concern may be irrelevant. Thirdly, the situation plays a central role in the decision-making process. Several issues may influence the decision. The theory of planned behaviour, developed by Ajzen and Fishbein (1980), attributes behaviour to a rational decision-making process involving several aspects, thus taking various attitudes into consideration (relevance and strength). The result may thus be a behaviour that conflicts with a person's attitude.

Another theory on attitudes and behaviour shows that although positive attitudes may be followed by the expected behaviour, the behaviour can only be predicted under certain circumstances. Attitudes are only good indicators of the behaviour that can be expected if no barriers to action are in place (Gardner & Stern, 1996; Guagnano, Stern & Dietz, 1995). These barriers are suggested to occur in the form of a chain. The framework below suggests what some of the barriers could be (Gardner & Stern, 1996, p. 78).

Table 3.8 Chain of causal factors that may influence behaviour (Adapted from Stern & Oskamp, 1987)

Level of Causality	**Type of variable**	**Example**
7	Household background	Income education, number of household members
6	External incentives and constraints	Energy prices, size of dwelling, owner/renter status, available technology, difficulty and cost of energy conservation action
5	Values and worldviews	New environmental paradigm, biospheric-altruism values, postmaterialism
4	Attitudes and beliefs	Concern about national energy situation, belief that households can help with it, belief that neighbours expect you not to waste
3	Knowledge	Knowing that water heater is a major energy user, knowing how to upgrade attic insulation
2	Attention, behavioural commitment	Remembering to install weather stripping before heating season
1	Resource-using or resource-saving behaviour	Decreased use of air conditioner, purchase of high efficiency furnace, lowering winter thermostat setting

This table depicts a chain of causal factors that may influence behaviour resulting in resources-using and saving behaviour (level 1). These factors may influence behaviour at any of the levels.

If an interruption in the chain occurs at any level, the expected behaviour may not occur; this is the case in both directions. Attention (level 2) may influence knowledge (level 3) as much as attitude (level 4) may influence attention (level 2) or behaviour (level 1).

3.11.2 Theory of Reasoned Action

Although behaviour is not the focus of enquiry during the discussions with the respondents in this study, it is still important to give a brief overview of what the theory entails in order to aid the conceptual discussions in chapter six and seven. The theory of reasoned action (TRA) has been widely cited in the field of psychology because of its economical explanation of action (Thøgersen, 2004). This theory teaches that action is a direct result of volitional intention.

Ajzen (1985) states specifically that "people can easily perform these behaviours, if they are inclined to do so" (p. 12). Figure 3.3 below gives a visual representation of what the theory of reasoned action entails.

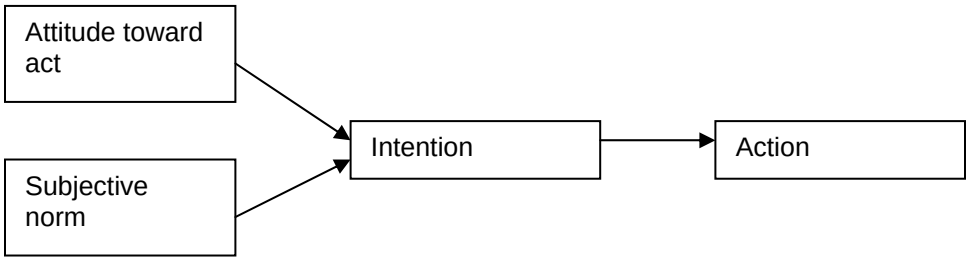


Figure 3. 3 The theory of reasoned action (Bagozzi, Gürhan-Canli & Priester, 2002, p. 70)

People generally tend to state that they plan to make use of renewable energy sources at some stage in future, but that they have not looked into the possibility and do not intend to use it the near future (Bell, Greene, Fisher & Baum, 2001). In the subsequent section we will look at the theory of planned behaviour.

3.11.3 Theory of Planned Behaviour

The theory of planned behaviour (TPB) is an extension of the theory of reasoned action and was changed to include the possibility of a third variable in the decision-making process that would lead to action. The additional predictor refers to "the person's belief as to how easy or difficult performance of the behaviour is likely to be" (Azjen & Madden, 1986, p. 457). The basic premise of this theory is to consider that a person's intention could be influenced by aspects such as the perception that renewable energy sources are unsafe, and could thus influence the behaviour demonstrated, even though the intention to use renewable energy may have existed. Figure 3.4 below, from Bagozzi et al. (2002), indicates how the theory of planned behaviour differs from the theory of reasoned action (figure 3.3 above).

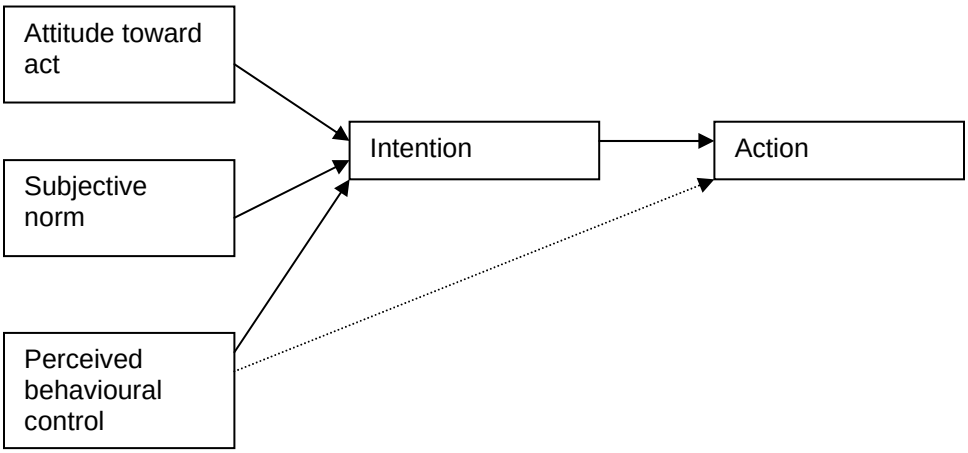


Figure 3.4 Theory of planned behaviour (Bagozzi et al., 2002)

As seen in figure 3.4, perceived behavioural control has an impact on both the intention and the actual behaviour of the respondent. This theory is used in chapter 6 to aid the researcher to explore and discuss the factors that could influence either the intention or the behaviour of the respondent to make use of renewable energy sources in the home. Some of the aspects that influence behaviour could have been learned through the process of social learning. The theory of social learning is discussed in the following section.

3.11.4 Social Learning Theory

Pennington (1986) describes the social learning theory formulated by Bandura, Ross and Ross (1961) as being based on observational learning. Social learning theory advocates that people learn through the exercise of observing people around them. For instance, children learn frequently from their parents, while adults learn from their neighbours, colleagues and families.

Learning takes place through observing the consequences of the behaviours of another person. If the observer perceives the consequences as rewarding, the likelihood of that person imitating the behaviour at a later stage is increased (Pennington, 1986). Attitudes are often acquired through this process of observation (Feldman, 2001). The reasons for the acquisition of attitudes are discussed briefly in the following section.

3.11.5 Acquisition of Attitudes

Why attitudes are acquired may influence what people do with attitudes. According to Feldman (2001), attitudes have two main functions: first, to help people to organise the world around them and make sense of it, and second, to create and maintain a positive sense of self.

i) Knowledge function of attitudes

Attitudes help people to acquire information about the immediate environment and to make decisions about people and the environment in the shortest possible time span. Bateson (1972) describes another function of attitudes. He refers to the economics of flexibility as being important because it is wasteful to use the computation resources of our brain where they are not needed. He describes flexibility as the ability to deal with novel situations by means of a trial-and-error approach, while actions we have repeated several times over become much easier to master.

Similarly, attitudes help people to classify others and situations quickly with the use of the subconscious attitudes already formed by means of trial-and-error. We seldom evaluate people or situations without preconceptions. Rather, we make several assumptions about a person, product or situation by taking in cues from the environment, in order to quickly form an opinion. If these cycles are repeated often, the thought process becomes habit, and these habits gradually become less and less flexible. In systems theory these cycles could be called feedback loops. Feedback loops work on the basis that information received in one cycle is incorporated into future cycles. Feedback loops are discussed in section 8.1.9 that focuses on attitude change.

It is important to realise that flexibility helps people to make more accurate assumptions (most of the time). However, if this flexibility is threatened because of increased attention to an aspect that has become subconscious, the flexibility of other functions is lessened (Bateson, 1972). The system in which the person operates is changed and this has effects throughout the system. The crucial variables whose stability depends on this flexibility may in turn become unbalanced. In a later section Bateson's (1972) habits of thought are discussed.

ii) Self-function of attitudes

Feldman (2001) explains that attitudes may also enable a person to "create and maintain a positive sense of self" (p. 335) by sharing attitudes with people whom we associate with, or with whom we would like to associate. A greater sense of belonging may also be experienced through expressing attitudes congruent with the specific group with which the person is affiliated.

3.11.6 Habits

Habits are emphasised in the environmental literature because of the impact that high-frequency behaviours have on the environment (Thøgersen, 1994; Verplanken, Aarts, van Knippenberg & Moonen, 1998). According to Pervin and John (2001, p. 373), habit is "an association between a stimulus and a response" and "personality structure is largely composed of learned habits". It should be emphasised that a frequent association between a stimulus and a response may

eventually become more that just a habit; it may become an attitude or even a value. Shaffer (1999) also notes that habits eventually represent the "stable aspects of one's personality" (p. 47).

Past behaviour seems to play a role in the prediction of intentions and future behaviour. Past behaviour could also be a predictor of the perceived level of behavioural control (Terry, Hogg & White, 1999). Habits are often simple behaviours that can be executed automatically by a person. More complex habits tend to become routinised, meaning that a person does not execute the action as force of habit, but as a semiautomatic response pattern (Bargh, 1989). Such a description is "appropriate for understanding any habit" (Knussen et al., 2004, p. 240). Ouelette and Wood (1998) emphasise that intentions tend to be repeated in a semiautomatic, non-habitual manner, without being based on conscious reasoning, similar to simple habits.

According to Bateson (1972), habits of thought refer to much more than what people usually mean when saying something is a habit. Bateson focuses on the development of habits of thought. A habit of thought usually starts with reality, from which a person derives his or her own interpretation. This interpretation quickly becomes a map of the reality that exists independently of the interpreter. When a person thinks about the domestic use of renewable energy sources, he or she may conjure up an image of a renewable energy system. It is important, however, to realise that this image is different in each person's mind, because the image is a map of the reality and not the reality itself.

The map that people may have (which inevitably differs from person to person) is constructed through people's perception of differences that they may consider as important. Therefore, maps of renewable energy sources may differ from person to person because the differences they perceive are different. The map may also be viewed at different levels. One level may represent an individual's map of renewable energy based on his or her own experience, while another level may include the larger governmental and legislative framework, which would make the map look very different. Maps could thus be viewed in part or as a whole, and each map contains different levels of difference (Bateson, 1972).

Feedback loops are relevant here. Our mental maps are often used to make attributions about other people, situations and even products. These attributions may also be called assumptions. As described in section 8.1.3.1, assumptions usually help people to make decisions faster and more accurately. When people use maps to make assumptions, these assumptions are sometimes proven wrong. When this happens, feedback on the map is received and certain adjustments might be made. If the feedback supports the assumption, for instance, the

assumption was that renewable energy sources are expensive and a person finds out that in fact they are quite expensive, the assumption is strengthened. If a map is accurate according to the feedback received, a person may become surer about the map, and may eventually even forget about the true reality (the essence) and only use the map (Bateson, 1972). A habit of thought may be formed when people start to confuse the map with reality because they are in the habit of looking at the map and not re-evaluating it against reality.

Habits of thought influence future attributions and planned behaviour. In some cases, however, people hold attitudes that directly contrast with their intentional or planned behaviour. In such cases the person will experience some form of unease. This is commonly referred to in psychology as cognitive dissonance, and is examined in the following section.

3.11.7 Theory of Cognitive Dissonance

Festinger's (1957) theory of cognitive dissonance has been widely used to explain human behaviour. He defines dissonance as a negative state that drives people whenever they hold two ideas or attitudes which are not psychologically consistent (Pennington, 1986). The basic assumption of this theory is that a person's "desired state is one of balance and harmony among beliefs and attitudes" (Pennington, 1986, p. 71). The concepts of forced-compliance and effort are discussed in more detail below, because the researcher suspects that they may be relevant to the respondents in this study.

i) Forced-compliance

> The less a person is paid for doing something against his beliefs or attitude the more he or she is likely to change those beliefs or attitudes. Conversely, the more a person is paid to do such a thing the less he or she has to justify it to him/herself, consequently, the less likely are his or her attitudes to change. (Pennington, 1986, p. 73)

The above is a good example of what happens when people are forced to comply with an action that is in direct contrast with the attitudes they hold (Zimbardo & Leipp, 1991). The application of this theory suggests that, when forced by government to implement renewable energy sources in their homes without incentives, people who do not value environmentally responsible behaviour may express more positive attitudes toward the environment. In order to attain "harmony" (Penningtoin, 1986, p. 73) between their actions and attitudes, they are likely to change their attitude because of the necessitated change in their actions. This is, however, not likely to

happen in South Africa, since there is no legislation in place pertaining to renewable energy usage and forced-compliance is thus not prevalent.

ii) Effort

Another aspect that individuals may react to is the amount of effort necessary to implement the use of renewable energy sources in the home. Following the theory of cognitive dissonance with regard to effort, we may predict that the more effort required of a person to attain a specific goal, the more likely that person is to perceive the goal as attractive (Pennington, 1986).

Self-perception adds another dimension to Festinger's (1957) cognitive dissonance theory. According to this theory, attitudes tend to shift when justification for a specific behaviour is low and tend to remain stable when justification for behaviour is high. In this research for instance, the respondents have often requested incentives from government to install renewable energy sources in their homes. If these incentives were offered, but limited, they would be more prone to show positive attitude changes with regard to environmentally responsible behaviour. According to Bem's (1967) and Festinger's (1957) theories, attitude change would occur because people would reason that the change in their behaviour (i.e., increased use of renewable energy sources) is due to their support of this action rather than the trifling incentive. In this way, the attitude changes to coincide with the behaviour.

Bem (1967) postulates that people sometimes form and maintain attitudes by observing themselves (similar to the process of observing others in the social learning theory discussed above). Thus, without the implementation of incentive programmes, individuals reaffirm their attitudes by observing their own behaviour (Feldman, 2001).

3.11.8 Attribution Theory

Zimbardo and Leipp (1991) describe attribution theory as a situation in which a person makes a judgement about a situation in which he or she "attributes the cause either to something about that [other] person's disposition or something about his or her situation" (p. 89). Dispositional attributes make assumptions about the personal characteristics of another person. It is reasoned that the person acted in a certain way because of personal beliefs and attitudes.

Situational attributions are made with reference to the social or physical environment that influences a person's actions. Respondents in this study may make dispositional and situational attributions to others who make use of renewable energy sources. These are explored in more detail in chapters 6 and 7.

3.11.9 Locus of Control

Rotter's (1966, 1982) personality theory of social learning includes the concept of locus of control. This concept refers to the "generalized expectancy concerning the determinants of rewards and punishments in one's life" (Pervin & John, 2001, p. 45). In other words, people may have a preconceived idea (acquired through social learning) about the level of influence they have in their own life.

Hiroto (1974) tested this by placing people, whose locus of control was tested beforehand, in either an escape or a no-escape situation. People with an external locus of control tended to take longer to avoid or escape the situation than people with an internal locus of control.

According to Sia, Hungerford and Tomera (1985-1986), environmentally responsible behaviour is exhibited more often by people with an internal locus of control. People with an internal locus of control tend to recycle materials more often because they perceive environmental problems to be their responsibility (Gifford, 1997). Thøgersen (2004) conducted research on consistencies and inconsistencies in environmentally responsible behaviour and described several of the discrepancies in terms of locus of control. Thøgersen (2004) also makes the link between cognitive dissonance, perceived control and locus of control in the following statement:

> The amount of dissonance produced by acting inconsistently not only depends on the individual's perception of the behaviours' relationship to the super-ordinate goal, but also on the level of his/her perceived volitional control over the behaviour (i.e. whether the reason for performing a behaviour is attributed to intrinsic motivation or external forces) (cf. Festinger, 1957). (p. 94)

The perception of the level of control over a certain situation may influence a person's reactions significantly. The following section focuses on perceived locus of control and the psychological responses to this.

3.11.10 Perceived Lack of Control

The perceived loss of control over an environmental situation usually leads to psychological reactance (Brehm, 1966), in which people try to regain control over the situation. If it is cognitively interpreted that the situation is beyond their control, learned helplessness may ensue (Bell et al., 2001). Evans and Jacobs (1981) conducted research in which the results showed that a perceived loss of control over air pollution seemed to reduce efforts to do anything to rectify the problem.

We thus witness several stages through which people go before reaching a stage of perceived lack of control. Personality traits such as locus of control play a contributing role, and people offer some resistance in the form of psychological reactance before giving up attempts to change the situation in which they find themselves. The impact of this process of assessing the level of control an individual has over a certain situation is used as basis for the discussions on renewable energy implementation in chapter 6.

3.11.11 Reward and Punishment

Bell et al. (2001) describe four strategies to help bring about change in behaviour. Positive reinforcement is what respondents in this study often referred to as incentives, meaning that they gain something of value for exhibiting environmentally friendly behaviour. Negative reinforcement also brings about positive feelings because participants exhibit desirable behaviour. Negative reinforcement works on the premise that removing a negative outcome increases desired behaviour. For example, one respondent suggested allowing individuals with renewable energy generation sources to feed this back into the grid and have the amount contributed subtracted from the amount of conventional energy used.

Two other forms of influencing behaviour are relevant to this discussion. Punishment is the addition of a negative action and brings about negative feelings in the person receiving the punishment. This could be done by increasing electricity prices on a scale - the more you use the more you pay per unit. Alternatively, a user could be fined for exceeding a certain limit. The last method discussed by Bell et al. (2004) to influence behaviour is simply giving feedback. Feedback supplies information about the attainment of a certain environmental goal and motivates people to maintain energy efficiency levels.

On a larger scale, alternative forms of motivation may be necessary to instigate change, especially if the focus is on individual energy use by many people, for instance a whole city. One form is to make use of the strategy described above called the removal of barriers. Perceived barriers to certain environmentally friendly acts could be removed in order to increase the chances of those acts being exhibited. For instance, renewable energy sources could be made more available to consumers who might want to use them by removing the barrier of having to search extensively in order to find the products.

The second form of large-scale motivation would be to make policy changes. Bell et al. (2001) state that policy level interventions could have large-scale impacts on energy use. The last form of large-scale motivation is technological innovation. New technologies have been developed that use less energy, such as solar hot water systems, and could thus increase environmentally

responsible behaviour on a large scale. High volume purchases could result in positive effects, although problems often include resistance to change, high cost implications and little initial support for these technologies (Bell et al., 2001).

In some instances environmental behaviour change has lasted for long periods of time after the reward or punishment has been administered. This could have some effects on the attitudes of the people taking part in the reward/punishment programme. However, different strategies are suggested when attitude change rather than behaviour change is sought.

3.11.12 Attitude Change

In this section three methods of attitude change will be discussed, namely attitude change through education, attitude change through increased exposure and awareness to environmental issues and attitude change through availability of a resource.

According to Gifford (1997), environmental education is more often that not unsuccessful in changing levels of environmental concern. He states that studies or information tend to increase ecological knowledge, but do not have a significant influence on environmental attitudes. Bell et al. (2001) also state that "most studies have suggested that simply educating people is not tremendously effective at changing energy relevant behaviours, recycling efforts, or littering tendencies" (p. 481). More information, however, may ensure that perceptions are more accurate. Bagozzi et al. (2002) state that "novices' inferences about unknown attributes [of a product] can become more extreme over time when perceivers do not remember the absence of information" (p. 164). Thus education may be instrumental in increasing ecological knowledge and knowledge about specific products, although this does not guarantee that attitudes will change with the increase in knowledge.

Zimbardo and Leippe (1991, p. 253) say that "mere exposure leads to liking." This statement implies that increased exposure to the use and the technology of renewable energy systems may increase the liking of the idea and possibly lead to increased implementation of renewable energy sources. Various forms of persuasion and exposure could be used to bring about change in attitude.

3.12 Quality of Life

Originally, the concept of quality of life came from the medical sciences, with individual experiences of illnesses as the focal point. It thus became important to describe the measure of quality of life to avoid profound differences in research (Ferrans, 1996). According to Ferrans

(1996), the individual is seen to be the only accurate judge of quality of life, for only individuals are able to judge what they value. Quality of life is defined in terms of satisfaction with those aspects of life that the individual values most.

When using quality of life instruments, one presumes that the point of reference is stable, in other words, that an individual's attitude toward something will not change. Otherwise, changes in response to particular variables cannot be interpreted. However, attitudes are not constant: they contrast with time and experience and are personalised by such psychological phenomena as adaptation, coping, expectancy, optimism, self-control and self-concept.

Physical and emotional comfort impacts on the lifestyle of the individual to a large extent (Greenhaus, Callanan & Godshalk, 2000). In simple terms it could be described as the "satisfaction of wants" (Carley, 1983, p. 151). Energy plays a vital role in the satisfaction of these wants; energy moves us, warm us and feed us: "These resources [non-renewable resources] are directly related to our human settlements, to our way of life, and to the quality of life" (Gauthier cited in Jackson, 1978, p. 7).

Quality of life is described 'objectively' by Frick (1986, p. 2) as the "level of physical and mental health enjoyed", and 'subjectively' as "the sum of the perceptions and experiences [of people] and the judgements resulting from these perceptions and experiences." In considering this statement it becomes clear that a person's level of enjoyment is determined by intuitive perceptions.

Through extensive research on needs, values, human well-being and consumption patterns, Poortinga, Steg and Vlek (2004) identified 22 aspects that combine to determine people's perception of quality of life. The perceptions of renewable sources of energy and the impact on quality of life are discussed according to these aspects in chapters 5, 6 and 7.

Table 3.9 Twenty-two aspects of quality of life (Poortinga et al., 2004)

Aspect	**Description**
Aesthetic beauty	Being able to enjoy the beauty of nature and culture
Challenge/excitement	Having challenges and experiencing pleasant and exciting things
Change/variation	Having a varied life. Experiencing as many things as possible
Comfort	Having a comfortable and easy daily life
Education	Having the opportunity to get a good education and to develop one's general knowledge
Environmental quality	Having access to clean air, water and soil. Having and maintaining a good environmental quality
Freedom	Freedom and control over the course of one's life, to be able to decide for yourself,

	what you do, when and how.
Health	Being in good health. Having access to adequate health care
Identity/self-respect	Having sufficient self-respect and being able to develop one's own identity
Leisure time	Having enough time after work and household work and being able to spend this time satisfactorily.
Material beauty	Having nice possessions in and around the house
Money/income	Having enough money to buy and to do the things that are necessary and pleasing
Nature/biodiversity	Being able to enjoy natural landscapes, parks and forests. Assurance of the continued existence of plants and animals and maintaining biodiversity
Partner and family	Having an intimate relationship. Having a stable family life and having good family relations
Privacy	Having the opportunity to be yourself, to do your own thing, and to have a place of your own
Safety	Being safe at home and in the streets. Being able to avoid accidents and being protected against criminality
Security	Feeling attended to and cared for by others
Social justice	Having equal opportunities and having the same possibilities and rights as others. Being treated in a righteous way
Social relations	Having good relationships with friends, colleagues, and neighbours. Being able to maintain contacts and to make new ones
Spirituality/religion	Being able to live a life with an emphasis on spirituality and/or with your own religious persuasion
Status/recognition	Being appreciated and respected by others
Work	Having or being able to find a job and being able to fulfil it as pleasantly as possible

These twenty-two aspects can be summarised into four categories as defined by Ferrans and Powers (1985): health and functioning, psychological/ spiritual, social and economic, and family.

All these aspects that form part of quality of life are interrelated. This forms a system of attitudes, which in turn is formed by patterns of thinking. Habits determine the possibilities we allow ourselves. Bateson (1972) states that "the same is true of the psychology of the individual, where learning conserves the opinions and the components of the *status quo*" (p. 434).

3.13 Conclusion

The world's ecosystems are speedily being destroyed by our lifestyles. Carbon emissions are high and worldwide treaties are being signed and ratified to attempt to stop global warming. Many states have started to act, but many others are lagging behind. Little is being done by individuals. Many perceive their contribution to be negligible.

In this chapter energy trends in the world and South Africa were discussed in order to give a description of the energy environment in which the energy-consuming individual operates. The system of laws and compliance is another system that functions in the energy environment in which energy consumers find themselves. The use of legislation in the attempt to increase renewable energy use and environmentally friendly behaviour in general was explored.

Lastly, a description of the psychological theories that influence individuals' behaviour, attitude formation, value systems and attitude change were discussed to give insight into the individual as a separate system. The energy consumer as a system as well as the energy environment as a system are brought together in subsequent chapters. The discussions on the research in chapters 5, 6 and 7 are based on the intricate interaction of these systems that form part of the larger ecosystem.

CHAPTER 4

Methodology

4.1 Introduction

The purpose of this chapter is to give a description of the research design and justify why the approach that was followed was appropriate. The development of the interview guide and the influence of the guide on the data are discussed. The sampling methodology, the application of the interview guide, and the systems that played a role during the data collection are examined in depth to allow the reader the opportunity to understand the rationale behind this approach. Lastly, the method of analysis is discussed, allowing the reader to follow all steps of analysis with the use of an example from the data collected.

4.2 Methodology

The next section focuses on aspects such as the choice of the research design, the role the researcher plays in her research and the effects thereof; the development of the interview guide and the direction it gives to the discussions with respondents; the sampling method and its influence on the reliability of the research; and a description of the data collection phase. This section concludes with an outline of the method of analysis.

4.2.1 Qualitative Methodology

The researcher opted for a qualitative research methodology. Numerous studies focussing on environmentally responsible behaviour (e.g., Thøgersen & Ölander, 2003; Thøgersen, 2004), level of environmental concern (e.g., Teisl & O'Brian, 2003), intentions to act environmentally (e.g., Knussen et al., 2004), environmental values (e.g., Poortinga et al., 2004) and theories of planned behaviour (e.g., Ajzen, 1985; Knussen et al., 2004) formed the background to this research, as was discussed in chapter 3. These studies are important because they form the background to this research; however, they were conducted predominantly in Europe and the United States of America. A limited amount of environmental research has been conducted in South Africa focussing on South Africans' attitudes toward environmental concerns. This limited amount of South African literature failed to aid the researcher in developing a questionnaire for use in quantitative research. As a result, the researcher was obliged to opt for a more open

method of inquiry. It was decided that a qualitative method of enquiry would be used to enable the researcher to explore, rather than determine, certain aspects of the topic. Miles and Huberman (1994, p.1) emphasise that “qualitative data are a source of well-grounded, rich descriptions and explanations of processes in identifiable local contexts”, which is what the researcher needed.

Miles and Huberman (1994) also comment on the usefulness of qualitative data by stating that

> Qualitative data, with their emphasis on people’s ‘lived experience’, are fundamentally well suited for locating the *meanings* people place on the events, processes, and structures of their lives; their ‘perceptions, assumptions, prejudgements, presuppositions’ and for connecting these meanings to the **social world** around them. (p.10)

In scrutinising the attitudes and perceived implications of renewable energy source use for a respondent’s quality of life, a qualitative methodology permits the researcher a peek into the meanings and their influence on the social world that are formed by respondents.

In summary, considerations that influenced the selection of a qualitative methodology included the lack of South African literature on the topic and a need for rich, descriptive data. Since qualitative data are grounded in the experiences of people, they tend to yield deeper information and allow the researcher a level of flexibility to explore the research topic with more freedom than is allowed by quantitative studies.

4.2.2 Systems Theoretical Framework: The Researcher as Part of the Research

> According to the systems view, the essential properties of an organism, or a living system, are properties of the whole, which none of the parts have. They arise from the interaction and relationship between the parts. These properties are distorted when the system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, these parts are not isolated, and the nature of the whole is always different from the mere sum of its parts. (Capra, 1997, p. 29)

The above quote ties in with the epistemology of the researcher. The researcher forms part of the human system in which the research was conducted, analysed, interpreted and ultimately discussed. Therefore the 'realities' identified by the researcher may in some cases be different from those of another researcher. It is "not possible to simply hold up a mirror to participants' views” (Henwood & Pidgeon, 1995, p. 15). Data are always interpreted by the researcher.

Acknowledging this stance, the interview remains an attempt by the researcher to *understand* the point of view of the respondent by means of a purposeful discussion in order "to unfold the meaning of people's experiences, to uncover their lived world prior to scientific explanations" (Kvale, 1996, p. 1). The researcher forms an integral part of the research design, the development of the interview guide, and the style of the interview, and continues to do so into the various stages of analysis.

Qualitative methodology allows the researcher the opportunity to probe the links made by respondents. Respondents make meaning of the world through interpretation. During the discussion with respondents, the ways in which they interpret the world around them, and their maps of the systems around them, are explored. The qualitative method allows the researcher to investigate these maps in order to understand how the respondents make meaning of their experiences.

The systems theoretical approach promotes the concept that researchers are constantly aware of the perceptions that they themselves contribute to the research being done. This is important for the outcomes of the research are not solely based on the discussions with respondents, but also include the interpretations and perceptions of the researcher (Bateson, 1972). The systems theoretical approach thus allows the researcher to become part of the research. From an ethical point of view, respondents and other researchers alike should note that results of this study are an interpretation by the researcher. This should be kept in mind when the outcomes of the study are discussed in chapter 7.

4.2.3 Semi-structured Interview as Research Method

Several factors contributed towards the selection of a semi-structured, in-depth interview as method of inquiry. According to Smith (1998), semi-structured interviews are often used when “[t]he investigator has an idea of the area of interest and [has] some questions to pursue” (p.12). The researcher wanted to be able to adjust the interview questions in response to answers given by the respondents. Another reason for the choice of this method was that it enables the researcher to respond naturally during a conversation with the respondent and so elicit the “psychological and social world of the respondent” (Smith, 1998, p.12).

The semi-structured interview as data collection method was thus deemed appropriate in light of the research requirements and constraints. The exploratory nature of the study necessitated an approach where the respondent is allowed ample opportunity to discuss the topic at length without too much intervention from the researcher. In the following section the development of the interview guide is discussed.

4.2.4 The Interview Guide

Schmidt (2004) states that "[t]he analytical categories and instruments for the semi-structured interview, designed and carried out in the spirit of qualitative research, are developed in response to the demands of the material collected" (p. 254). As stated in section 4.1.1, research material collected during the literature review generally originates from European and North American sources; there is a paucity of literature on the specific issues examined in this study within a South African context. The interview guide therefore had to tailored to allow an exploration the world of attitudes towards and perceptions of renewable energy sources, rather than asking direct pre-empted questions.

i) Initial interview guide and pilot study

The exploratory nature of the research and the paucity of available literature on research in this area necessitated a pilot study. After the overall issues to be discussed during the interview were identified, the interview structuring exercise began. A "broad range of themes" (Smith, 1998, p. 13) was identified by means of the literature study. These aspects were grouped into categories, sequenced to flow into one another. Questions were formulated in a way that prevented suggesting answers when the questions were posed to the respondents.

The groupings included:

- Exploration of the daily life of the respondent in order to understand the level of exposure to environmental issues on a daily basis;
- The level of environmental concern;
- The level of understanding of available renewable resources;
- The necessity of the use of renewable resources;
- The cost implication to the environment of conventional energy generation versus generation by means of renewable energy sources;
- The cost of the domestic use of renewable energy sources;
- The perceptions coupled with the domestic use of renewable energy sources;
- The implications (on a micro-, meso- and macro level) of the domestic use of a renewable energy systems; and
- The perceived change in lifestyle as a result of the domestic use of a renewable energy system.

A pilot study was conducted with two respondents working in the environmental sphere using the preliminary interview guide. The respondents that were selected for the pilot studies resembled the desired sample group, except that they did not comply with the criterion that they receive remuneration for their services to the environment. As Abrahamson (1983) indicates, the major

criterion of pilot studies is that "elements in the pilot study are as identical as possible to elements in the final sample" (p. 209).

During the pilot study it became apparent that an apparent repetition of groupings tended to cause confusion when questions were posed to the respondents and that respondents would assume that they have already answered the question. Although questions did not give an indication of the 'preferred' answer they were phrased in a very rigid manner. This discouraged conversation and interviews became short and shallow.

The researcher thus opted for another approach in order to engage respondents in conversation about aspects that influence perceptions of renewable sources of energy and the perceived implications of the domestic use of these sources.

ii) The revised interview guide

Feedback from the two pilot study respondents was taken into consideration when developing the revised interview guide. With semi-structured interviewing the interview guide is designed to serve as a *guide* during the interviewing process, and does not restrict or stipulate questions that should be covered.

A study conducted by Haugestad (2003) made use of vignettes to introduce moral and social dilemmas to the respondent. This proved to be an effective method both to set the respondent at ease and to open up a discussion on the selected topic. The researcher decided to make use of this technique to break the ice at the beginning of an interview.

Hill (1997) describes vignettes as “[s]hort scenarios in written or pictorial form, intended to elicit responses to typical scenarios” (p. 177). The type of response ordinarily elicited by such scenarios is described by Hazel (1995) as “comment or opinion” (p. 2). However, Hughes’s (1998) definition of vignettes is most apt for this research, namely that vignettes are “[s]tories about individuals, situations and structures which can make reference to important points in the study of perceptions, beliefs and attitudes" (p. 381).

The interview guide included one vignette, asking respondents to identify the person in the vignette whose argument they supported most. A discussion followed on why they agreed most with a certain argument. This opened up the conversation on the desired topic and the researcher made use of the interview guide only to make sure that the identified aspects were covered somewhere during the discussion.

The vignette reads as follows:

> Three people are standing on the sidewalk. They are looking at their neighbour Greg's house that has a new solar panel installed on the roof. They discuss the new system, but they soon realise that they have very different viewpoints on this new development.
> *Patricia says*:" I think that must have cost a pretty penny to install , but I am sure once it is installed, it doesn't require a lot of effort and Greg will live comfortably from now on."
> *Simon says:* "Even though it must have cost a lot to install, it makes economic sense in the long run, don't you think? My only objection is that I already have a very efficient system, why would I switch to an alternative if what I have is working just fine?"
> *Geoffrey says:"* I don't believe electricity costs reflect the costs to the environment, and therefore it could be a good idea. I just don't like to think that I would only be able to have a shower after the sun has shined for a whole day, because there is no hot water available in the mornings."

The vignette introduces most of the aspects to be covered in the interview, as discussed in section 4.2.2(a) above. These aspects, posed as questions, were rearranged in order to aid the flow of conversation. From the pilot study the researcher learned to adopt a slower pace during the interview in order to allow respondents to complete ideas, or to elaborate on them. The researcher also added several prompts to the questions to help her probe deeper into the ideas expressed by the respondent (refer to appendix A for the interview guide).

4.2.5 Sampling

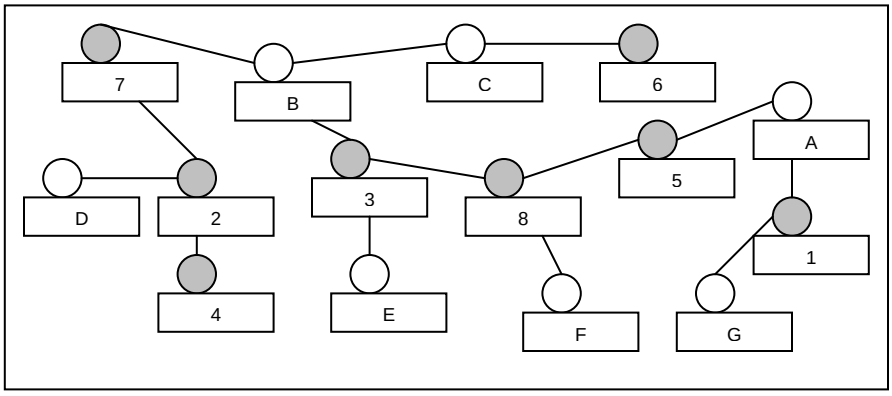
Purposive sampling methods aim to select respondents who are representative of the criteria identified by the researcher before starting the sampling exercise. The researcher decided to select respondents on the basis of their "representativeness" (Abrahamson, 1983, p. 238) of certain criteria.

The criteria included that respondents must be in contact with environmental issues on a day-to-day basis, and that respondents must receive remuneration for their services in the environmental sphere. Environmental issues could range from social, noise, visual or environmental impacts caused by a development, to sampling soil and water in order to assess contamination levels. Once some respondents that complied with these two criteria had been included in the sample, snowball sampling was further used to identify respondents. According to Neuman (1997), snowball sampling is particularly useful when taking some form of interaction or linkage into account throughout the research: "the crucial feature is that each person or unit is connected with another through a direct or indirect linkage" (Neuman, 1997, p. 207). Respondents thus refer the

researcher to other possible respondents whom they think would be inclined to take part in the study, and who would react positively towards the researcher.

The researcher focussed on the attitudes of environmentalists, based on the assumption that environmental issues are more salient to environmentalists and that they could be considered to be informed individuals (see chapter 1 for a more complete explanation). Thus all respondents work in similar professional environments and most come from similar study backgrounds. This directs the perceptions of the individual to some extent. As will be discussed in chapter 7, this may also influence the depth of the research somewhat. However, choosing to discuss these issues with environmentalists is presumed to allow the researcher a more focused research than would otherwise have been possible.

Figure 4.1 Network of recruitment via snowball technique



The network in figure 4.1 shows that, taken as a whole, the respondents interviewed form part of an "interconnected web of linkages" (Neuman, 1997, p. 207). This illustrates how the respondents as separate energy-consumer systems interact with each other to create the larger energy-consumer-in-energy-environment system that is discussed in more detail in chapter 7. The demographic information of the respondents who took part in this study is described in chapter 5.

According to Patton (1990), there are no rules as to how many interviews must be conducted in a qualitative inquiry. Kvale (1996) also states that the researcher does not need to do more interviews than is necessary to find answers to the research question. According to Terre Blanche and Durrheim (1999, p. 24),

> [s]aturation refers to the condition of an interpretive account where the account is richly fed by the material that has been collected, at least to the point where the researcher can intuitively say: “I have thoroughly explored the data and have acquired a satisfactory sense of what is going on.”

The researcher decided to bring the interviews to a close when it became clear that similar topics were discussed by respondents, and when topics that were not even suggested in the interview guide seemed to recur. Furthermore, the researcher conducted the interviews on her own, thus limiting the number of respondents that could be interviewed due to time constraints.

4.2.6 Data Collection

The researcher contacted potential respondents via e-mail and sent them an information sheet that discussed the purpose and duration of the study, the rights of the respondents, the criteria for the respondents to participate in the research, and consent for the researcher to record all interviews (Appendix B). A response form was attached (Appendix C) which respondents completed if they were willing to take part in the research. Arrangements were made to see respondents where it suited them best, and most of the interviews took place either at the respondents' or the researcher's places of employment. Interviews were recorded digitally and lasted between half-an-hour and an hour and 15 minutes. The data collection phase took place in the first half of 2005. At the interview respondents were asked to sign the consent form and take note of the confidentiality agreement.

The systems theoretical point of view emphasises that language is an instrument through which the world is described and understood (Keeney, 1983). Language thus serves as a reflection of the perceptions and attitudes the researcher is interested in. English was used to as the language of communication because all respondents were professionals who made use of English on a daily basis in the workplace. This means that respondents already described and understood their world on a daily basis by means of the English language. Some respondents did, however, change over to Afrikaans during the course of the interview. In these cases, the researcher continued the interview in Afrikaans because the respondents clearly felt more comfortable expressing themselves in Afrikaans.

According to Mouton (1996), the researcher, the respondent and the research setting may all have significant effects on the outcomes of the research. The researcher conducted all the interviews herself in order sufficiently immerse herself into the data. From a systems theoretical point of view, the research becomes part of the research to such an extent that it becomes impossible to differentiate between the respondents' viewpoints and the researcher's interpretation (Bateson, 1972). The researcher also transcribed the interviews herself in order to remain close to the data. In so doing, the researcher became acquainted with the data before the analysis stage started.

The above discussion on the stance of the researcher, the interview guide, the sampling method and method of collecting data describe the way in which the data were obtained. In the following section, the steps of analysis are discussed to enable the reader to understand how the researcher came to the research conclusions.

4.2.7 Data Analysis

The epistemology of the researcher and the theoretical framework form an integral part of the methods used to analyse the data that were gathered. The description of the analysis of data relates to "the class of differences which are created by the process of transformation whereby the differences immanent in the territory become differences immanent in the map. In the corner of every serious map you will find these rules of transformation spelled out…" (Bateson, 1972, p. 458). The aim of this section is to allow the reader insight into the analysis process (the rules of transformation or map legend) in order to understand the conclusions (to be able to read the map) as they are described in the chapters that follow.

i) Introduction to the analysis

The researcher stands within the network of theory, methods of analysis, the discussions with respondents, and her own thoughts. She is basing her method of analysis on prior methods used within a qualitative methodology. A segment of the method of analysis that is aimed at incorporating the relationships between the various categories is explored and discussed (as described by Bateson, 1972; and Capra, 1997). Bateson (1972) describes research in the following way:

> Operationally, somebody went out with a retina…and made representations, which were then put upon paper. What is on the paper map is a representation of what was in the retinal representation of the man who made the map; as you push the question back, you find an infinite regress, an infinite series of maps. The territory never gets in at all… Always the process of representation will filter out so that the mental world is only maps of maps of maps, ad infinitum. (Bateson, 1972, pp. 454-455)

This process is in itself suggested by the word ‘analysis’. According to the Oxford dictionary, analysis is "the study of something by examining its parts…"; however, Hornby (1998) goes further by saying that analysis is "the study of something by examining its *parts and their relationship* [researcher’s italics]" (p. 38). This relationship is described by Bateson (1972) as the process of explaining human behaviour in which "you are always dealing with total circuits, completed circuits" (p. 459). Therefore the energy-consumer system and the energy-environment system cannot be viewed in isolation. The relationships between these systems are thus paramount and will be explored in chapter 7. In the following section, the methods by which the

categories were identified are discussed, after which the methods used to explain the relationships between these categories are examined.

ii) First stage of analysis

The first stage of analysis followed the methods for qualitative research analysis advocated by Abrahamson (1983), Henning, van Rensburg and Smit (2004), Miles and Huberman (1994), Neuman (1997) and Schmidt (2004).

Getting to know the material

The researcher transcribed the digitally recorded interviews herself, heeding the recommendation of Henning et al. (2004) that the "novice researcher in particular should be responsible for their own transcriptions. In the slow process of transcribing data you come (and stay) close to the data" (p. 104). The initial phases of analysis require the researcher to get acquainted with the data. Reading the individual interviews several times over before jotting down any notes allowed the researcher to acquire an "overview of as much contextual data as possible" (Henning et al., 2004, p. 104). Inevitably, while reading, units of meaning were identified. These are the topics and categories identified in the first stage of analysis and are discussed in chapter 5. Schmidt (2004) notes that the "researcher's own theoretical prior knowledge and the research question guide his/her attention in the reading of the transcripts" (p. 254).

Fiedeldey (1991) emphasises the importance of acknowledging these thoughts as the researcher's own and remaining open to new ideas that may emerge from the transcripts. Schmidt (2004) warns against tailoring "material to one's own theoretical assumptions by reducing the analysis to a search for locations in the text that are suitable as a proof or illustration of these assumptions" (p. 255). Initial ideas were related to the research question and thoughts the researcher had concerning the research topic, but upon reading the transcripts several times over, new ideas that were not previously considered as important became more apparent to the researcher. Topics were discovered throughout this process, some of which were introduced by way of the questions asked, some emerging from the respondents themselves. An example of the emergence of new topics is given in table 4.3 below. The number refers to the interviewee and the letter M refers to the interviewer.

Table 4.3 Example of topics emerging through discussions with respondent

7: Unfortunately coal is still the cheapest form of energy M: and it is available… 7: It is available. I know there are a number of initiatives to look at other resources, like the wind farm in Cape Town, and Durban is looking at landfill sites… If you try to get outside funding like USAID or the World Bank and get funding structures in place. Those sorts of renewable energy resources are just not financially viable. I don't think it is not financially viable per se, I think it is not viable for a third world country like South Africa.	*Researcher suggests topic* - Availability of natural coal resources *Respondent alludes to new ideas and other topics* [A] Renewable energy sources aren't financially viable [B] Funding structures for renewable energy sources are unavailable [A] Renewable energy sources aren't financially viable [C] Socioeconomic status influences limit the feasibility of renewable energy

. The above example shows how new ideas or themes not considered by the researcher were introduced by the respondents. The researcher's initial ideas did not consider aspects such as the possibility that renewable energy sources are not financially feasible, or the socioeconomic influences on these energy sources. However, these topics were noted and accommodated in the resulting coding structure.

Topics identified

Several topics were identified by way of phrases, sentences or words describing feelings and perceptions respondents raised during the interviews. These feelings and perceptions contain value statements. During the next phase, when topics were placed into categories, the value statements were made redundant by value-free category description. It was important to the researcher to do this because the focus of the research was not on the positive or negative attitudes of respondents, but rather on what attitudes were expressed and the reasoning behind them. In table 4.4 below an example of how the value statements were made redundant can be seen. This example pertains to the category of perceived governmental responsibility. The category does not indicate whether respondents feel that the governmental responsibility is high or low. The topics which constitute the category, however, contain these values; for example, governmental responsibility is high. The categories thus consist of value-laden topics, whereas

the categories themselves are described in a neutral way. The identified topics are indicated with capital letters (i.e., A, B, C and so on), as is visible in table 4.3. Throughout the topic identification exercise, differentiation between topics within what seemed to the same category was emphasised in order to ensure a true representation of all the different viewpoints.

Table 4.4 An example of value topics identified

7: I think it is not viable for a third world country like South Africa. *Topic: Socioeconomic influences limit the feasibility of renewable energy*
8: And if you take South Africa, although it is a developing country, it can't just shake the responsibility *Topic: Socioeconomic influences do not exempt responsibility*

Assembly of the identified topics into a topic schedule (categories)

The topics that were identified through the process thus far were listed and combined in cases where the same topic emerged with the same value judgement. As Miles and Huberman (1994) indicate, "[w]e have to look carefully at the complex configuration of processes within each case, understand the local dynamics, before we can begin to see patterning of variables that transcends particular cases" (p. 250-206). At this stage topics still contain the value statements made by respondents, delineating differences between positive and negative perceptions regarding lifestyle impacts, for example; however, these are placed in value-free categories.

The researcher re-read the transcripts and ensured that the topic schedule (categories) included all salient topics and that the data suit the topics identified. Marshall and Rossman (1989) state that "[t]he researcher does not search for the exhaustive and mutually exclusive categories of the statistician, but instead to identify the salient, grounded categories of the meaning held by the participants in the setting" (p. 116), and therefore several of the identified topics include the same references made by respondents. The researcher selected several quotations from the transcripts as supporting evidence for the reasoning behind the identified topics. As stated by Schmidt (2004), "[t]he analytical categories [topics] that were established *from* the material in the previous stage of analysis are now applied *to* the material." (p.256). In figure 4.2 below, the transition from topics to categories is shown.

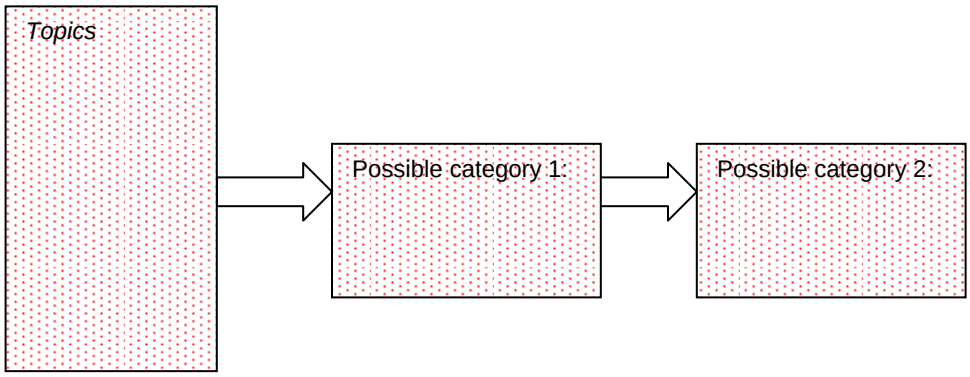


Figure 4.2 From topics to categories (Henning et al., 2004)

iii) Second stage of analysis

The second stage of analysis focussed on the development of pattern categories emanating from the categories identified in the first stage. Identifying the preliminary topic schedule (categories) was important, because "[a] category will already begin to show the themes that will be constructed from the data and that will be used in the discussion of the inquiry" (Henning et al., 2004, p. 106).

Identification of pattern categories

Preliminary categories emerged from the reading and topic identification phases. Categories were initially identified through the use of sentences and phrases identifying a topic, after which pattern categories were developed by combining categories that contained similar psychological reasoning. These are discussed in more detail in chapter 6. The researcher grouped these topics without trying to find appropriate names for the respective pattern categories. Her existing knowledge, gained through the literature study, was used in order to systematise the knowledge emerging from the transcripts (Henning et al., 2004).

The researcher marked topics in colours in order to group the topics into conceptual categories. Similarly, conceptual categories were grouped into pattern categories. The researcher's initial impressions were also taken into consideration during the grouping exercise in order to arrive at a full description of the context as part of the identified groups (Groenewald, 1995).

Throughout the grouping process, ideas for possible names for the categories occurred to the researcher. Categories with "internal convergence and external divergence" were sought in accordance with the idea that "the categories should be internally consistent but distinct from one

another" (Marshall & Rossman, 1989, p. 116). The researcher identified conceptual, meaningful categories that were distinct from one another. Figure 4.2 below indicates the process from topics to categories to pattern categories.

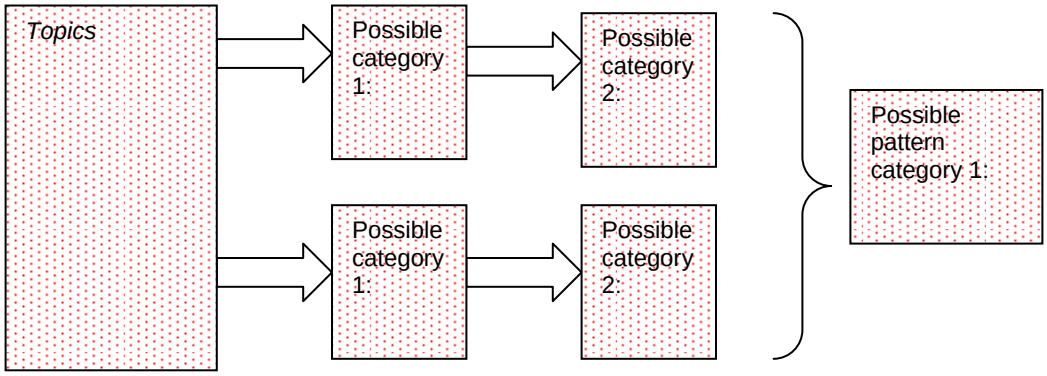


Figure 4.2 From topics to categories to pattern categories (Adapted from Henning et al., 2004)

Description of the identified categories

In this phase of the research, after appropriate names had been created for categories, the categories were described. Ely, Anzul, Friedman, Garner and McCormack Steinmetz (1991, p. 87) note that "[c]reating categories triggers the construction of a conceptual scheme that suits the data". This conceptual scheme or patterning of conceptual ideas is discussed in detail in chapter 6. The emphasis is on the description of the interaction between various topics, identified during stage one of the analysis, that fall in the same category. The description of the categories is thus already a conceptual discussion of some of the aspects concerning perceptions and attitudes held by respondents. Bateson (1979, p. 63) notes that "it is impossible in principle, to explain any pattern invoking a single quantity. But note that a *ratio between two quantities* is already the beginning of a pattern."

iv) Third stage of analysis

> The next step is to move from metaphors and interrelationships to *constructs* and from there to *theories.* We need to tie the findings of our study to overarching, across-more-than-one-study proposition that can account for the "how" and the "why" of the phenomena under study. (Miles & Huberman, 1994, p. 261)

According to Marshall and Rossman (1989), this conceptual discussion summarises the categories previously discussed, links the research findings to theoretical aspects, and considers how the findings fit with the theoretical approach. This conceptual discussion is presented in chapter 7.

4.3 Conclusion

In this chapter the researcher discussed the methodology and methods used during the qualitative inquiry. The purpose of this chapter was to guide the reader to understand the rationale of the research methodology in order to increase appreciation for the discussions that follow in the next three chapters.

The methodology of the research was described by means of a justification of the research design. The researcher's role is described because the researcher becomes part of the system in which the respondents and the environment interact.

The development process of the interview guide was described, as was the sampling method and the data collection phases. This chapter concluded with a detailed description of three stages of data analysis to provide insight into the process followed in the subsequent chapters.

CHAPTER 5

First stage of analysis

5.1 Introduction

In this chapter information about the sample is presented to provide insight into the background of the eight respondents. The first stage of analysis is discussed in detail. The 16 identified categories and their 64 topics are presented. To allow the reader to follow the reasoning behind the categories a description of each category is provided, and quotations are given to support and illustrate the categories. In some cases several quotations are given in order to emphasise different aspects of the identified topic or category. Throughout this chapter areas of interest and controversial issues are identified. These are used as a point of departure to introduce and discuss the psychological foundation of these issues. These are discussed further in chapter 6.

5.2 Biographical Information

The biographical information of the participants in the study is presented in table 5.1 below. An equal number of females and males were interviewed, ranging between the ages of 27 and 59. The mean age of respondents was 37.5 years. All respondents satisfied the criteria as set by the researcher before the study commenced and none of the respondents knew the researcher before the time of the interview. All the respondents reside in the Gauteng region.

The work environment of the respondents is stated because this influences the level to which the respondents satisfy the criteria to participate in the research. The qualifications of respondents are also noted to provide a sense of their educational background; all respondents have degrees and/or postgraduate qualifications.

Table 5.1 Description of the respondents

	Gender	Age	Work environment	Qualifications
1	Male	27	Ecological and heritage surveys, environmental impact assessments, GIS	B. Landscape Architecture M. Landscape Architecture
2	Male	51	Consulting engineer - impact assessment	B. Sc (Eng) Electrical M. Sc (Eng) Electronic
3	Female	33	Social impact assessments and public participation	B.A. Political Science B.A. Anthropology (Honours)

4	Male	59	Field work - impact assessment	B. Sc (Eng) Electrical B. Sc (Eng) Electrical (Honours) M. Sc (Eng) (Cum Laude) PhD
5	Female	29	Environmental consultant	B. Landscape Architecture M. Sc Project management
6	Female	35	Public interest environmental law	BLC, LLB
7	Female	31	Environmental consultant	B. Sc Geography B. Sc Geography and Environmental management (Honours) M.A. Sociology (currently busy)
8	Male	35	Environmental impact assessments	B. Landscape Architecture M. Phil (Environmental Science)
Mean age: 37.5				

5.3 Presentation of Perception Categories

Throughout the first stage of analysis 64 topics were identified. These topics were then grouped together in order to form categories of perceptions. In the subsequent sections the 16 identified categories are discussed in detail. The categories are presented below in no particular order or hierarchy, thus category number one (maintenance cost) is not a more important category than category 16 (trust in technology).

The descriptions of the category criteria are given below, followed by direct quotes from the respondents to illustrate how the category and its topics are grounded in the raw data. These short descriptions of the criteria and examples are followed by a discussion on the perceptions respondents may have toward the specific issue. Some of the researcher's ideas regarding the interconnectedness of the categories are also explored. Several more of these are pursued further on a more theoretical basis in chapter 6. It is important to highlight that two respondents, respondent number 6 and respondent number 8, both already have renewable energy systems installed in their homes and that their perceptions differed consistently from those of the other respondents. In order to keep the discussions flowing only a few quotes are highlighted in each section.

For the sake of this research, experience levels with renewable energy sources were classified. The researcher may therefore refer to respondents with ‘some experience with renewable energy sources’, ‘experience with renewable energy sources’ and ‘no experience with renewable energy sources’. Although having no experience with these systems is self-explanatory, the classifications of ‘experience with renewable energy’ and ‘some experience with renewable energy’ need further clarification. Respondents who are classified as having some experience

have had contact with actual renewable energy systems; for instance, parents or friends have had such systems installed domestically. Only respondents who own a renewable energy system and use it as part of their daily lives are considered to have experience with renewable energy. Two of the respondents interviewed owned renewable energy systems, three had some previous experience with renewable energy sources and the remaining three had never had personal experience with renewable energy sources.

5.3.1 Cost

i) Maintenance cost

This category refers to references by the respondents to costs that they would incur to maintain their domestically installed renewable energy system. In two of the cases (one of which is illustrated by a quotation from respondent 5 below) where people made reference to the high cost of maintenance, repairs had been necessitated by damage to the system. Damage does not qualify as maintenance but rather as damage repair; however, since the respondents termed it maintenance, it was included in the 'cost of maintenance' category.

Respondent # 5
"So I think one needs to make sure that the technical aspects are sorted out, because I don't think one can just look at public perception, you should look at technical capability, and if these things can actually deal with those aspects. Because once that thing gets damaged, there's a lot of cost, particularly with a lot of movement and that."

"I think the one thing which you need to consider in all of these aspects is maintenance, and maintenance cost. We saw that with my parents, it is a nightmare, maintenance wise, usually nothing much happens, but when something does go, the maintenance is absolutely horrendous."

References to maintenance cost indicated that it would be high. No references were made to maintenance cost being low, although the two respondents who had renewable energy systems installed in their homes said that no maintenance was really necessary and therefore did not comment on the cost thereof. This contradicts the reports of respondents who had little or no experience with the use of renewable energy sources. These perceptions could be used to better market renewable energy sources. Recommendations for the use of this research to develop market strategies are discussed in chapter 7. From the quotes below it becomes apparent that maintenance is not a salient issue to the two respondents who have renewable energy systems installed in their homes; in fact they needed direct prompts from the researcher before commenting on maintenance.

Respondent # 8

M: Do you have to do a lot of maintenance?

 # 8 No, there's very little maintenance to do.

M: How regularly do you think you do maintenance, once a year, once in five years…?

 # 8 Once in five years…there's not much maintenance to do.

Respondent # 6

M: And do you need to do a lot of maintenance?

 # 6: No, nothing whatsoever…We put our system in…9 years ago. We haven't gone up to look at it once! It just works. No we haven't had any difficulties with it at all. It just works."

It is possible that people who have not had personal experiences with a renewable energy system hear only about the bad incidents from people they know who have a renewable energy system installed. Their perception might be formed by comments about damage and so on while, due to their lack of direct experience, they do not have access to a true reflection of the functionality of the system.

ii) Installation costs

This category pertains to comments on the initial expenses and the installation costs involved in the process of acquiring a domestically installed renewable energy system. This category consists of three topics. The first topic identified pertains specifically to high installation costs, the second focuses on making the use of renewable energy more feasible by means of funding and the third reflects upon the financial benefit of the domestic use of renewable energy sources.

Initial direct and installation costs

This topic focuses on initial cost, which includes the installation and the direct costs. Cost seems to be a major discouragement to the installation of renewable energy sources.

Respondent # 6

"The second thing obviously is cost. And I can't wait for the day that those kinds of solar energy become much more readily available. And even in our instance, the cost meant that we could only install up to a certain level. Our entire house cannot run on what we have, a very large part of it can, but we couldn't afford to run the entire house on that in terms of energy use from solar."

Respondent # 2

"…dit is duur om dit te installeer, en veral om 'n betroubare stelsel te installeer…"

Respondent # 5

"If you can show that voltaic cells can deal with that [desired comfort levels], then it is just an issue of cost, I think."

The perception that installation costs are high was emphasised by both respondents who had renewable energy systems installed in their homes and those who did not. Respondent # 8 was the only respondent who seemed more convinced of the cost benefits of the renewable energy system than the disadvantage of high initial costs. High costs seem to inhibit further thoughts on possible implementation. It poses as a barricade that has to be removed before the use of renewable energy sources again is likely to be considered. The removal of psychological barriers to implementation, discussed in chapter 3, is explored in chapter 6 as one method by which this problem can be overcome.

Financial viability of renewable energy systems

Discussing the perception of the high cost of the initial and installation costs naturally flowed to a discussion on the feasibility of the domestic use of these renewable energy systems. This topic focuses on the financial viability of the use of renewable energy systems.

Respondent # 6

"There's such a lot of health benefits, if one could use renewable energy sources and actually incorporate it into development of low cost housing, that type of thing, but I think cost is a major issue."

Respondent # 7

"If you don't get outside funding like USAID or the World Bank and get funding structures in place, those sorts of renewable energies are just not financially viable. I don't think it is not financially viable as resource per se, I think it is not viable for a third world country like South Africa."

Observation of direct benefit is very low in this instance. The obvious cost implication is far more concrete than the possible benefit that could be experienced in a few years' time.

Cost benefit

This topic included discussions on the financial benefit of the use of renewable energy sources.

Respondent # 2

"Om 'n goeie stelsel te kry wat werk, sal duur wees, maar dit maak op die lang termyn beslis sin om dit te doen"

Respondent # 8

"I can tell you I have a solar system myself, and it makes economic sense and it makes environmental sense…"

M: "From your experience, do you think the initial investment justifies what you get back?"

8: "Ja, absolutely."

Only two respondents were of the opinion that the use of renewable energy sources in your home makes economic sense and that the initial cost would be recovered over a number of years.

Six out of the eight respondents have the perception that not only is the initial cost of a renewable energy system high, but that such a system is not financially feasible in several situations. Although the implication of costs is clear to several of the respondents, only two observe any direct financial benefit deriving from it.

iii) Environmental cost

The third category also consists of three topics. These topics are concerned with the cost of conventional electricity generation to the environment. This category includes the effects of electricity generation to the environment and people.

Effects on the environment

This topic included statements regarding the direct effects of conventional electricity generation on the environment (excluding the impact on people).

Respondent # 6

"…the electricity that we have available in the grid actually doesn't reflect the cost to the environment."

"The cost to the environment is vast, if you just begin to consider the CO_2 emissions from coal fired power stations and the impact it has in terms of climate change."

Respondent # 4

"… I think there are certainly those costs [indirect costs] attached to not only electricity, but to many aspects of our modern life, there certainly are those costs, whether that makes it a crime or something else. Yes certainly there are those costs."

Most respondents felt that the effects on the environment were detrimental. Even so, it seems that some respondents did not feel that that implies a responsibility on them as consumers.

Respondent # 4

“I don’t think our electricity is way out in terms of cost. If I think about it as a cost in your total budget, you know the household expenditure, it is not negligible, but it is not something that I get most excited about…I am not so much concerned about electricity costs.”

The previous statement illustrates that acknowledging the detrimental effects of conventional energy on the environment does not necessarily lead to the acceptance of personal responsibility.

Effects on people

This topic centres on discussions about the impact of the generation of conventional energy on people specifically.

Respondent # 4

"And it is easy for us living in Pretoria and not close to any of these refineries and the mines, but there are various types of pollution taking place in and around these mines. For example sulphur that releases from coal that is washed up in rivers…and in the soil that surround the plant…but it is not the end of the world…I feel sorry for the people who suffer from air pollution… "

Respondent # 2

"…daai prys [environmental cost] is, dink ek, vroeër verswyg vir verskeie redes en dis NOU eers wat mense begin besef…"

Respondent # 6

"I represent a whole lot of communities who live in the Vaal Triangle, there the air pollution problem is not only concerned with the two power stations in the area, but power stations play a very important part…There's such a lot of health benefits, if one could use renewable energy sources."

Respondent # 8

"Global warming, acid rain, and health effects, the coal comes from somewhere obviously, so mines, the people who live and work close to the mine…"

Seven out of the eight respondents commented on the influences that these environmental costs have on people, while only four respondents commented on the effects on the environment. The

perception seems to indicate that the direct impact on people makes a larger impression than the impact on the environment. Again the concept of direct benefit observation comes into play where it is hypothesised that direct impact observation increases the level of concern expressed.

Benefits of renewable energy use for people and the environment

This section attends specifically to the perceived benefits of the use of renewable energy for people in general and for the environment.

Respondent # 3

"…from wind generation or whatever, I guess there's less cost to the environment, and you actually get the same product in the end…"

"…electricity also has a negative impact. I think that when you think about how much it costs to actually put up power lines, I mean how much power lines can you have? You have to look at alternatives, why not, you know?"

Respondent # 5

"I mean if one does it, it might trigger somebody else to do it and ultimately it is not about the big things in the world, it is about the small things. Every little bit helps at the end of the day, to improve the quality of our environment. It is also the more sustainable solution."

The possible benefits of using renewable energy are mentioned far less frequently than are the costs and detrimental effects of electricity, and in a more general sense. Respondents tend to avoid personal involvement in the possible benefits by focussing on general statements whereas negative statements are sometimes more focused on the impact on the individual.

5.3.2 Financial Feasibility of Electricity

This category pertains specifically to the feasibility of conventional electricity. Two topics form part of this category: perceptions of the price of electricity and interpretations of the impact of the price of electricity.

i) Price of electricity is low

This topic includes statements on the current price of electricity.

Respondent # 1

"I mean, we have the cheapest electricity in the world."

Respondent # 3

"I don't think we pay too much for electricity."

Respondent # 7

"Well unfortunately coal is still the cheapest form of energy."

Respondent # 8

"And if you take South Africa, although it is a developing country, it can't just shake that responsibility, because we have the lowest energy price on earth."

All eight respondents were in agreement that the current price of electricity is low; however, some did indicate that they were not willing to pay more for electricity than they currently do.

ii) Impact of price of electricity

The perception that the electricity price is too low includes several aspects such as the impact on health, energy use habits and increased expenditure on energy-related factors.

Respondent # 1

"I mean, we have the cheapest electricity in the world and we are one of the worst polluters. I mean, if you drive around Pretoria, or where-ever, and see what is happening, you just see grey smog hanging over the city…"

Respondent # 3

"I don't think we pay too much for electricity because the actual cost and then the impact it has… if you think how much it costs to put up transmission lines…"

Respondent # 8

"And if you take South Africa, although it is a developing country, it can't just shake that responsibility, because we have the lowest energy price on earth. And that makes use very energy inefficient. So I think we use too much energy."

The perception of the impact of electricity price on habit formation is an interesting topic. This topic is discussed in chapter 6 in a broader sense. Systems theory and theory about the formation and change of habits is incorporated to discover more about the interconnectedness

that may exist between the perceived price of electricity and the perceived impact it has on the routine of the individual.

5.3.3 Reliability Comparison between a Renewable Energy System and Conventional Energy

Comparisons to what we know are often the only way to explain something that we do not know. In this category the use of renewable energy systems and the use of a conventional energy system are compared in terms of reliability.

i) Conventional energy to support renewable energy systems

This section pertains specifically to the practical implications of the level of trust that the respondents show in the relevant technology. Respondents emphasised that conventional energy should function in support of renewable energy systems.

Respondent # 6

"…the only thing we weren't sure about was how to get the system to function in such a way that the geyser kicks over on ordinary electricity when there is not enough solar power. One difficulty with solar power of course is, if your geyser heats up during the day and at night-time you empty it, there isn't hot water for a warm shower if you need one the next day. So that was the only thing that we needed to sort out, but that was fairly easy to sort out in the end."

Respondent # 8

"…but during summer we use it all the time, and it is quite sufficient, unless it is a cloudy day, but then we have a dual system. So I don't buy the argument… if you already have an existing system, it still makes sense to supplement it with electricity."

Interestingly, only respondents who already have a renewable energy system in their homes perceived conventional energy to be a support for the renewable energy system.

ii) Renewable energy to support conventional energy

This topic contains a discussion about the concept that renewable energy should function in support of conventional energy.

Respondent # 1

"I think they should start subsidising solar water, not as a replacement of a geyser, more like a pre-heater. Using solar energy to preheat the water. And then get poured into the geyser, the more obvious one."

Respondent # 2

"…ek sal veral in die voorsienbare toekoms, soos die stelsel verbeter, sal ek geneig wees om te sê goed reg, kom ons kyk maar daarna om 'n passiewe ondersteunende stelsel te installeer."

Respondent # 3

M: So what you said is that these systems are very dependable, especially in support of the current system?

3: ESPECIALLY then, yes."

Again it is interesting to note that respondents who do not have personal experience with solar systems advise that conventional energy be the main source of energy, supported by the use of renewable energy systems. Personal experience with a renewable energy system seems to dramatically change perceptions regarding the use and applicability of the system in the home. Increased exposure as a way to change perceptions is discussed as category 16 below, and is also explored further in chapter 6.

5.3.4 Psychological Inertia

This category contains references to the inability or the tardiness of people to change habits. The first focus in this section is on the tempo of change. The second topic emphasises the impact that this inability to change will have on the implementation of renewable energy sources.

i) Slow change

In this section the tendency for change to be slow is explored. Reasons for this are discussed in depth in chapters 3 and 6.

Respondent # 1

"You can't expect people to now start doing things in a completely different way, with possible financial implications, you know, you have to give a little…"

Respondent # 2

"…ek dink in Suid-Afrika is ons nog baie lui, jy weet, in verband met goedkoop energie…"

Respondent # 3
"I don't know, it is a new thing for a lot of people. I think some might know why to change and others might know but they don't want to change."

Respondent # 8
"I think generally there's a perception amongst people that it is more expensive, even though they may not know how much more expensive it is, as you said there's a perception that it may require higher maintenance, that it may lead to a less comfortable lifestyle. I think, people, it is just inertia, they are used to what they have and they are not…it is within their comfort zone and they are not prepared to look outside that comfort zone…"

Respondent # 5
"If you particularly want to push any renewable resources, I think it is a worthwhile endeavour, because you give yourself a bit more time to phase out non-renewable energy sources."

The general perception is that change would be slow, habit change is difficult and that some form of motivation would have to occur. The use of incentives is discussed as category 17 below. The concept of the interconnectedness between an external form of motivation and responsibility is examined in the following chapter.

ii) The importance of change

In this section, respondents' responses illustrating the perceived importance of change are presented.

Respondent # 1
"I think the biggest necessity is cutting down on electricity use…"

Respondent # 5
"It is very difficult to encourage people to change their energy use within the house, because that is pretty much habit and it goes back to awareness, but I think at the end of the day if it talks to their pockets…"

Respondent # 8
"…we have the lowest energy price on earth. And that makes us very energy inefficient. So I think we use too much energy."

Although respondents mention that change of habits would be necessary, reference is only made to change in a very general sense without relating it to the self.

5.3.5 Maintenance

This category and topics, include aspects of the discussion between the researcher and the respondents that specifically focus on the perceived level of maintenance that is necessary in order to have a renewable energy system installed in the home. This category does not refer to the cost of maintenance but focuses more on other constraints.

i) High maintenance

This topic contains discussions in which respondents referred to renewable energy sources as requiring more time to install than a conventional system and the need for regular checks to be done in order for the system to function optimally.

Respondent # 7

"7: Weet jy, dit is nie die betroubaarheid van die sisteem wat my bekommer nie, ek dink dit is meer die onderhoud daarvan. Ek dink nie daar sal 'n probleem wees met konstante energie wat verskaf word nie. Omdat jy nie elke dag daar is nie, het jy nie daardie konstante toesig daaroor om seker te maak dat dit in stand gehou word nie.

M: Watse tipe onderhoud sal nodig wees?

7: Wel ek neem aan, jy weet, as iets gebeur en dit breek kom jy dit nie dadelik agter nie, want dis heelwaarskynlik nie 'n sisteem waarmee jy vertroud is nie."

Respondent # 1

"…the more high tech things are more visible, you have to have a panel on your roof and something on the side for water, so… I think people are reluctant to let into their lives something that requires a lot of maintenance and operation and whatever…"

Respondents with no or little experience with renewable energy systems tend to exaggerate the amount of time necessary for maintenance compared to statements made by the respondents with long term experience of the renewable energy sources. From respondent # 7's comment above it becomes clear why the perception of time-consuming maintenance remains. Renewable energy systems are relatively unknown to most people and the limited amount of exposure of the respondent to the implementation and use of renewable energy systems may cause a feeling of insecurity in the respondent. This may lead to constant surveillance of the system that would

presumably alleviate the feeling of insecurity. This concept, however, requires further exploration in the following chapter.

ii) Low maintenance

This topic pertains to the discussions of low levels of maintenance in the use of renewable energy sources.

Respondent # 8

M: Do you have to do a lot of maintenance?

 # 8 No, there's very little maintenance to do.

M: How regularly do you think you do maintenance, once a year, once in five years…?

 # 8 Once in five years…there's not much maintenance to do.

Respondent # 6

M: And do you need to do a lot of maintenance?

 # 6: No, nothing whatsoever…We put our system in…9 years ago. We haven't gone up to look at it once! It just works. No we haven't had any difficulties with it at all. It just works.

Respondents with personal experience with renewable energy systems find that the maintenance required in the domestic use of renewable energy systems as infrequent.

iii) Predictability of maintenance

Respondent # 5

"…usually nothing much happens, but when something does go, the maintenance is absolutely horrendous…"

Respondents with some experience with renewable energy systems emphasised the predictability of maintenance more than the other two groups. Maintenance should be to maintain the renewable energy systems' efficiency, for example, lubricating moving parts on a monthly basis or clearing fallen leaves off the panels. However, in this case, several of the respondents referred to damage repair as maintenance, for example, replacing a cracked panel because somebody accidentally threw a cricket ball on it.

Perceptions pertaining to the amount of maintenance necessary with a renewable energy system in the home are compelling. Several respondents indicated that maintenance is a time-consuming exercise, apart from the expenses it involves, as discussed in section 5.3.1 above.

5.3.6 Perceived Impact on Comfort

The perceived impact on comfort is an important category. It consists of six topics all relating to the perception of impact on lifestyle. It includes aspects like the perception of personal benefit, the perception that the respondent's current lifestyle would have to change, the visual impact that renewable energy systems would have on the life of the respondents and the trust respondents have in the system.

i) Personal benefit

This section includes statements concerning the perception of personal benefit emanating from the use of a renewable energy system. The direct experience of personal benefit as a result of the use of renewable energy systems is not necessarily equally apparent to all respondents, and may influence the willingness to implement such a system.

Respondent # 1

"…when people start to realise themselves that something needs to be done. We don't feel the impact, yet when people start to experience it…"

Respondent # 7

"I think a lot of people often think, why should I; even though it would be good for the environment, people think, why should I pay more for electricity if a cheaper option is available to me?"

"And people are less likely to implement change if they don't see the direct benefits to themselves."

Respondent # 3

"You know what? It is too much hassle to change, because you have got it [conventional electricity] now, so why bother?"

"…Greg said that you have got the comfort of having hot water and electricity and all that, why would you actually change that?"

Respondent # 4

"I would like to support it, but I am also a practical in the sense that I feel I would be prepared to pay a limited cost for contributing to such a system. So I would be prepared to pay an additional cost…"

The perceptions of personal benefit from the use of renewable energy sources are low. The focus seems to fall on the negative impact on the lifestyle of respondents because of the little personal benefit perceived. The relationship between perception of personal benefit and the tendency to support an idea is discussed further in chapter 6.

ii) Small or no lifestyle changes

This topic includes the perception of respondents that the use of renewable energy systems in the home would have little impact on the quality standard of the respondent's life.

Respondent # 8
"No, just, when you forget to switch on the electricity when it is cloudy there is obviously not going to be hot water in the morning when you want to shower, but if you switch it on there's usually warm water within half an hour. So it is not really a constraint."

Respondent # 3
"There's obviously changes you will have to make in your lifestyle, but not that much"

Respondents voiced the opinion that there would not be a large impact on their lives as a result of the use of the renewable energy system in their home.

iii) Visual impact of the system is high

The visual impact of the system may also have an impact on the lifestyle of the individual. Some of the quotations below refer not only to the aesthetics of the system but also to the efficiency of the available technology.

Respondent # 7
"The panels have to be big enough but at this stage I don't think it is possible to have a panel that is big enough."

Respondent # 8

"I suppose it can be regarded as ugly if you have a certain architectural design and it does not complement the design."

Respondent # 1

"They [passive systems] usually require less operation during their lifetime and even the design of the architect could influence the way it looks…the style of the architecture…the more high tech things are much more visible, you have to have a panel on your roof and something on for water…"

Several respondents commented on the high visual impact that renewable energy systems have.

iv) Renewable energy use would have a negative impact on lifestyle

In this section the perceived negative impacts of the domestic use of a renewable energy source are discussed.

Respondent # 7

"…in Morocco, although the solar panels are smaller there, you cannot run a colour TV, you can only run a small black and white TV on that. You cannot power a fridge or a freezer."

Respondent # 4

"I don't think there are systems on a house scale…there shouldn't be too much inconvenience, only in terms of heating; you know, sometimes it might not make water as hot as you would like. So I am prepared to make a small sacrifice in that regard as well."

Respondent # 5

"…in ten years you have paid it off and thereafter you have free electricity…but [you have to show] that it is not going to affect the TVs and all the other things that one gets, the other things that one gets so used to. And luxury, like underfloor heating and all of that…"

The perceived negative impact on the lives of respondents was emphasised by respondents, whereas limited attention was paid to perceived positive impacts.

v) Trust in the system is high

The levels of trust in renewable energy systems influence the level of comfort experienced and therefore indirectly influence lifestyle. This section pertains to high levels of trust in renewable energy systems.

Respondent # 6

"I don't have to wait for the sun to shine a whole day before I can take a hot shower… so I don't agree with that part."

Respondent # 8

"It was one of the first solar systems installed in Pretoria…"

M: "How regularly do you think you do maintenance, once a year, once in five years?"

8: "Once in five years, there's not much maintenance to do…"

M: "How long have you been living there?"

8: "Since I was six years old."

Only respondents with experience with renewable energy systems expressed trust in the use thereof. The deduction from this could be that exposure to the use of renewable energy systems increases the level of trust in the system and decreases uneasiness regarding the use of this system. Again, this is discussed further in the chapter that follows.

vi) Trust in the system is low

Low levels of trust in the system are discussed in this section.

Respondent # 2

"…as jy redelik seker is dat jy het 'n verskaffer wat weet wat hy doen, dan dink ek sal ek redelik gemaklik voel daarmee jy weet…en dan nou die moer jy weet die donder in wees, as dinge nou NIE werk nie…"

Respondent # 7

"Weet jy dit is nie die betroubaarheid daarvan wat my regtig bekommer nie, dit is die onderhoud daarvan. Ek dink nie daar sal 'n probleem wees met konstante energie wat verskaf word nie. Omdat jy nie elke dag daar is nie, het jy nie daardie konstante toesig daaroor om seker te maak dat dit in stand gehou word nie…"

Respondent # 5

"I think one needs to make sure that the technical aspects are sorted out. Because I don't think one can just look at public perception, you should look at the technical capability, and if these things can actually deal with those aspects [technical challenges]. Because once the thing gets damaged, there's a lot of maintenance. But I think with technology, we can move beyond that. That will be the big thing in terms of ensuring that we are more comfortable and trusting in using that [renewable energy systems]."

The perceived efficiency of the available renewable technology is a main contributor to a lack of trust in renewable energy systems. The low level of trust in these systems hinders implementation and prevents use of these systems. In the following chapter underlying causes for the distrust are explored.

5.3.7 Effort

Similar to the perceived impact of the domestic use of renewable energy sources on the lifestyle of respondents, the perceived effort it requires to attain or operate such a system also impacts on the lifestyle of the respondents.

i) High effort levels

This section highlights respondents' perceptions of the amount of effort needed to use renewable energy systems, with a specific focus on high effort levels.

Respondent # 3

M: What are the things that would stop you from installing such a system in your house?

3: You know what? It is too much hassle to change, because you have got it [electricity] now, so why bother?

Respondent # 6

"For instance I know about these solar stoves, which are those contraptions with the plastic covers that closes that works very well. It is just not the type of thing that tannies *from Lynnwood would normally put out on the* stoep *to cook their meal in."*

Respondent # 1

"I believe most people are aware of the concept [of renewable energy] but that they don't create (…) the actual schlep to use the high tech system that it takes, or they couldn't be bothered."

"I think people are reluctant to let into their lives something that requires a lot of maintenance and operation and whatever…"

High effort levels, along with high levels of maintenance and perceived or expected changes in respondents' current lifestyles, tend to negatively influence a generally positive attitude toward renewable energy, thus inhibiting implementation.

ii) Effort levels should be low

Along with the perception that a high amount of effort is needed to operate renewable energy systems, the perception exists that their operation should be easy. The use of renewable energy sources could be made psychologically easier if the system were integrated into the house at the design stage. When the occupant of the house is allowed the opportunity to passively use renewable energy systems, without making a conscious decision about it, future behaviour may be more in favour of the use of such systems.

Respondent # 1
"I think a lot more needs to be done from your planning and your detailed design…"

As is discussed in chapter 6, the positive changes in behavioural patterns could be increased dramatically by the implementation of regulations on a building design level, rather than expecting individuals to begin displaying environmentally-friendly behaviour. Legislation could possibly play a role in decreasing the level of effort needed to instigate the use of renewable energy sources.

iii) Effort levels are low

Respondents with experience with renewable energy sources stated that the effort levels needed to install and operate a renewable energy system are low.

Respondent # 6
"We put in our system …9 years ago. We haven't gone up to look at it once! It just works. No we haven't had any difficulties with it at all. It just works."

Respondent # 8
"You can install a switch [automatic electricity switch] if you want to, but it is not really necessary."

Respondent number 6 and number 8 were the only two respondents who said that the necessary effort levels are low. Experience with renewable energy systems may change attitudes toward the use thereof. Increased exposure to these systems might thus be positive in increasing use. This idea is explored further in chapter 6.

5.3.8 Responsibility

The category of responsibility encompasses several levels of acceptance or rejection of acceptability of responsibility. Each topic below contains a discussion on the criteria for that particular topic. The responsibility levels have been grouped as follows: governmental responsibility, community level responsibility, and rejection or acceptance of personal responsibility.

i) Governmental responsibility

The first topic pertains to governmental responsibility, and specifically to answering the question: what should government be doing? Perceptions on the current performance of government are discussed in a later section. Numerous references to the responsibility of government were made during the interviews. These groupings include references to central generation of electricity, central implementation of electricity, the perceived political will of government, expected financial aid and funding that should come from government and incentives and encouragement provided by government.

Central generation and implementation

This sub-topic contains references to and discussions of the responsibility of Eskom (or another large energy generation company) to generate electricity centrally by means of renewable sources and to implement the necessary infrastructure in order to make it available to all.

Respondent # 5

"I think it might not be practical [home installation] and it is more a sort of thing you know, put it out there, not as such out of mind's way, but I just think it makes more sense than putting it into every single unit in suburban areas."

Respondent # 7

"…they are not given that choice of the electricity and at the rate they currently pay, or electricity by another sources, by another rate. There is just no variable in the system where they can make

a choice. There may be some people who are willing to pay for electricity from coal generated by Eskom or some other source; they may be willing to pay for that."

Respondent # 1

"…on the other side the more lower class will come from a more urgent… you know… more and more people living in an urban set-up and they also need ways of…finding ways to serve more people…it is very urgent and needs attention."

Respondent # 7

"Ek dink die enigste opsie is om byvoorbeeld 'n windfarm *op te sit en op een punt elektrisiteit te genereer en dit dan deur die bestaande grid te sit, maar dan moet daar insette van jou nasionale owerheid wees wat wetgewing instel wat dit enable. Jou plaaslike munisipaliteit want hulle koop elektrisiteit by Eskom en versprei dit dan verder"*

Central generation and implementation of electricity by means of renewable sources seems to be accepted by respondents; however, it is also the easier option because no responsibility is expected from the individual. The perception that renewable energy sources are expensive, combined with the perception that central implementation is largely the responsibility of government, lead several respondents to make statements about how governmental wealth and responsibility coincide.

Political will

Political will to increase the use of sustainable energy sources, and thus the development and implementation of legislation, are also responsibilities assigned to the government.

Respondent # 7

"Ek dink die enigste opsie is om byvoorbeeld 'n windfarm *op te sit en op een punt elektrisiteit te genereer en dit dan deur die bestaande grid te sit, maar dan moet daar insette van jou nasionale owerheid wees wat wetgewing instel wat dit* enable*."*

Respondent # 6

"I mean there must be political will behind it otherwise it depends largely on private concerns to get it pushed and that is not going to have the massive impact that we would like to see it having. If the political will is there the policies will come into place and that will ensure that it [implementation] happens much faster and much easier."

Financial aid

The responsibility of government to provide financial aid is a fairly well-established perception. Government also has the perceived responsibility to start spending money in the renewable energy sector.

Respondent # 4

"I am not trying to say that everything must come from government, but they could play a very important role in this, because they are spending a lot of money on housing…"

"If you go to Botswana, as poor as those people are, I mean it is a wealthy government, what is noticeable, is when you go into Gaborone and Lobatse, you see fairly large housing developments where government has funded solar heating, every house has a solar system on the roof. So I think there should be some inspiration coming from the authorities' side…"

Respondent # 5

"I still think it is going to increase first, because they are going to have to cover their costs of putting in the infrastructure, like local government, their costs for that will not decrease substantially once there are many users."

Respondent # 8

"I think also the government can play a greater role in facilitating the use of more environmentally-friendly technologies, especially large-scale housing developments…"

The perception is prevalent that government should lead the way, financially and in terms of legislation. The responsibility assigned to government by the public may be an indication of the need from the public's side for a higher level of central decision making before personally committing to something.

Incentives and encouragement

The provision of incentives and encouragement from government is included in this sub-topic.

Respondent # 4

"So I think there should be some inspiration coming from the authority's side…"

Respondent # 7

"I think it would go a long way for people to start using it, if they have some contribution from government towards renewable energy and sustainable development."

"I think government would go a long way by providing rebates on their renewable energy."

"I think unfortunately there has to be a big push from government's side…"

Respondent # 5

"I think [in Germany] people are actually getting paid to convert their garage roofs into solar panel systems and then feedback into the grid, and they get a certain amount of energy compensation for that…"

"You will be able to contribute to the national grid, and the meter checks out what you have contributed and accordingly that gets deducted from your account, or whatever…"

The concept of incentives are discussed in detail in category 17; however, from this section it becomes clear that the public has a need to perceive government as a leader in the field of renewable technologies, including strategies to increase implementation like the provision of incentives.

ii) Community level responsibility

In this topic instances where respondents discussed the level of responsibility that professional members of the community have are highlighted.

Respondent # 8

"The engineers are obviously the kind of people that kind of drive that thinking [technological development]."

"But I think architects also have the responsibility to be more proactive and provide these systems from the start."

Respondent # 2

"Ek sal graag eers bietjie navorsing wil doen oor wat dit behels, jy weet en so, wat is die (…) van die stelsel, en as jy presies dit weet en jy rederlik seker is jy het 'n verskaffer wat weet wat hy doen en dan dink ek sal ek redelik gemaklik voel daarmee, jy weet?"

Respondent # 5

"if you were an architect or an engineer particularly and you could motivate that this could work, then it is not an issue."

Several respondents referred to the concept that the architect or engineer has the responsibility to introduce other renewable energy sources during the construction phase of the home. The initial installation of a renewable energy system in the home could make it easier for people by limiting the perceived amount of effort necessary to install such a system. People might be very likely to use it if they do not have to exert effort to install it in their homes.

iii) Acceptance of personal responsibility

Respondents' references to the concept of personal responsibility are discussed in this section.

Respondent # 6

"So I think it was perhaps one of the first hurdles to take the decision, to put in the effort, the research the idea and to see what is available on the market, to see how does it work, et cetera, et cetera."

Respondent # 8

"I can tell you that I have a solar system myself. And it makes economic sense and it makes environmental sense."

"I have experienced very few problems with it, so I don't expect any"

Respondent # 3

M: *"So you would feel comfortable installing such a system in a flat that you rent out to other people?"*

3: *"Yes."*

Some respondents seem to be willing to accept personal responsibility for a renewable energy system. Even respondents with no experience with renewable energy systems state their willingness. However, the level of experience with renewable energy sources increases the certainty with which these statements are made and limit the amount of reservations expressed.

iv) Rejection of personal responsibility

Perceptions that the responsibility for these systems is too great and the rejection of personal responsibility are discussed in this section.

Respondent # 4
"I don't mind fixing my own system myself, but if it is a flat that I rent out, you are dependant on a specialist or that type of thing, so I would think twice there."

Respondent # 5
"I think it might not be practical [individual units] and it is more the sort of thing you know, put it out there, not as such out of mind's way, but I think it just makes more sense than putting it in every single unit in suburban areas."

Respondent # 7
"Ek gee nie regtig om waar my elektrisiteit vandaan kom nie, solank dit 'n veilige bron van elektrisiteit is."

It is clear from the quotations above that respondents are sometimes in two minds about accepting responsibility for the operation and maintenance of a renewable energy system. The perception of whose responsibility it is to implement renewable energy sources also gives an indication of the level of commitment already made by the individual. Very few of the respondents actually indicated their willingness to accept responsibility for such a system, even hypothetically.

5.3.9 Perceived Governmental Commitment to the Environment

The perceived level of commitment exhibited by various organisations, government and institutions influences the individual's level of their environmental commitment. This category contains two topics. The first pertains to the perceived commitment of government and large organisation to environmental issues, the second emphasises the perception that the level of commitment is doubtful.

i) Political will and drive to implement is high

This section differs from section 5.3.10.1 (c) in that a value statement is made in terms of the perceived level of political will. Here it is not participants' expectations of government that are discussed, but government’s perceived level of commitment.

Respondent # 1

"But solar energy, specifically solar water energy…there's quite a significant grant from the government's side, or a lot of talk in that direction at least."

"I think a lot more needs to be done from planning and from your detailed design. And from what I've heard from people, it is slowly starting to happen…"

ii) Governmental commitment is doubtful

Governmental commitment to the implementation of renewable energy sources is doubtful to some. These statements are discussed below.

Respondent # 7

"…there are a number of initiatives from DEAT [the Department of Environmental Affairs and Tourism] to go toward renewable energy, I think what lacks is the legislation to support it."

Respondent # 6

"…the fact is that policies aren't in place, the systems aren't in place, that type of thing. I would include that in government protecting or in a way subsidising the use of [conventional] electricity."

Respondent # 8

"They know they have coal reserves for the next 20 or 30 years, so they are not going to look at alternatives, and change that to something maybe slightly more expensive. They are also in some kind of comfort zone."

It seems from the above statements that doubt about governmental commitment exists. The perceived level of commitment could influence the level of individual implementation. The effects of the level of doubt in governmental commitment that influence the level of commitment from the individual are further explored in chapter 6.

5.3.10 Legislation

Legislation is a category that is divided into two topics, namely, the perception that legislation could be used as a tool to force the use of renewable energy sources, and the perception that bureaucracy inhibits action from the government.

i) Legislation is a tool to force use

Respondents' ideas about legislation as a tool to force the use of renewable energy sources are illustrated in the quotes below.

Respondent # 1

"I have heard from people it is slowly starting to happen, that is somewhere in…You will have to force someone…not force, but if they are required to do it…"

Respondent # 7

"Unless people are forced to make use of renewable energy through legislation their attitudes are not going to change."

"I think what lacks is the legislation to support it. There isn't legislation to force people to use renewable energy in the first instance…"

There is a prevalent perception that the use of legislation by government is needed as a means to enforce the use of renewable energy. The possibility that a need for clear guidance from the government exists and the impact thereof is explored in chapter 6.

ii) Bureaucracy inhibits the drive from government

Obstacles in the development of legislation and the impact thereof are discussed in this topic.

Respondent # 6

"I know from experience how difficult it is for renewable energy to get into the grid, just because of the bureaucracy. The fact is that the policies aren't in place, the systems aren't in place that type of thing."

Respondent # 7

"…daar moet insette van jou nasionale owerheid wees wat wetgewing instel wat dit [die gebruik van herwinbare energie] enable*."*

To a limited degree, the perception that bureaucracy inhibits the drive and commitment from government is prevalent. The need for legislation to give direction on government's stance is clear. The interconnectedness between the direction indicated by government and other leading organisations, and how it influences the decision-making processes of the individual, are investigated.

5.3.11 Attitudes toward Renewable Energy Sources

This category pertains specifically to the general perception of renewable energy sources. In this case, renewable energy sources refer to the concept of sustainability, making use of natural systems and renewable energy in the everyday life of the respondent.

i) Negative attitude towards renewable energy in general

Negative ideas about renewable energy are quoted and discussed below. Some respondents referred to the use of alternatives in a negative sense, such as respondent 7 below, whose tone of voice expressed a certain level of disgust with some available alternatives.

Respondent # 2

"Ja kyk, daar's ander goed ook soos goed wat van jy weet die verrottingsproses gebruik maak, maar ek dink ek sal dit nie so graag in my tuin wou hê nie…so van elle ander probleme veroorsaak nog 'n ander ding wat baie maklik ontbrand en ontplof, en daai tipe ding, so ek sal huiwerig wees…Die reuk van beesmis vorm meer deel van die plaas, nie deel van my agterplaas nie."

Respondent # 7

"Solar is obviously a big one all over. A lot of people use cow-dung."

Respondent # 4

"I think it [renewable energy technology] is just at a stage where we haven't really started yet, it hasn't started to gain its own momentum. It's still very early days."

"…the ideal to develop new sources of energy and solar energy is one of those things. I would like to support it, but I am also practical..."

"There was a time when there was some interest in it [renewable energy technology]."

"I am prepared to make a small sacrifice, provided that it works. And it is not just a novelty idea."

Respondent # 1

"Although solar panels are not feasible because they are still very expensive, they have a lot of stigma and a lot of arguments attached to them."

To understand how this negative attitude toward the use of renewable energy sources is embodied, the attitudes of respondents regarding resource efficiency requires further investigation.

Respondent # 2

"Wel eerstens, wat is die alternatief? 'n Mens gee vir hulle elektriese energie, nou afgesien van omgewingskoste, en jy weet, wat niks voel vir die goed wat hulle mors nie…"

The necessity of resource efficiency was not emphasised by respondents. The level of awareness could influence the prevalence of discussions on the topic. The possibility that people responsible for paying the electricity bills are more aware of the cost and efficiency of the resources that other family members is explored in the following chapter.

The use of sustainable and alternative means of energy, grey water use and general waste recycling seems to have connotations of being somewhat disgusting and possibly dangerous. In general respondents referred to the use of renewable energy as impractical and to a certain degree as an ideal rather than a possibility grounded in reality. Interestingly, respondents who have had experience with the use of renewable energy sources in the home also have a more positive attitude toward environmentally-responsible behaviour in general, as is discussed in the following section.

ii) Positive attitudes toward renewable energy sources in general

This section examines the respondent's positive attitudes to the general, efficient use of resources and responsibility to the environment, including the use of renewable energy sources.

Respondent # 5

"I definitely think it is something that can be used more than it is currently being used."

"If you particularly want to push any renewable resources, I think it is a worthwhile endeavour, because you give yourself a bit more time to phase out non-renewable energy sources."

Respondent # 8

"We have the solar potential, and we could look much more at wind energy as well. The other possibilities in terms of energy generation could be explored as well…"

The belief that resource efficiency is necessary and important may serve as an example of positive attitudes toward resources conservation.

Respondent # 1

"…not only specifically energy, but sustainability, or cutting down their water use, that is the big one."

"But I think the biggest necessity is cutting down on electricity use…"

Respondent # 8

"If you look at what is happening world wide, there is a big move for energy efficiency and against global warming."

Only four respondents spoke about resource efficiency and all stated that it is becoming more important to behave in resource-efficient ways. Resource efficiency constitutes a necessary change of current resource usage pattern and is potentially difficult to change.

A positive attitude toward the general implementation of renewable energy, the promotion of efficient use of resources and recycling may start with introducing people to a simple form of sustainable behaviour often modelled by parents or neighbours. The influences on the environmental inclination of individuals are examined in chapter 6.

5.3.12 Level of Awareness

This category contains references made by respondents to their personal levels of awareness about the use of renewable energy sources. Included as separate topics are also references made to the perception of the awareness levels of the average 'person on the street'.

i) Personal awareness - high

High awareness levels of individuals are discussed below.

Respondent # 8

"If you look at what is happening world wide, there is a big move for energy efficiency and against global warming."

Respondent # 2

"Ek weet uit my beroep uit ook jy weet, dat steenkool reserves is besig om vinnig af te neem, vinniger as wat meeste mense dink dit neem af."

ii) Public awareness - high

The following section focuses on the perception of the high public awareness about the use of renewable energy sources.

Respondent # 8

"I think there is much greater awareness. It has become part of the mainstream press, if you read it, you can't miss it. Maybe the man on the street, or the person on the street is maybe not quite yet aware of the affect it may have on them, but I definitely think there's a higher awareness than say ten years ago, especially since the Kyoto protocol has come into play."

Respondent # 3

"I think the younger generation, they know more of what is going on in terms of the environment."

iii) Public awareness - low

In this section perceived low public awareness is explored.

Respondent # 3

"No, I don't know, it is a new thing for a lot of people."

Respondent # 5

"For the everyday man on the street, I think it is a matter of awareness, and I think that is the big issue…"

"I think there it is a problem of awareness…"

Interestingly, none of the respondents thought of their personal level of awareness as low and few respondents described the public's level of awareness as high. This may be because they work with environmental issues on a day-to-day basis, or because of the need to always see oneself as an individual different from the group. This concept is probed within a theoretical framework in chapter 6.

5.3.13 Acceptance through Exposure

This category refers specifically to the level of acceptance of the concept of the use of renewable energy sources through awareness-generating projects and increased exposure to renewable energy sources.

i) Importance of awareness-generating projects

In this section the impact of the perceived generally low awareness of the use of renewable energy sources is discussed. The most frequently mentioned solution is awareness-generating projects.

Respondent # 1

"I still think they can come back and start using the media, because everybody knows about this now, but still, they are aware of it, but they don't really understand it."

Respondent # 6

"…it is quite a search to find the right product, you know, it is not like you walk into Builder's Warehouse and there it is…"

The need for awareness programmes may serve as an indication of a growing need for more and better information. This need may also be an indication of what is perceived by respondents as socially acceptable suggestions. Thus respondents may not genuinely intend to take part in, or be convinced of the necessity of such awareness programmes. Nevertheless, they may suggest them because it is perceived to be a socially acceptable.

ii) Education by means of exposure

This topic refers to the perceptions of respondents that increased exposure to the use of renewable energy sources by means of marketing, advertising and promotion would increase the level of knowledge about the use of these systems.

Respondent # 6

"It would probably depend on the kind of publicity, broadly speaking, that is put into promoting it...making it an easy option."

Respondent # 7

"I think it is also about education, there isn't yet a widespread campaign out there trying to educate people about the advantages of renewable energy that tell them where to find it, how much it costs, and what the benefits to them would be."

"…ek neem aan jy weet as iets gebeur en as dit breek kom jy dit nie dadelik agter nie, want dit is heelwaarskynlik nie 'n sisteem waarmee jy vertroud is nie."

Respondent # 3

"I think if you want to have it, actually if you want to get the buy-in from the people because some have started using it, they will start using it…"

Respondent # 1

"And then I still think they can come back and start using the media. I think they should start using the media more effectively…because everybody knows about this now, they are aware of it, but they don't really understand it. I don't know of ways you can do it, but using the media may make people more and more aware if not the existence of it, but actually dealing with it on a day-to-day basis.

The use of the media seems to be a popular suggestion on how to increase awareness; however, as respondent # 1 states above, access to the media does not constitute an understanding of the technology nor the reasons for implementation. The experience of personal benefit as discussed in section 5.2.8.1 may still be lacking. In chapter 6, the relationship between awareness, perception of personal benefit and actual behaviour is examined.

iii) Increased environmental awareness by means of exposure

This topic focuses on the increase of general environmental awareness through exposure to the concept of sustainability, resource efficiency and the use of renewable energy sources. In this section, specific reference is made to the respondents who have been exposed to renewable energy sources, but who do not have personal experience with it.

Respondent # 1

"The most common ones are solar wind and the one that does not have a lot of application is tidal energy as well. And then there is stuff like bio-gas, although there are arguments out there that these things aren't terribly renewable, but rather sustainable."

Respondent # 5

"Well the first one that comes to mind is gas. Gas is not necessarily renewable, it comes from the earth, but you can also, you know, get gas from composting or waste material."

From the above statements it seems that respondents with high levels of exposure to the possibilities of renewable energy, such as respondent 5 and 1, also have more background about the difference between renewable and sustainable energy. The possible influence of increased knowledge on the level of environmental concern is explored in the following chapter.

iv) Risk perception

This topic pertains to the perception of the risk that accompanies the use of renewable energy systems. In this section it becomes clear that respondents with personal experience of the use of renewable energy tend to also perceive low risk with the use of alternative means of energy generation.

Respondent # 8
"If you take a geyser system, it has more risks than a passive solar system, a geyser can explode, but what can a solar system do?"

As is clear from the quote above, the respondent does not perceive a high level of risk in the use of renewable energy sources. This is not the case for all respondents. Several respondents refer to the financial implications, the high levels of effort necessary for implementation and the difficult operation of these systems. All of these are perceptions of the risk involved in the use of renewable energy sources; however, they have been discussed under several other sections. The relationship between the impact of the use of renewable energy sources on lifestyle, the trust in renewable energy technology, the costs involved in implementation and the level of perceived risk are discussed in a broader sense in the following chapter.

5.3.14 Incentives

This category refers to the use of incentives as a means to increase implementation of renewable energy sources.

i) Need for incentives is high

The need for incentives, whether these are of a financial nature or something else, seems to be high.

Respondent # 5

"I think at the end of the day it talks to their pockets, take it from a saving point of view, that yes, if you do convert your garage roof to voltaic cells, you will be able to contribute to the national grid, and the meter checks out what you have contributed and accordingly that gets deducted from your account…"

"I think there are people who are actually being paid to covert their garage roofs to solar panel systems and then feed back into the grid, and then they get a certain amount of energy compensation for that."

Respondent # 1

"I know the one thing that they are looking at is to subsidise, I don't know how they plan on doing that, but if you use one of those things you get a rebate on your electricity costs. And that is a way of compensating people for using that. I think they will have to do something like that."

Respondent # 7

"Whether it be paying less property tax, or cheaper water, but I think until people see it as beneficial to me and my pocket, you are not going to change their attitude to the environment just because it is good. People are just not like that."

The need for incentives may be high because of the perception of low direct personal benefit emanating from the use of renewable energy sources. In the following chapter the researcher examines the idea that the need to experience personal benefit may be linked to the perceived risk of the system, and that incentives may strengthen the link between experience of personal benefit and implementation.

ii) Means to implement incentives are necessary

This topic contains discussions on the viability of the implementation of incentive programmes and the technological and administrative needs for such a system to be put in place.

Respondent # 5

"…if you do convert your garage roof to voltaic cells, you will be able to contribute to the national grid, and the meter checks out what you have contributed and accordingly that gets deducted from your account…"

"…and then they feed back into the grid and get a certain amount of compensation for that."

Respondent # 1

"The problem with solar panels and fluorescent light bulbs, unlike computers and cell phones that keep on getting cheaper and cheaper, is that they aren't trendy. And therefore there isn't that drive to make improvements and to make redundant the older models. That drive that keeps on advancing the thing. It is very trendy whereas in a solar panel, it is not going to change much. There isn't that much stuff that you can use to make more people want to use it."

The use of incentives, by government as well as generation companies and private concerns, is deemed as imperative for the successful large-scale implementation of renewable energy sources. Perceptions that government would not be able to provide the necessary technological and administrative services remain.

5.3.15 Trust in Technology

This category refers to the level of trust in the renewable energy technology. Aspects that impact on the trust in the system such as quality, convenience and inconvenience, potential for success or failure and the sphere of implementation all form part of this category.

i) The need for a system of high quality

The need for a good quality system is high and several respondents alluded to expressing more trust in systems that come off a production line.

Respondent # 2

"…ek dink as 'n mens begin met 'n goeie stelsel, nie met 'n slap dash tipe ding nie, dan gaan jy waarskynlik nie veel meer onderhoud nodig hê as 'n gewone stelsel nie."

Respondent # 4

"…I think if you have a system that is properly designed and built, as I have seen in Botswana, those systems that weren't built in a backyard, they come from a production line. I don't think there should be major, regular maintenance required…"

Respondent # 7

"…ek sal net vooraf oortuig moet word dat ek nie nodig het om 'n ander bron van elektrisiteit ook hoef te hê nie…"

Perceived levels of risk could be high because respondents doubt the functionality, origin and quality of available technology.

ii) Impact on the quality of the system

This topic contains references to the impact that a renewable energy system could have on trust in the system.

Respondent # 8

"It doesn't necessarily work as efficiently during winter, but during summer we use it all the time, unless it is a cloudy day, but then we have a dual system."

Respondent # 2

"…ek dink as 'n mens begin met 'n goeie stelsel, nie met 'n slap dash *tipe ding nie, dan gaan jy waarskynlik nie veel meer onderhoud nodig hê as 'n gewone stelsel nie. Daar sal miskien meer koppelings wees (meer kettings) miskien, ek weet nie, maar dit behoort nie meer, vreeslik baie meer tyd of geld te kos nie."*

The quality of the system seems to impact on perceptions of high levels of maintenance and a great deal of effort in the operation of the system. The trust in the technology is supported by good quality systems.

iii) Inconveniences of the system

The trust in the system can also be influenced by the experienced and the perceived inconveniences the system may entail.

Respondent # 7

"Omdat jy nie elke dag daar is nie het jy nie daardie konstante toesig daaroor om seker te maak dat dit instand gehou word nie."

Respondent # 5

"I think that we might not want to put up so many voltaic cells…"

Respondent # 4

"I suppose, the solar system as we know it today is limited to heating. I don't think there are systems on a house scale… there should be too much inconvenience, only in terms of heating; you know, sometimes it might not make the water as hot as you would like."

Respondent # 6

"One difficulty with the system is, of course, if your geyser heats up during the day and at night time you empty it, there isn't hot water for a warm shower if you need one the next day."

Respondent # 8

"…If you forget to switch on the electricity when it is cloudy there is obviously not going to be hot water in the morning when you want to shower, but if you switch it on there's usually warm water within half an hour. So it is not really a constraint."

The perceived level of inconvenience caused by the domestic use of a renewable energy system influences the level of trust in the system.

iv) Solar potential is low

The potential for the actual implementation of the necessary infrastructure and the use of the available solar energy is low in some cases.

Respondent # 7

"If you had to go and put up a separate network [electricity grid], obviously that would have its own cost implications for whoever is generating the electricity."

Respondent # 4

"I suppose the solar system as we know it today is limited to heating. I don't think there are systems on a house scale…"

The perception that the domestic use of renewable energy is unattainable because of financial and technology constraints is prevalent, especially in respondents who have not had personal experience with renewable energy systems.

v) Technology used in combination

It seems that trust in the system might increase if the system were to be used in combination with conventional energy or other sources of renewable energy.

Respondent # 7

M: *"It needs to be in support of another system…?"*

7: *"Either that, or the panels must be big enough but at this stage I don't think it is possible to have a panel that is big enough."*

vi) Availability of renewable technology

The availability of technology is an important topic, because the availability could potentially increase the level of implementation and also influence several perceptions on the use of renewable sources of energy.

Respondent # 7

M: *"If you talk about renewable energy sources, which are available to be used in the home?"*

7: *"I think mainly solar, I have seen some projects overseas where they don't only use solar, they also use landfill gas."*

Respondent # 6

"It was quite a search to find the right product, you know; it is not like you walk into Builder's Warehouse and there it is…"

"It would depend on a whole lot of things, it would depend on how readily available it is, it would depend on cost, and it would probably depend on the kind of publicity…"

"But there is sort of a range available depending on how much effort you want to put into it…"

The level of availability of the product influences the trust the respondent has in the system. Availability could also refer to the psychological availability of the system as an option. A higher level of awareness, awareness-generating projects, and exposure to the use of renewable energy systems all play a part in the psychological availability of the system, which in turn influences the trust in the system. The relationship between these systems is examined in the following chapter.

vii) Renewable technology is efficient

Here the focus is on the perceived efficiency of renewable energy, with quotations that illustrate the groundedness of this category in the data. This is followed by a discussion on the respondents' perceptions.

Respondent # 6

"…we can't afford to run the whole house on that in terms of energy use from solar. I think that and then largely maybe a mental shift, to understand how easy it actually works once it is installed."

"We haven't gone up to look at it once, it just works."

Respondent # 8

"I have experienced very few problems with it…"

"The solar system can work and you can switch on the electricity when it doesn't work, which is not that frequent."

Respondent # 1

"I think from a technology side they are dependable, these things have been around for quite a while now."

Perceptions on effort, design and technology are positive in some cases and this heightens the trust in the system.

viii) Solar potential is high

The high potential for solar energy to succeed in South Africa increases the trust in the system and the probability that more people would use it.

Respondent # 5

"Look I have has some experience with solar, having worked in Europe and having been here. I mean, South Africa doesn't use it efficiently, because we have a lot more daylight hours than a lot of the European countries do, and there is some very interesting work going on in Germany."

Respondent # 6

"I think it is something that has to happen and that it has a very high potential of happening in small household or within smaller regional areas."

Respondent # 2

"…kyk, die beste een waarskynlik in dié deel van die wêreld is die werk van son energie, ek dink dit is die maklikste ene om op klein skaal te doen."

The possibility that solar energy and other energy sources could be used successfully in South Africa contributes to the respondents' level of trust in its use.

ix) Existing technology is sufficient

This section explores the perception that there is no need for the use of renewable energy sources because the present energy supply and generation methods are sufficient.

Respondent # 3

"…you know what, it is too much hassle to change, because I have got it now, you know, so why bother?"

The perception that conventional energy generation methods are sufficient links to the experience of personal benefit and the need for renewable energy sources. The possibility that benefits will be recognised when there is no need for it is low.

x) Existing technology is insufficient

The perception that existing technology is not sufficient influences trust in the constant supply of electricity.

Respondent # 1

"I think it is becoming necessary because if you take a simple example like Eskom with all their power failures, they are really struggling to meet the demand."

Respondent # 2

"So ons gaan 'n toekoms tegemoet waar al meer te doen met soort van kragonderbrekings en die prys van elektrisiteit sal opgaan."

Respondent # 3

M: *"Do you think it would have an impact on the energy use in the home?"*

3: *"Yes, because that is because they can't satisfy the peak demand…"*

The perception that existing energy generation methods and supply are not sufficient or will not be sufficient in the near future influences the level of trust in conventional energy and may encourage a search for alternative energy sources.

5.3.16 Impact of Level of Implementation

The impact that the level of implementation would have on the individual and the actual impact thereof on the environment are discussed in the topics below. Some respondents believe that small-scale domestic implementation would make a big difference, whereas others are certain that industry is the largest generator of energy demand and domestic implementation would only have a small impact.

i) Small scale implementation - low impact

In this topic the respondents perceive that the impact that the domestic use of renewable energy is small.

Respondent # 2

"Jy moet natuurlik besef dat by verre die meeste energie in Suid-Afrika gebruik word deur die industrie…so mens kan nie verwag dat groot besparing in terme van die totale energie verbruik van die land deur middel van huishoudelike oplossings gaan kom nie."

Respondent # 8

"It might not have a huge impact because a lot of electricity demand is created by industrial users, but cumulatively, if it makes a bit of a difference, it could either delay the need to build new power stations, or obviate that need completely."

The use of renewable energy sources in the production and supply of products and services is suggested in an attempt to increase the impact of renewable energy sources. The level of trust in renewable energy sources would have to be rather high if industrial users were to invest in a renewable option.

ii) Use of renewable energy in the production and supply of products and services - high impact

Similar to section 5.s.16.2 above, this section investigates perceptions that the industrial use of renewable energy would have a large impact are indications of high levels of trust in the capabilities of the technology.

Respondent # 2

"Jy moet natuurlik besef dat by verre die meeste energie in Suid-Afrika gebruik word deur die industrie…so mens kan nie verwag dat groot besparing in terme van die totale energie verbruik van die land deur middel van huishoudelike oplossings gaan kom nie."

Respondent # 8

"It might not have a huge impact because a lot of electricity demand is created by industrial users, but cumulatively, if it makes a bit of a difference, it could either delay the need to build new power stations, or obviate that need completely."

iii) Use of renewable energy in the production and supply of products and services - low impact

The use of renewable energy in the domestic framework and the doubt about large-scale industrial implementation are examined below.

Respondent # 6

"I think that the solution for the bigger problem would probably not come from having the big provider of electricity going the route and using renewable sources of energy. I think it is something that has to happen and that has the potential of happening in small household or within smaller regional areas."

The trust in the applicability of renewable technology could be seen in this respondent's suggestion of domestic implementation. The implementation suggestion shows a high level of trust in the technology, the system and the possibility of implementation.

The trust in technology, whether it is current or renewable, greatly influences the level of comfort, the need to implement it and the perceived benefit experienced by the individual. The interconnectedness between these categories may play an important role at the level of implementation of renewable energy sources. This is explored in depth in chapter 6.

5.4 Conclusion

This chapter reported specifically to the first stage of analysis, highlighting the criteria of identified categories and topics. The purpose of this chapter was to increase both the researcher's and the reader's understanding of the aspects that were discussed during the interviews with respondents. Some of the identified categories also play a significant role in the discussion in the chapter that follows. Aspects such as how learned attitudes influence the perceptions of environmentalists, the perception of the responsibility of both the individual and government, and the perceived risks perceived in the use of renewable energy sources comes under scrutiny. The perception of the self as influenced by the use of renewable energy sources, the availability of renewable energy sources, the impact thereof on perception and the possibility of attitude change are also discussed from a theoretical point of view. These aspects are discussed as the second stage of analysis.

CHAPTER 6

Second Stage of Analysis

6.1 Introduction

In this chapter the results of the second stage of the analysis are discussed and presented. The first stage of analysis was presented in the preceding chapter and contained detailed discussions on the identified topics and how they were combined into categories. In this stage of analysis the 64 topics and 16 categories were pooled into six pattern categories (PC). A full discussion of the second stage of analysis can be found in chapter 4.

Similar to the previous chapter in which a topic could form part of more than one category, categories could form part of more than one pattern category (and most often do). The focus of this chapter is not to reduce the data, and as a result possibly lose a lot of valuable information, but to remain with the complexity of the data to obtain a holistic view of the topic. This may ensure a deeper understanding of all the factors that play a role in the formation and change of attitudes and the exhibition of behaviour.

In each of the following sections a short description of the pattern categories is given, followed by a table delineating the topics and categories that constitutes the pattern category. This is done in order to start identifying patterns into which the description of respondents' perceptions of renewable energy fits. The pattern categories that are presented below include a theoretical discussion on the presented phenomena. The systems theoretical approach is referred to only briefly since it is the objective of chapter 7 to combine the literature on social psychology and systems theory with the perceptions and attitudes of renewable energy sources as basis.

6.2 Presentation of Pattern Categories

In this section, six pattern categories are presented. In this section, the categories emanating from the first stage of analysis that constitute a pattern category are identified. A similar layout to the previous chapter is followed, in which a short description of the categories included in each pattern category is given. To facilitate cross-referencing, categories are numbered according to the numbers allocated in chapter 5. This is followed by an extensive discussion of the pattern category according to a theoretical framework as discussed in chapter 3. It is important to emphasise that by no means are these pattern categories mutually exclusive and

several categories may form part of different pattern categories. The emphasis of chapter 7 is to examine and conceptually discuss the interconnectedness between the pattern categories.

6.2.1 PC 1: Learned Attitudes toward the Environment and Renewable Energy

The numbers of the categories as they appear in chapter 5 are also given for easy cross-referencing. The column on the right refers to the topics that fall into the specific category. The inclusion of the topics is necessary to enable the reader to understand the link made between the pattern category, the category and the topics.

Table 6.1 First order categories and topics present in PC 1

First order category name	Category number	Topics included in category
Cost - maintenance	5.3.1.1	Maintenance costs are high
Cost - environmental	5.3.1.3	Effects on the environment
Financial feasibility of electricity	5.3.2	Price of electricity is low
Psychological inertia	5.3.4	Slow change Importance of change of current practice Unexpected change
Maintenance	5.3.5	High and low maintenance Predictability of maintenance
Perceived impact on comfort	5.3.6	Personal benefit observation Lifestyle changes (positive and negative) Visual impact is high Trust in the system (high and low)
Effort	5.3.7	High effort levels
Commitment to environment	5.3.9	Political will and drive to implementation is high
Legislation	5.3.10	Legislation as tool to force use
Positive and negative stigma around environmentalism	5.3.11	Negative attitude toward renewable energy in general Positive attitudes toward renewable energy in general Importance of energy efficiency is high
Trust in technology	5.3.15	Inconveniences of the system Efficiency of renewable technology

Several learned attitudes toward the environment and renewable energy are present in all of the abovementioned categories and topics. From the systems theoretical point of view, as discussed in chapter 3, habits of thought that have been formed over many years and that have formed positive feedback loops via parental and wider social examples have become less flexible and more subconscious.

In chapter 3, the theory of social learning (Bandura et al., 1961) was examined as a possible contributor to some environmental perceptions held by respondents. The theory of social learning stipulates that people learn by way of observing happenings in the social realm. Social learning plays a role in the acquisition of attitudes (Feldman, 2001; Pennington, 1986). The perceived cost of the maintenance of running renewable energy systems (5.3.1.1), the perceived cost to the environment (5.3.1.3), as well as the general stigma attached to environmentalism (5.3.11) could be perceptions learned from parents, colleagues, neighbours or family.

The perceived level of commitment to environmental issues by the authorities (5.3.9) could reflect that the authorities model a low level of environmental commitment and a lack of action to the public. The generally perceived lack of legislation (5.3.10) similarly demonstrates that low levels of action are expected from citizens and government alike.

Learned attitudes or habits are often described as a stable part of personality (Pervin & John, 2001; Shaffer, 1999). As such, they become part of who people consider themselves to be. According to the theory of cognitive dissonance (Festinger, 1957), people act in harmony with their beliefs and attitudes in order to avoid a certain sense of unease (Pennington, 1986). The psychological inertia (5.3.4) that respondents exhibit seems to indicate that respondents act in accordance with their current behaviour in order to avoid disharmony between their attitudes and behaviour. For instance, some respondents indicated that they generally agree that people should display environmentally-friendly behaviour. However, they have not exhibited behaviour consistent with this attitude. When queried about this, various reasons why renewable energy is not functional were presented to externalise the reason for non-exhibition of environmentally-friendly behaviour.

Another aspect of habits includes a certain level of automatism. People in general tend to prefer little change in the responses expected of them (and their learned attitude) and therefore perceive some unease when confronted with aspects where change is expected (Thøgersen & Ölander, 2004). In this study, such aspects include maintenance (5.3.5), effort (5.3.7), positive and negative stigma around environmentalism (5.3.11) and trust in technology (5.3.15). These categories are all perceived to include a level of undesired change in the automated (habitual) action of the respondents.

The low cost of conventional electricity (5.3.2) has taught people that the efficient use of resources is not important. This links with the observation of direct or personal benefit that is discussed in section 6.2.4 below. The responsibility that is bestowed upon the individual and what he or she does with it is discussed in the following section.

6.2.2 PC 2: The Role of Responsibility and its Influence on Perceived Quality of Life

The second pattern category consists of several categories and topics identified in the previous chapter concerning the responsibility of government, the community and personal responsibility. The following section discusses the contents of table 6.2, which stipulates which categories and topics are included in this pattern category, the psychological significance of these aspects of responsibility.

Table 6.2 First order categories as part of PC 2

First order category name	**Category number**	**Topics included in category**
Costs - installation	5.3.1.2	Feasibility through outside funding
Cost - environmental	5.3.1.3	Effects on people
Financial feasibility of electricity	5.3.2	Impact of price perception
Effort	5.3.7	High effort levels
Responsibility	5.3.8	Governmental responsibility i) Central generation and implementation ii) Need for political will iii) Financial aid iv) Incentives and encouragement Community level responsibility Personal responsibility - accepted Personal responsibility - rejected
Commitment to environment	5.3.9	Political will and drive to implementation
Legislation	5.3.10	Legislation as tool to force use Bureaucracy inhibit drive from government
Incentives	5.3.14	Incentives should be financial Need for incentives are high
Trust in technology	5.3.15	Impact of small scale implementation is low Industry will have a large impact
Impact of level of implementation	5.3.16	Large industrial impact Large individual impact

In discussing prominent aspects identified in the above categories, it becomes difficult to discuss pattern categories separately, since their interconnected nature renders such divisions artificial. References to other pattern categories and how these interact will therefore be referred to often, although it is the focus of chapter 7 to take a closer look at how these categories are interconnected.

As discussed in chapter 3, personality traits could influence the degree of responsibility people ascribe wither to themselves or to other role players like the community or the government. The perceived high cost of installation (5.3.1.2) of renewable energy systems often leads people to the natural conclusion that it should either be encouraged by means of financial aid organised through government from organisations such as USAID or the World Bank (5.3.8) or the government itself, by means of incentive programmes (5.3.14).

Aspects such as little or no commitment to the environment (5.3.9), no political will (5.3.8) and the lack of appropriate legislation (5.3.10) are often cited as reasons why government has not succeeded in implementing renewable energy sources as the main source of generating electricity or at least an incentives framework. Industry (5.3.16) and professionals (5.3.8) such as architects and engineers are also sometimes described as more responsible than individuals for implementing the use of renewable energy.

These are all statements focusing on externalising responsibility and ascribing it to institutions, organisation, government and professionals. As discussed in chapters 3, people with an external locus of control tend to engage in environmentally responsible behaviour less often than people with an internal locus of control.

Thøgersen (2004) links environmentally-responsible behaviour to locus of control by stating that a lack of perceived control influences the level to which an individual acts environmentally. Aspects such as accepting responsibility for change (5.3.8) and acknowledging the impact that conventional energy generation methods have on people (5.3.1.3) are indicative of an internal locus of control. Employing some form of effort in order to increase knowledge (5.3.7) and by expressing the belief that small-scale implementation of renewable energy can make a difference (5.3.15) are also related to the respondent's personal sense of responsibility. Interestingly, as noted in chapter 5, respondents who have already exhibited environmentally-friendly behaviour in some sense emphasised personal responsibility (5.3.8). Also, as indicated in chapter 3, people with an internal locus of control tend to exhibit high instances of environmentally-responsible behaviour.

Cognitive dissonance, as discussed in chapter 3, could be applied to both internal and external locus of control and the accompanying actions. In the first instance cognitive dissonance may play a role in the attribution that 'other' organisations and groupings are responsible for the implementation of renewable energy sources (5.3.8; 5.3.10; 5.3.15). An

individual might experience cognitive dissonance when stating that he or she supports the use of renewable energy without exhibiting behaviour that is consistent with the statement. Thøgersen and Ölander (2003, p. 226) state that "[p]eople may neutralize the moral attitude or norm dictating pro-social behaviour by denying that continuing their current behaviour has any serious consequences or by denying their own responsibility for solving the problems produced by their current behaviour". This concept is also known as the tragedy of the commons (Hardin, 1968). This is one way in which cognitive dissonance is handled. Similarly, the desire to act consistently with the views and attitudes expressed may cause people who have already exhibited some form of environmentally-friendly behaviour to express beliefs in accordance with those acts.

Locus of control, the level of perceived control an individual has, and the emotionally disturbing and unpleasant experience of behaving inconsistently with stated beliefs or values are intimately intertwined. In chapter 7 the interconnectedness between these and other psychological aspects of the use of renewable energy sources is explored in more detail.

6.2.3 PC 3: Risk Perception as Inhibitor of Action

As the discussions on pattern categories advance it becomes increasingly difficult to make separations between the psychological issues; however, the researcher attempts to discuss psychological phenomena in isolation in this chapter and explore the interconnectedness in greater detail in chapter 7. In this pattern category, risk perception as an inhibitor for action is discussed and explored. This inevitably ties in with the concept of level of perceived control discussed in pattern category 2. Similar to previous sections in this chapter, table 6.3 below shows the third pattern category and first level of analysis categories and topics of which it consists.

Table 6.3 Categories and topics from the first stage of analysis as part of PC 3

First order category name	Category number	Topics included in category
Cost - maintenance	5.3.1.1	Maintenance costs are high
Cost - installation	5.3.1.2	Installation expenses Cost benefits
Cost - environmental	5.3.1.3	Effects on people
Reliability	5.3.3	Conventional energy to support renewable energy
Psychological inertia	5.3.4	Unexpected change
Maintenance	5.3.5	High maintenance Predictability of maintenance

Perceived impact on comfort	5.3.6	Small or low lifestyle changes Visual impact is high Negative impact on lifestyle Trust in the system is high Trust in the system is low
Effort	5.3.7	High effort levels Effort level need to be lower
Responsibility	5.3.8	Personal responsibility - acceptance Personal responsibility- rejection
Acceptance through exposure	5.3.13	Perceived level of risk
Trust in technology	5.3.15	Quality system is a need Inconveniences of the system Solar potential is low Renewable technology is efficient Existing technology is insufficient

In research conducted by Pilisuk, Parks and Hawkes (1987) risk perception is considered in terms of level of education of the respondents. According to Gifford (1997, p. 326), "[m]ore educated people tend to have fewer fears and concerns about hazards." He continues to say that this does not mean that more educated people think that hazards are less likely, only that people with higher education are less fearful of hazards. For the purposes of his research, he classified educated people as people who presumably have technical education on the topic discussed, while uneducated people are merely laypersons on the specific topic. Discussions on nuclear power generation methods with nuclear specialists (experts) were contrasted with specialists in renewable energy (laypersons on the topic of nuclear energy).

In this research, it is interesting to note that even though all respondents are highly educated, and all work professionally with environmental issues on a daily basis, several stated that they are not experts on the topic of renewable energy usage. None of the respondents has had specific training on renewable energy sources. General knowledge about the environmental issues and awareness about global warming and the effects of CO_2 emissions do not constitute knowledge about specific forms of renewable energy.

Fiorino (1989) makes a distinction between a technical and a democratic model of risk assessment. He states that experts employ a technical model in which rationality and expertise form the premise of the risk assessment whereas laypersons tend to base assessment of risk on personal experience and social values. In the research conducted none of the respondents could be classified as experts in the field of renewable energy sources and therefore, using Fiorino's argument, made use of personal, experiential and/or social values to assess the level of risk that the use of renewable energy holds. For environmentalists,

however, it was assumed that environmental issues were more salient than for the general public. Environmentalists were therefore not considered to be experts, although they were considered to be informed individuals. Further studies may be necessary to draw comparisons between this study and the attitudes of people who do not come into contact with environmental issues on a daily basis. This recommendation is discussed further in chapter 7.

The topics and categories that constitute this pattern category can be grouped into four themes of risk perception. Cost implications (5.3.1.), unexpected implications for lifestyle (5.3.3, 5.3.4, 5.3.5, 5.3.7, 5.3.8, 5.3.15), expected impacts on lifestyle (5.3.6, 5.3.8, 5.3.13), trust in the technology (5.3.15) and the implications thereof (5.3.4, 5.3.6). These four groups are discussed in the sections that follow.

Cost implications in terms of installation costs (5.3.1.2) and maintenance costs (5.3.1.1) are often perceived to be high, as illustrated in chapter 5. Cost implications to the individual are often perceived to be a direct risk for which the individual will have to accept personal responsibility. Again risk and responsibility go hand in hand.

Unexpected impacts on lifestyle, such as the reliability of the system (5.3.3), the possibility of unexpected change (5.3.4) and unexpected maintenance (5.3.5), may cause respondents to become uneasy and uncomfortable when the use of renewable energy sources is suggested. Perceptions of high effort levels (5.3.7) to repair and maintain the systems imply a certain level of personal responsibility. According to Bell et al. (2001, p. 472), "[p]erceived risks tend to be higher if the activities associated with them are seen as uncontrollable… [and] unknown."

Expected implications for lifestyle, such as a change in lifestyle through lower aesthetic qualities and high visual impacts (5.3.6), and the perception of the inability to maintain the current lifestyle because of less available resources (5.3.6) discourage environmentally-friendly behaviour. According to Weidemann, Anderson, Butterfield and O'Donnell (1982), perceived physical qualities of a residence are important factors that contribute to the experience of satisfaction. When the lifestyle satisfaction or satisfaction with a living environment is perceived to be endangered, the probability of environmentally-friendly behaviour also decreases. This could be countered through various methods of awarding rewards and/or punishment, but are nevertheless viewed as a risk to the self and the environment.

Trust in the conventional technology and the renewable technology that is available also plays a role in risk perception. Trust is the "belief or willingness to believe that one can rely on the goodness, strength, ability etc. of somebody or something" (Hornby, 1998, p. 1280). A lack of

trust in the use of renewable energy sources in the home contributes to the perceived threat to the lifestyle of respondents described in the previous paragraph.

6.2.4 PC 4: Renewable Energy and the Perception of Self

The perception of self and what the use of renewable energy sources says or does not say about the self emerged as another pattern category. In this section, the researcher focuses on the link between benefit observation and implementation of renewable energy sources. The impact of the level of benefit observation influences the perception of self. In table 6.4 below, pattern category four and the topics and categories it consists of are presented.

Table 6.4 The categories and topics form the first stage of analysis that constitute PC 4

First order category name	Category number	Topics included in category
Cost - environmental	5.3.1.3	Benefits to the environment Effects on people
Psychological inertia	5.3.4	Slow change Change of current practice is important
Perceived impact on comfort	5.3.6	Perceived personal benefit Visual impact on system is high Negative impact on lifestyle
Effort	5.3.7	High effort levels Should be easy
Responsibility	5.3.8	Personal responsibility - accepted Personal responsibility- rejected
Incentives	5.3.14	Incentives should be financial Need for incentives is high
Trust in technology	5.3.15	Inconveniences of the system

Three aspects of the self are discussed in the section below. The first emphasises the perceived benefits to the self and the environment. The second focuses on the perception of self and the cognitive dissonance experienced when moral norms do not coincide with actual behaviour, while the third aspect examines how cognitive dissonance can influence behaviour.

Personal benefit observation is one of the most subtle categories that emerged from the research. As indicated in previous pattern categories, respondents and people in general experience cognitive dissonance when statements about beliefs and attitudes do not coincide with actual behaviour. In some cases, however, respondents exhibited attitudes inconsistent to what they stated previously in the conversation, but consistent with their current behaviour.

An example of this is when one respondent stated that it is good to make use of renewable energy and that people should use it more often. Later in the conversation, however, the respondent stated that renewable energy is actually just too much hassle to install because of the convenience of conventional electricity.

Neither the link between the benefits of using renewable energy sources and the impact on themselves, nor the link between the quality of life or financial losses incurred when using conventional energy and the impact on themselves is clear to respondents. The need to implement other sources of energy or to exhibit resources efficiency in general is not experienced.

The rewards and punishment argument, as discussed in chapter 3, becomes relevant here. Respondents commented on the fact that they do not see why it is necessary to implement renewable energy sources (5.3.6), others said that they know why, but that this does not constitute action (5.3.14), others again said that little change is brought about by individual action (5.3.1.3). Domjan (1993) notes that a reward or punishment should follow the desirable or undesirable action as soon as possible in order to establish a link between behaviour and the outcomes thereof.

As has been discussed in chapter 3, the rewarding of desirable or punishment for undesirable behaviour could become very complicated since individual behaviour is the focus of this section. Alternative methods of instigating change, such as the removal of barriers for action (Stern & Oskamp, 1987), 'green' policies and technological advances (discussed in section 3.11.11) may be useful motivators (Bell et al., 2001).

Perceptions people hold about themselves may be subjacent to other perceptions that are expressed. The amount of effort a person is willing to exert (5.3.7, 5.3.15), the level of responsibility a person is willing to accept (5.3.8) and the amount and nature of the incentives necessary to motivate environmentally-responsible behaviour (5.3.14) may all be expressions of the self-concept. According to theories of cognitive dissonance (Festinger, 1957) and self-perception (Bem, 1967), individuals reinforce their own attitudes by observing their own behaviour. An example of this could be a respondent stating that the use of renewable energy requires a lot of effort (5.3.7). The respondent may look at his or her own non-environmentally-friendly behaviour and see that he or she does not exert a lot of effort to exhibit environmentally-friendly behaviour. This may then reaffirm the idea that the use of renewable energy requires high effort levels (5.3.7). This concept is discussed in more detail in chapter 3; however, the use of incentives as described above may once again have some influence on attitudes.

A key concern in the self-concept explanation of dissonance is people’s desire to perceive themselves as a moral person. In some instances cognitive dissonance may be experienced

when important elements of a person's self-concept are being threatened (Thøgersen, 2004). However, Thøgersen (2004) warns that the level of dissonance experienced depends on the strength of the elements of self-concept that are being threatened. As emphasised by Thøgersen (2004, p. 95), "for individuals who have no or only weak moral norms for environmentally relevant behaviours it matters little if they perceive their behaviour in this domain to be inconsistent."

6.2.5 PC 5: Renewable Energy as Available Medium

The second last pattern category pertains to the availability and awareness levels of renewable energy sources. This section also focuses on the methods suggested by respondents in order to increase use of renewable energy sources and how attitudes could be changed. In table 6.5 below, topics and categories that form part of the fifth pattern category are presented. The section on changing attitudes ties in with pattern category 6, which explores possible change of attitudes toward to the use of renewable energy sources.

Table 6.5 Categories and topics from chapter 5 that constitute PC 5

First order category name	Category number	Topics included in category
Cost - installation	5.3.1.2	Expenses
Financial feasibility of electricity	5.3.2	Price of electricity is low
Effort	5.3.7	High effort levels Should be easy
Positive and negative stigma around environmentalism	5.3.11	Availability of renewable energy Negative attitude toward renewable energy in general Importance of energy efficiency - high Importance of energy efficiency - low
Mainstream awareness	5.3.12	Personal awareness - high Public awareness - low Awareness making projects
Acceptance through exposure	5.3.13	Level of environmental awareness by means of exposure - high
Trust in technology	5.3.15	Quality system is a need Technology must be available

Knowledge about the state of the environment and electricity prices (5.3.2), the actual cost of renewable energy systems (5.3.1.2), functionality of renewable energy systems (5.3.7, 5.3.15) and ideas toward environmentalism in general (5.3.11) all form part of the perceived availability of renewable energy systems. According to Respondent # 6, systems are perceived to be unavailable "in the minds of people".

The level of awareness of both the person in the street and the respondents as they perceived themselves to be may give an indication of the level to which the use of renewable energy sources are available to people. Respondents suggested several techniques that could be employed in order to increase levels of awareness, education, environmental knowledge and the like. These were briefly discussed in chapter 3 and form part of pattern category 6, which is discussed below.

Very little literature could be found on the impact of the perceived availability of resources on the actual implementation of these resources. However, the removal of barriers to implementation, as discussed in chapter 3 (see also Stern & Oskamp, 1987), could include making energy-efficient systems more available by means of education, advertising and actual availability in stores. Making resources psychologically more available, by increasing people's exposure to the idea of using them, is discussed below.

6.2.6 PC 6: Possible Change of Attitudes toward Renewable Energy Use

Techniques that could be used to change attitudes are often simply called advertising. The use of these methods and techniques to increase to availability in the minds of people, and consequently increasing the implementation of these systems, are discussed below. Table 6.6 shows the topics and categories from the discussion in chapter 5 that constitute pattern category 6.

Table 6.6 PC 6 and the topics and categories from the first stage of analysis

First order category name	Category number	Topics included in category
Psychological inertia	5.3.4	Slow change
Acceptance through exposure	5.3.13	Education by means of exposure Level of environmental awareness by means of education
Incentive	5.3.14	Incentives should be financial Need for incentive is high
Trust in technology	5.3.15	Quality system is a need Impact on the quality of the system

According to the discussion in chapter 3, increased education on the use of renewable energy sources by means of lectures (Gifford, 1997) and pamphlets are not effective methods in which to influence environmental concern (Bell et al., 2004). Thus awareness levels about low electricity prices and the tendency to over consume, the need to change habits (5.3.4) in order to more efficiently use the resources available (5.3.13), and general awareness about a pending ecological crises do not necessarily change attitudes.

Increased exposure to trustworthy, technologically advanced, renewable sources of energy could be one method by which attitudes could be changed (5.3.15). Advertising may be more effective than simple education because of the level of exposure it offers (Zimbardo & Leippe, 1991), and not necessarily because of the cognitive message of persuasion it may contain (Bagozzi et al., 2002). Thus the availability of a product and constant reminders of what a product does and how it can be used may be more effective strategies to encourage renewable energy use. In chapter 3, Zimbardo and Leippe (1991) were quoted as stating that "mere exposure leads to liking" (p. 253).

Introducing incentives into the equation can drastically change outcomes of renewable energy source implementation. According to Festinger (1957), however, larger incentives do not constitute an attitude change even though the desired behaviour may be exhibited. As explained earlier in this chapter, the theory of cognitive dissonance predicts that the smaller the incentive is, the more likely it is that attitude change will occur. To reiterate, small incentives are more likely to convince people that they do in fact agree with the requested behaviour, and they are therefore more likely to change their attitude in such a way that corresponds to the requested behaviour. In contrast, if a large incentive is offered for the exhibition of certain behaviour, people may reason that even though they do not agree with the behaviour they exhibit, an external form of motivation could be used to justify why the action was taken. Environmental education, exposure to the use of renewable energy sources, and active marketing for the use of renewable resources may all influence environmental attitudes to some extent.

6.3 Conclusion

In this chapter, results from the second stage of analysis were discussed in the form of six pattern categories. It was emphasised that these categories often overlap. The categories identified pertained specifically to the impact of learned attitudes on the ability to change, the role of responsibility and how it influences the perceptions held on quality of life and the extent to which risk inhibits environmentally-responsible behaviour. The availability of renewable energy sources and the implications that the use of renewable energy sources may have on the individual were also explored. Lastly, the possibility of changing attitudes was discussed.

Although the identified pattern categories cannot be said to be an exhaustive list of possible categories from the second stage of analysis, it does coincide with several psychological theories as referred to in each discussion. In the following chapter, the second order or

pattern categories are related to one another by means of a conceptual discussion with specific reference to systems theory.

CHAPTER 7

Conceptual Discussion

7.1 Introduction

In this concluding chapter, the third stage of analysis becomes a description of the previously identified topics, categories and pattern categories. The relationships between these elements are examined in order to highlight additional dimensions of these elements. The discussion is based on systems theory, drawing primarily on authors such as Bateson (1972; 1979), Capra (1987, 1997), Keeney (1983) and Keeney and Ross (1984).

The intricate fit between the energy consumer and the energy environment is discussed in detail to explore the fit between these systems. The impact of both the individual systems and the larger energy consumer system on the energy environment system are discussed as part of the ecosystem of which all systems inevitably form part and interact with. In this chapter the discussions with respondents are related to one another in order to understand the ecosystem in which the energy environment, the energy consumer, the generators of energy, the government and many other role players interact with one another.

The second part of this chapter includes a critique of this study by the researcher herself, followed by recommendations concerning aspects that need further investigation. This chapter concludes by recapitulating the important aspects of this study.

7.2 Third Stage of Analysis becomes Description

Tautology is defined by Hornby (1998) as "the saying of the same thing more than once in different ways without making one's meaning clearer or more forceful" (p. 1224). Bateson (1979, p. 87) notes that "tautology contains no information whatsoever, and explanation (the mapping of description onto tautology) contains only the information that was present in the description." The third stage of analysis could be seen as a double description of the phenomena described in chapter 6. According to Bateson (1979), this conceptual discussion is necessary because "an explanation is a mapping of pieces of a description onto a tautology, and an explanation becomes acceptable to the degree that you are willing and able to accept the links of the tautology" (p. 89). These tautological explanations will be given according to the systems theoretical framework.

The description in this chapter attempts to link pattern categories identified in chapter 6 in order to develop a holistic understanding of the research problem. Capra (1987) states that "[r]eductionism and holism, analysis and synthesis…[are] complementary approaches that, used in proper balance, help us to obtain a deeper knowledge of life" (p. 288). The researcher attempts, in this chapter, to move from reductionism in chapter 5 and 6, to a fuller, holistic description.

Consistent with the systems theoretical epistemology it should be emphasised that the representation of whole in the following section is influenced by the researcher's own ideas. However, the whole system could never be plotted, therefore the discussions in the section below are approximations (as are all theories according to a systems theoretical viewpoint) and should be regarded as such.

7.3 Conceptual Discussion of the System as a Whole

The system in which the individual thinks, feels and reacts forms part of the first description of the discussions with respondents. Similarly, the environment, and how it reacts to certain influences on it, was also described as the first stage of discussion in chapter 5. These individual systems interact in a certain way. Some of these ways of interaction were explored and discussed in chapter 6. The objective of the following section is to put the systems, the individual and the environment into context; to relate the interactions between these systems with each other; and to connect these relations to the wider ecosystem in which they naturally occur.

Figure 7.1 below depicts the systems that will be focused on. A discussion on the integrated systems follows. As discussed in chapter 2, these integrated systems are the combination of the energy consumer, the energy environment, the energy-consumer-in-the-energy-environment and the ecosystem that all interact with one another. The descriptions found in the following section relate closely to the description of how systems influence one another as stipulated by systems theory thinkers such as Bateson (1972; 1979), Capra (1987; 1997) and Keeney (1983; 1984). Figure 7.1 is referred to throughout the discussions that follow.

The following section makes use of the six criteria for mind as discussed by Bateson (1979) and Capra (1997) to explain the interaction between the systems in figure 7.1 (see chapter 2). The interaction between systems, the recognition of a difference in the surroundings or other systems, and the collateral energy it takes to perceive the difference is discussed. The systems are described by way of the feedback loops that provide input on the effects of the collateral energy and the level of difference that is necessary to be able to recognise the differences. Lastly, it is noted that the methods used to interpret the data received from the

feedback loop and the transformation methods taint the interpretation of the participant and the researcher alike.

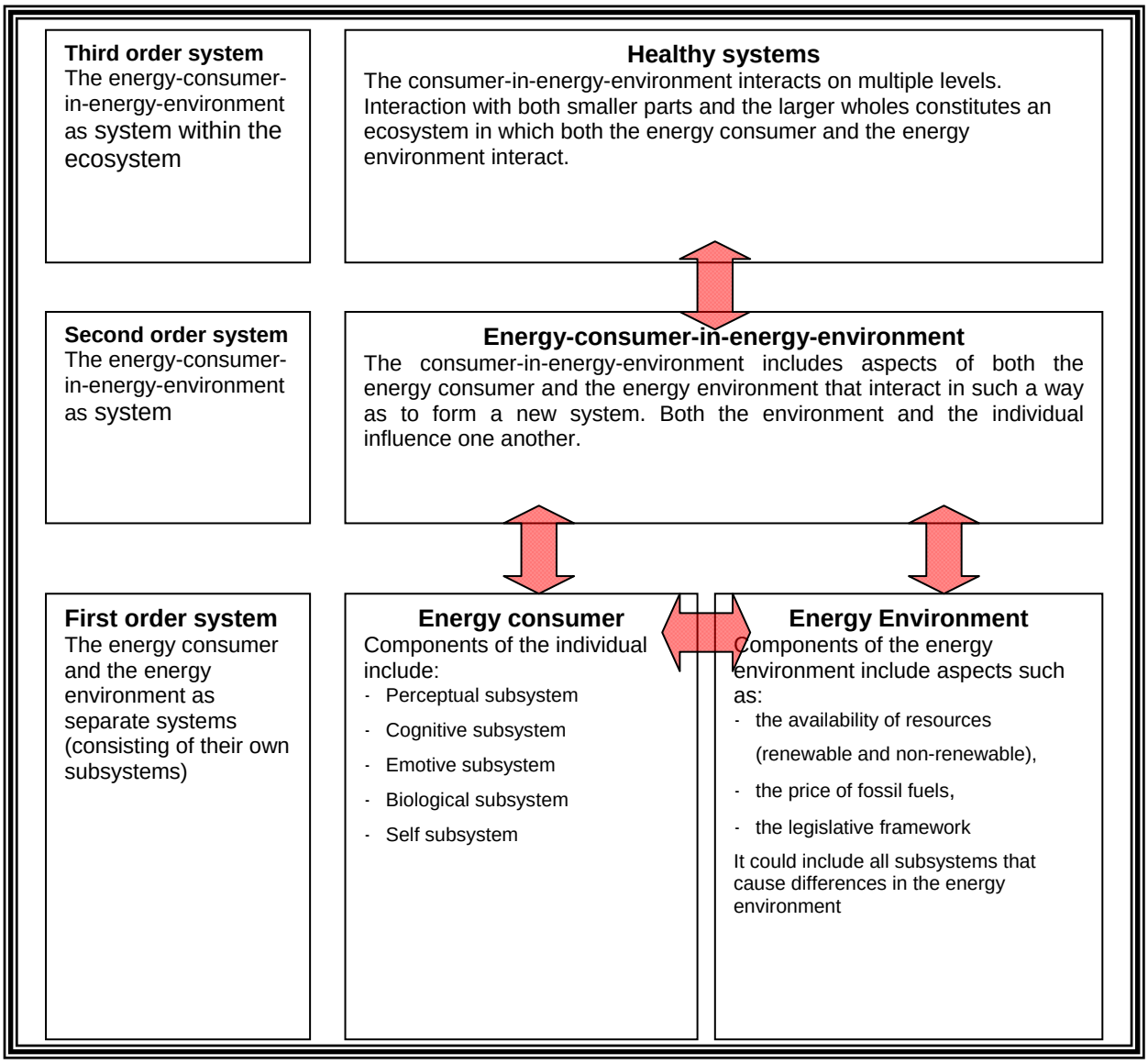


Figure 7.1 Multiple levels of systems (adapted from Groenewald, 1995)

7.3.1 Interactive Parts

A system in which the energy-consumer system and the energy-environment system interact with one another existed throughout the exploration of the separate systems. In chapter 5, the first stage of analysis, several topics were merged into categories. These topics themselves form part of the description of how the respondents form part of the larger system. The respondents become part of the system through perceptual subsystems that individuals employ to understand the world around them (for a more detailed description refer to chapter 2, section 2.4).

Keeney (1983) says that, in order to "understand the realm of phenomena, we should begin by noting how it was constructed, that is, what distinctions underlie its creation" (p. 21). In so doing it is necessary to refer back to the descriptions in chapter 5 and try to understand the underlying causes for the specific topics that emerged from the data. The researcher will not discuss all 64 topics that were identified, but will rather select some examples from these topics in an attempt to discover the "distinctions that underlie its creation" by means of the perceptual subsystems described in chapter 2.

Some of the most interesting topics identified in chapter 5 pertain to the reaction of the individual to perceived impacts on the self. For instance, greater concern was expressed about the effects that electricity generation has on people than on the environment (5.3.3). The individual becomes part of the larger system through subsystems such as the emotional and cognitive subsystems of perception, as described in chapter 2. In accordance with this, Ulrich (1983) states that emotions are precognitive and in effect set the scene for the reactions on the environment that influence and are directly followed by cognitive processes.

In conjunction with this is the subsystem of self, which is the way in which people perceive themselves and the awareness they have about awareness of the self. A greater concern was expressed about the impact of renewable energy systems on people's health than the impacts on the environment (5.3.3). This could be described in terms of the emotive and self-subsystems in which the individual possibly perceives a threat to the self. This threat could be caused by the perception that renewable energy systems would decrease comfort in the home, or cause high levels of anxiety since it is unknown to the user. Respondents therefore express heightened concern about some aspect in particular.

Similarly, the trust in the available technology (5.3.18), the perceived impact on comfort (5.3.8) and the perceived level of effort (5.3.9) that the use of renewable energy sources may require of the individual could be negative because of the underlying emotive and self subsystems. All subsystems are intertwined to such an extent that it is impossible to separate the one from the other (Keeney, 1983). A threat perceived by the emotive subsystem would inevitably activate the cognitive subsystem to react to the environment. If the perceived threat is large, the individual might even experience it on a biological level, even though the biological subsystem would have been involved from the onset (Capra, 1997). The way in which these subsystems react to one another is not static (Dell, 1985) and depends on the aspects from the environment to which they react. The identification of topics in chapter 5 thus occurred by way of the differences that were experienced by the respondents in the environment. In the following section the recognition of differences in the environment is discussed.

7.3.2 Recognised by a Difference

In the previous section it was explained that all subsystems interact, and as a result, the individual becomes emerged in the system; but how do these parts interact? According to Bateson (1979), "[a]ll receipt of information is necessarily the receipt of news of *difference,* and all perception of difference is limited by a threshold" (p. 29).

According to Bateson (1979), a relationship between two parts, or one part at different times, is necessary for subsystems to interact. Respondents act as the receivers of this information. Respondents would only receive information if there were a perceivable difference between the two parts or in the one part at different times. Bateson (1979) continues, however, by indicating that the difference must have a meaning: "We are discussing a world of meaning, a world some of whose details and differences, big and small, in some parts of that world, get represented in relations between other parts of that total world" (p. 106). Only when difference is recognised and has meaning is an opinion formed, as expressed by the respondents in this study. The respondents' use of the existing conventional energy system differs significantly enough from their perception of the implications of the use of renewable energy sources for them to perceive an impact on their lives, their comfort, and their health. These aspects were discussed in chapter 5, in which several respondents were quoted as stating that the use of renewable energy would mean higher maintenance cost, more effort and a lower quality of life than currently experienced.

7.3.3 Interaction between Process and Collateral Energy

In section 2.5.1 of chapter 2, Dell (1985) was quoted to say that every living system has an identity that determines the interactions a particular living system has with other living systems. Maturana and Varela (1987) explain that "the changes that result from the interaction between the living being and its environment are brought about by the disturbing agent but *determined by the structure of the disturbed system*" (p. 96). The disturbed system contains collateral energy and that energy is used to react to the difference created in the individual.

Dell (1985, p. 7) states that "[f]orces and impacts cannot and do not determine, specify, or instruct the behaviour of an object. They are merely the historical occasion of the system to continue its structure-determined behaviour." The type of perception that is formed derives from within the individual. In other words, perceptions of the environment and environmentally-responsible behaviours are reactions originating from the individual and not from the perceived difference. The difference perceived may in fact vary from person to person.

The experiences related by the participants to the researcher in this study are thus differences that have meaning and that were therefore perceived by the respondents. Similarly so, the topics identified by the researcher stipulate the topics that had meaning for the researcher. These topics are thus 'filtered' through perception, first by the respondents and second by the researcher. The researcher reacted to the described differences by grouping them into topics and categories according to the perceived differences. Bateson (1979) indicates the importance of realising that these differences are hierarchical. The hierarchy involves "the organisation of triggered events into circuits, coding, and the genesis of hierarchies of meaning" (p. 108).

7.3.4 Transactional Processes Required Feedback Loops

According to Capra (1997, p. 290), "[a]ll members of an ecological community are interconnected in a vast and intricate network of relationships, the web of life". The word interconnected suggests bi-directional action: action and interaction. Capra (1997, p.290) adds: "linear chains of cause and effect very rarely exist in ecosystems." The systems that react to one another by means of collateral energy exist at multiple levels. The individual is composed of several subsystems, while individuals themselves are a subsystem of another level of a larger system: an ecosystem.

When viewed in isolation a system appears to be stable; however, when it is considered as part of a larger whole, it is apparent that the system is held within certain limits by way of homeostasis. This homeostasis is maintained through feedback received from parts of the system and the employment of 'corrective' behaviour. Capra (1997) states that

> [b]ecause networks of communication may generate feedback loops, they may acquire the ability to regulate themselves…Indeed, self-organisation has emerged as perhaps *the* central concept in the systems view of life, and like the concepts of feedback and self-regulation is closely linked to networks." (p. 82)

The system is capable of remaining stable because of the use of the interactions between the various systems and subsystems.

In this study, energy consumers react to what they perceive from the energy environment. According to the systems theoretical approach, the self has the ability to self-regulate behaviour in order to maintain some sort of balance. Feedback from the energy environment, however, does not seem to make an impact on the individual energy consumer and the balance of the system is upset. The system is upset because individual energy consumers do not react to the messages they receive from the environment because they may interfere with the individual's purpose. As discussed in chapter 2, the consciousness of the individual, and thus the purpose of the individual (the energy consumer) has changed the whole system. Bateson (1972, p. 446) states that “[c]onscious man, as a changer of his environment, is now

fully able to wreck himself and that environment – with the very best of his conscious intentions."

Even though individuals are self-regulatory, reacting to feedback, the energy-consumer-in-energy-environment system is not in balance. As discussed in chapter 2, the feedback loop that has formed seems to have become self-enforcing instead of self-balancing. Feedback received from the environment, such as the deterioration of the environment and illnesses caused by pollution, does not trigger the collateral energy of the energy consumer to respond to messages by regulating its behaviour as part of the system. On the contrary, the energy-consumer system has purpose – purpose to build and advance using energy as a means, and as a result continually disturbs the energy environment. Bateson (1972) describes this as follows:

> On the one hand, we have the systemic nature of the individual human being, the systemic nature of the culture in which he lives, and the systemic nature of the biological, ecological system around him; and on the other hand, the curious twist in the systemic nature of the individual man whereby consciousness is, almost of necessity, blinded by the systemic nature of man himself. Purposive consciousness pulls out, from the total mind, sequences which do not have the loop structure which is characteristic of the whole systemic structure. (p. 434)

7.3.5 The Difference that Makes a Difference

The topics identified in chapter 5 all emanate from the respondents' experiences and their descriptions thereof. Combined with these descriptions, the topics represent how the researcher (the receiver) understood and interpreted them. Capra (1987) says that these interpretations of researchers about respondents' explanations are "intimately connected with the patterns of their minds, with their concepts, thoughts and values" (p. 77).

For this reason, the perceived implications that the use of renewable energy sources may have for the quality of life of respondents can in reality not be studied. According to Bateson (1979), the closest we could get to the essence of the true implications is a description of the patterns that form ideas. These ideas were explored by means of the interview guide and the discussions with respondents, and interpreted by the researcher. The topics identified in chapter 5 are the researcher's representation of these patterns. Topics were not emphasised equally by all respondents and in several cases one respondent perceived the exact opposite of another. Dell (1985) states that "the reason they receive different 'information' is that each person is different, each person 'responds' differently to the 'same' thing" (p. 6).

These descriptions, even though very different from one another, enabled the researcher to explore the patterns respondents used to explain their perceptions. These were explored in more detail by the researcher in chapter 5 where the first topics and consequently the

categories were identified. Subsequently, in chapter 6, these were brought into the context of the larger energy-consumer-in-energy-environment system.

7.3.6 Description of Transformation Processes Expose a Hierarchy of Logical Types Inherent in the System

Systems form multiple levels, from the smallest subsystem that constitutes a system of an individual to society to the larger system in which different societies function. The description from one level to another changes both in style and in the phenomenon described. The descriptions in chapter 5 and 6 of the levels of systems that interact with one another are of different logical types, that is, they have different magnitudes of focus. This is inherent in the systems. Bateson (1972) states that it is impossible to discover and discuss all levels of a total system:

> Of course, the whole of the mind could not be reported in a part of the mind. This follows logically from the relationship between the part and the whole. The television screen does not give you total coverage or report of the events which occur in the whole television process; and this not merely because the viewers would not be interested in such a report, but because to report on any extra part of the total process would require extra circuitry. But to report on the events in this extra circuitry would require still further addition of more circuitry, and so on. Each additional step toward total consciousness will take the system farther from total consciousness. To add a report on events in a given part of the machine will actually *decrease* the percentage of total events reported. (p. 432)

The consciousness of the energy consumer in this energy-consumer-in-energy-environment system plays a large role in the experiences described to the researcher. Again the discussion is an interpretation by the researcher of the interpretation of the respondent. The consciousness about a connection to the larger whole and the ecosystem is discussed in more detail below.

7.4 Consciousness about Connection to Ecosystem

The topics and categories discussed in chapter 5 explored the experience of the self as energy consumer as a solitary entity. Similarly, the energy environment was discussed as a separate system. The pattern categories discussed in chapter 6 are an indication of the ways in which the respondents become aware of the energy environment and the ecosystem on a daily basis, although it is by no means an exhaustive list of the ways in which respondents interact with the larger systems. These pattern categories consist mainly of the discussion with respondents about the interaction between the energy consumer and the energy environment.

From a systems theoretical approach, the recognition of the ecosystem occurs through the acknowledgement of several systems (the self, the society and several societies) of their

existence as systems. The ecology of co-existence is realised and the idea of the possibility of the existence of an ecosystem emerges (Bateson, 1972). The energy consumer system has the unique ability to identify and be aware of the larger systems in which it interacts. The fact that environmentalists were used in this study places emphasis on their ability to recognise the connection between themselves as systems and the ecosystem. The attitudes of the participant, however, reflect that even though they are aware of the connection between themselves and the systems with which they interact, they do not necessarily exhibit environmentally-friendly attitudes.

The recognition of the self as part of the ecosystem in turn urges the recognition of the ecosystem in the self. In the same way that the ecosystem is constructed of systems and patterns, so the self also consists of systems and patterns. Capra (1987) supports this notion when he says that "[t]he patterns we perceive around us are based in a very fundamental way on the patterns within. Patterns of matter mirror patterns of mind coloured by subjective feelings and values" (p. 320). The values and subjective feelings of each interviewed individual thus reflect what they have learned from the energy environment; but similarly, the energy environment is perceived in a specific way because of the smaller system's values and subjective feelings. Participants showed that they were relatively informed about environmental issues, although few displayed a true integration between the system of the self and the environment with which it interacts. These values and subjective feelings also determine the way in which we may think and behave in future. In further support of this, Capra (1987) states that

> [i]f we separate phenomena from the larger systems in which they are imminent and confine them to human individuals, we will see the environment as mindless and will exploit it. Our attitudes will be very different when we realise that the environment is not only alive but also mindful, like ourselves. (p. 316)

In figure 7.1, arrows indicate the direction of interaction between the specific systems focussed on in this study. The interaction is multidirectional in any ecosystem. The self serves only as a small part of that system. This system of the self was highlighted in chapter 5 where the individual accounts were grouped and discussed, in isolation from each other and from the larger energy system. As the discussion progressed in chapter 6, the emphasis fell on larger systems and how these systems come to interact with one another. The awareness of systems within systems became apparent in the discussion above. Bateson (1972) believes that this awareness of being aware directly influences the behaviour of the individual. He argues that purposive actions by individuals - who themselves form part of the ecosystem - cause unbalanced systems on a continuous basis. Capra (1987) states that “[o]ur evolution continues to offer us freedom of choice. We can consciously alter our behaviour by changing our values and attitudes to regain the spirituality and ecological awareness we have lost” (p. 326). Bateson (1972), however, is not convinced that the necessary change in awareness will

occur when he says that "[c]onscious man, as a changer of his environment, is now fully able to wreck himself and that environment – with the very best of his conscious intentions" (p. 446).

Both theorists agree that the system as a whole should be recognised by the relevant role players of modern society in order for a truly sustainable solution to be presented to solve the imbalance created by people. Bateson (1972) states that acting in accordance with the ecosystem, and aligning individual needs so that they form part of the intricate ecosystem, is a necessary and urgent step. He says:

> Lack of systemic wisdom is always punished. We may say that the biological systems - the individual, the culture, and the ecology - are partly living sustainers of their component cells or organisms. But the systems are nonetheless punishing of any species unwise enough to quarrel with its ecology. (p. 434)

He reiterates this when he states that "[t]he unit of survival is organism *plus* environment. We are learning by bitter experience that the organism which destroys the environment destroys itself" (p. 483).

7.5 Recommendations

The recommendations in this section are twofold. The first focus of attention is on the development of environmental psychology as a field of research. This research field is discussed and recommendations made in this regard. The second focus of attention, based on the findings of this research, is the importance of the environment and the impacts that we as individuals have on it.

7.5.1 Environmental Psychology as a Field of Research in South Africa

The systemic approach in environmental psychology in particular is vital. Both du Plooy (2001) and Groenewald (1995) emphasise the importance of an interdisciplinary approach to environmental psychology specifically in South Africa, because of the diversity of cultures, values and attitudes. Wapner (1987, p. 1438) emphasises the importance of an integrated perspective and states that such an approach should focus on the interactions between people and the environment in which they find themselves. He believes that this focus would increase the ability of various disciplines to identify troublesome environments, to increase the quality of the experiences in these environments and to change the environments accordingly. If the changes follow systemic principles, they may create more positive outcomes in the long run because of the increased efficiency (through interaction) of each individual system.

From this study the importance of interdisciplinary work in the energy environment and the environment of the energy consumer becomes apparent. Collaboration is necessary, for

instance, between research done in education and developmental psychology in order to provide insight into the impact of scholastic environmental education on actual environmental responsibility. The need for such environmental school education, from a sociological point of view, may need to be established. This may need to be done in order to map the interaction between education, future technological development and the environment.

Anthropologists and cross-cultural psychologists may also have a valuable contribution to make in considering how culture-specific values influence attitudes and consequently behaviour toward the environment. These findings could in turn be applied in the education system. The impact of the use of incentives and effective incentive management programmes need to be developed and would aid in increasing implementation.

Specific recommendation include:

- A study in which the attitudes of the environmentalists explored in this research are compared with ordinary citizens of South Africa in order to establish what the need for environmental education is and how the exposure to environmental issues on a daily basis may influence environmental attitudes and perceptions
- A study on the impact of environmental education from an early age
- An investigation into the impact of environmental education from an early age on society as a whole at a later stage
- A study on the underlying values that are determinants of environmentally-responsible behaviour in different cultures
- A study on the effectiveness of incentives, taking the cultural values into account
- An incentive management plan that would ultimately increase the use of sustainable practices

This is only an example of how work in several disciplines may contribute toward the increase of sustainable practices in everyday lives. The writing and implementation of legislation would be another example. Thus, an integrated perspective is necessary to enable better legislation, promote a higher awareness level amongst the desired audience, implement better incentive programmes and eventually decrease the dependence on natural resources, resulting in more sustainable practices.

7.5.2 Awareness of Environmental Issues and Human Impacts

An innate human desire to behave consistently may be an indication that environmental awareness programmes need not focus on specific habits or be designed on an activity-to-activity basis. Some of the research mentioned in this study focuses on changing specific environmental behaviours such as decreasing energy usage (Poortinga et al, 2004), increasing household waste recycling (Knussen et al., 2004), or increasing relaxation in natural settings (Teisl & O'Brien, 2003). This study also focuses only on the use of renewable

energy sources. Thøgersen (2004) advocates a generalisation in both the research topics as well as the recommendations for environmental education because of this desire to be consistent in behaviour. He further suggests that specific attempts to change behaviour are in fact less effective than more general attempts.

Barriers to acting in environmentally-friendly or responsible ways (Stern & Oskamp, 1987) should be removed as much as possible when motivation for environmental behaviour is planned. Thøgersen (2004) warns that, even though cognitive dissonance is unpleasant, "the unpleasantness of the sacrifices needed in order to behave in an environmentally responsible way may be even worse" (p. 101). According to Festinger (1957), most people opt for other than behavioural means to resolve this dissonance, or they may even choose to live with it.

Environmental education, in schools and the general media, should be increased, and even though education alone does not necessarily increase environmentally-responsible behaviour (Bell et al., 2001), it would increase awareness on a broad level. Thøgersen (2004) warns that any motivational campaign should focus on the individual's subjective perception. From a systems theoretical point of view, individuals as part of a system will influence the systems with which they interact. The larger systems, such as the education system, the advertising system and the moral system of society, could all be employed as methods to disseminate information and motivate environmentally-responsible behaviour.

"If we keep on going where we are going, we might just get there" – Chinese proverb

7.5.3 Marketing Strategies for Solar Energies

Although this was not the focus of this study, this study lends itself to some suggestions with regard to marketing strategies for renewable energy sources. Firstly, this study indicated that the level of environmental education, even amongst environmentalists, is rather low. This suggests a need for awareness programmes or effective marketing. A lack of personal benefit observation was also expressed and could be explained by means of advertising. Marketing campaigns should be of a cognitive nature rather than affective or emotive, due to the expressed need for reasoning on the use of renewable energy sources.

Secondly, renewable energy sources are not considered to be widely available and would therefore entail much more effort in order to attain than less environmentally-friendly products. Renewable energy sources and products that promote resource efficiency and sustainability should be readily available in any off-the-shelf stores. The unavailability of these products reduces the average person’s exposure to the possibility of their use.

Thirdly, the installation costs of solar sources of energy in particular could be rather high. Payment plans, such as those used with cell phones in South Africa, could be used to motivate the installation of renewable energy and solar sources in particular.

This section pertains specifically to marketing strategies that could be adopted in order to increase sales of renewable energy sources and products that promote resource efficiency. However, governmental initiatives of awareness making and policy formation are also important.

7.6 Critique on this Research

Some points of critique on the research might highlight aspects that could be improved on in future similar studies. Two points are discussed: the number of respondents and the backgrounds of respondents.

Terre Blanche and Durrheim (1999) state that often "there is much, much more to be said about the material that has been collected…"(p. 422), however, because of their being part of the research system, the researchers involved may not be able to recognise it. In chapter 4, the researcher noted that the data collection process reached saturation at a certain point. It should be noted, however, that an increased number of respondents may have had other impacts on the research outcomes. Few respondents were included in this study and although a relatively high number of topics was repeated, the findings of the study may have been sturdier if respondents from various environmental spheres were included. In addition, the backgrounds of the respondents were very similar. All worked as professionals in the environmental sphere, whereas the inclusion of respondents from other employment sectors (such as government and non-governmental organisations) might have added more depth to the research findings.

The researcher believes, however, that these limitations do not present a significant threat to the research findings, because of the nature of the research. The researcher aimed to conducting a qualitative inquiry into the attitudes and perceptions of environmentalists regarding the domestic use of renewable energy sources, and she is content that this goal has been reached. As the paucity of literature in South Africa necessitated an exploratory study, the researcher was more interested in the depth of information than its quantity.

7.7 Conclusion

In this final chapter, the study findings presented in chapter 5 and chapter 6 were discussed in relation to one another, emphasising their interaction and the resulting ecosystem. The self as part of the ecosystem and the importance of the connection between the individual energy consumer, the energy environment and the total system was explored.

The second part of this chapter focussed on the outcomes of this research, and some recommendations were made. The last section concluded with an overview of the quality of the research and a short summary of the study as a whole.

The purpose of this study was not only to explore attitudes toward the environment and the perceived implications of the use of renewable energy sources for quality of life, but also to explore the system in which the energy consumer and the energy environment interact. The existence of patterns in the individual, the energy environment as well as in the ecosystem came under scrutiny in order to understand how these interact and what their influence on one another is. The concept of an ecosystem, in which the individual only plays a small part, always seems like an answer that does not satisfy the question.

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APPENDIX A

Interview Guide

Vignette

1) We are going to start off with a scenario, please listen carefully:
2) now that you have heard the scenario, I am going to read it again, and I would like you to identify the person with whose argument you tend to agree most:

Three people are standing on the sidewalk. They are looking at their neighbour Greg's house that has a new solar panel installed on the roof. They discuss the new system, but they soon realise that they have very different viewpoints on this new development.

.*Patricia says*: I think that that must have cost a pretty penny to install that, but I am sure once it is installed, it doesn't require a lot of effort and Greg will live comfortably from now on.

Simon says: Even though it must have cost a lot to install, it makes economic sense in the long run, don't you think? My only objection is that I already have a very efficient system, why would I switch to an alternative if what I have is working just fine?

Geoffrey says: I don't believe electricity costs reflect the costs to the environment, and therefore it could be a good idea, I don't want to wait for the sun to shine a whole day before I can take a shower.

Questions

Options

What do you understand by renewable energy sources? Which of these can you buy and install in your house?

Necessity

How necessary is it to use these methods? What are the things that would stop you from using these methods in your own home? Probe: cost, discomfort, doubting functionality of the system, unavailability, has existing system, cost of the current system, initial cost vs. running cost, difficulty of installation,

Cost

Does the price of electricity reflect the actual effect on the environment?

Does the government subsidise electricity in South Africa?

An example of economies of scale is what happened to cellphones, the more people bought it the more affordable it became. Do you think that that will happen to renewable energy systems?

How do renewable energy sources compare to conventional electricity in price?

How much would such a system cost? Guess?

Implication for quality of life

How would these things impact on your physical comfort in your home?

How would these things impact on your emotional comfort when using it?

Probe: will you be insecure, anxious, in constant doubt, self worth, social standing?

What would implications be of such a situation?

Would you say that these systems are dependable?

Would you feel comfortable to rent a flat that is fitted with this system?

Would you feel comfortable to let a dwelling fitted with such a system to someone else?

Change

Does the system limit your daily routine?

What would change in the way you live, if you had such system in your house?

APPENDIX B

Ethics Form

Respondent Information

Introduction

Before taking part in this study, it is important that you understand what is involved. If you have any questions, which are not fully explained in this leaflet, you are welcome to contact the researcher. You should not agree to take part in this study unless you are completely certain about all the procedures involved.

What is the purpose of the study?

The purpose of this interview is to explore your attitude toward particular environmental issues. This research will be done in order to fulfil requirement for attaining a masters degree in Research Psychology from the University of Pretoria. Information could be used to inform subsequent analysis or studies on the data. From this data the researcher would like to deduce how representative different views on the environment are.

What is the duration of the study?

The interview will take approximately an hour and a half. You should not be required to spend more that 2 hours with the researcher.

Has the study been ethically designed?

This study is has been approved by the University of Pretoria's Ethics Committee and designed according to the South African Market Research Association and the ESOMAR guidelines. A copy of this may be obtained from either websites:
www.esomar.org or www.samra.co.za

What are my rights as participant of this study?

Your participation in this interview is entirely voluntary and you can refuse to participate at any time without stating a reason. It would, however, be appreciated if you would voice any objection as early as possible. If you choose to stop participation, it will not have any effect on your relationship with the researcher or the University of Pretoria.

Are there any restrictions concerning my participation in the study?

The criteria for participation in this study are as follows:

- Be involved in environmental issues;
- Receive remuneration for services in the environmental sphere
- Be willing to participate in this study by being interviewed (face to face or on-line)

If you feel that you do not fulfil any of these criteria, please inform the researcher as soon as possible for the accuracy of the study depends upon the participants fulfilling the criteria stated above.

Is there financial gain/loss for my account in this study?
You will not be paid to take part in this study. You will, however, receive feedback and results on request. Your participation will not have any costs for you.

Observation
The researcher and the University of Pretoria, reserves the right to all raw data on audio tapes and transcriptions (either analogue or digital). No person will be allowed to make copies of the original data in audio or written form. Data will not be destroyed after the study for it may be used for further research; however, the data will only be used in the manner intended, as stated in the purpose of the study and not for any other purposes.

Therefore you hereby authorise the researcher to record all conversation in the interview, on audio tapes, transcribe it and use it appropriately.

Source of additional information
If at any time you have any questions about the study, please do not hesitate to contact the researcher, Mathilda du Preez. The telephone number is 072 478 8505.

Confidentiality
No data will be published that identifies you as a participant in this study. All information obtained during the interview or received from you will be held strictly confidential. Please take note that anonymity is not assured. The researcher, and potentially the researchers' supervisor will be able to connect the data to the name of the participant. Demographics will also be reported in the researcher's results. Your name (or any other identifiable information) will not be used directly in the researcher's dissertation. Data that may be reported in social science journals will not include any information which identifies you as a participant in the study.

Informed consent

I hereby confirm that the chief investigator, Mathilda du Preez, has informed me about the nature, conduct and benefits of this study. I have also received, read and understood the above written information regarding the interview.

I am aware that the results of the study, including personal details will be processed in the study report.

I may, at any stage, without prejudice, withdraw my consent and participation in the study. I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

Respondent's name _____ (please print)
Respondent's signature _____
Date _____

I, _____ (name of investigating officer) herewith confirm that the above respondent has been informed fully about the nature, conduct and benefits of the study.

Investigators name _____(please print)
Investigator's signature _____
Date _____

(this form will once again be discussed during the interview, and signed by both parties)

APPENDIX C

Response Form

Please note that all information is confidential. Demographic particulars would help me to select a group that corresponds to actual demographics in South Africa, but feel free to omit such information.

Personal Particulars:		
Name		
Surname		
Title		
Date of Birth		
Gender		
Race		
Employer		
Briefly describe your daily work:		
Contact Details:		
Cell phone:		
Work:		
Personal / work E-mail address:		
Province and city		
Suburb		
Have you read the consent form? (highlight)	**YES**	**NO**
Have you signed the consent form?	**Remember you need to keep a copy of the form**	

APPENDIX D

Transcriptions

Transcriptions – Respondent # 1

M: Het jy die vorms deurgelees?

1: Nee

M: Okay, dis regtig nie. ‘n probleem nie. Ek het dit vir jou ge-e-mail, nè?

1: Ja

M: Al wat dit sê, is waaroor gaan die studie, wat die studie van jou verwag, aan watter vereistes jy moet voldoen, dat ek jou gaan opneem en dat dit konfidensieel is, maar nie noodwendig anoniem nie, ons kan byvoorbeeld jou naam gebruik maar nie ander identifiserende inligting uit gee nie.

1: Ja

M: Maar dat ons nie jou as deelnemer sal identifiseer nie

1: Nee, nee

M: Is jy gelukkig daarmee, jy het ‘n kopie? En dat jy saamstem dat jy dit sal doen. Teken dan asseblief daar.

M: jy weet nou wat dit is, ek moet net ook ‘n kopie hê. Sal jy vir my hierdie ook invul, dit is nou gewwoonlik om kontak detail en sovoort uit te vind, maar ek wil nogsteeds weet wat is jou details…Okay, nou kan ons begin, ek wil net graag vir jou sê jy is die eerste een waarmee ek dit doen, en dit sal eintlik nice wees, en dit is vir my goedwant jy weet baie van dit waaroor ons wil praat. So party van die vrae mag simpel klink, eenvoudig, maar ek interview baie mense, wat, jy weet hulle is almal in die environmental circuit maar, van hulle kom van heeltemal ander sferes af. Is dit okay as ons in Engels aangaan?

1: Ja

M: Okay, uhmm, We are going to start of with a story: Three people are standing on the sidewalk. They are looking at their

neighbour Greg's house that has a new solar panel installed on the roof. They discuss the new system, but they soon realise that they have very different viewpoints on this new development.

Patricia says: I think that that must have cost a pretty penny to install that, but I am sure once it is installed, it doesn't require a lot of effort and Greg will live comfortably from now on.

Simon says: Even though it must have cost a lot to install, it makes economic sense in the long run, don't you think? My only objection is that I already have a very efficient system,

why would I switch to an alternative if what I have is working just fine?

Geoffrey says: I don't believe electricity costs reflect the costs to the environment, and therefore it could be a good idea, I don't want to wait for the sun to shine a whole day before I can take a shower.

Now that you have heard the story I am going to read it again and would like you to identify whose argument you agree with most.

Okay? So the solar panel is installed on the roof and Patricia says that it must have cost a lot, but even though it cost a lot he must be able to live very comfortably. Simon says that it makes economic sense in the long run, but why would he install a new system if the current system he has is working fine. And Geoffrey says that the electricity cost does not reflect the cost to the environment and therefore he thinks it is a good idea, although he doesn't wait a whole day for the sun to shine before he can take shower.

1: Uhhm, (1) I would say probably (1) the most is Geoffrey although Patricia does have a point, it does cost quite a bit at the moment.

M: Okay, what do you understand under renewable energy sources (…). Obviously you have a better idea of the renewable sources available so…

1: Okay ja, aag I will try to keep it simple, the more (…)stuff is not going to be, is not going to be… Basically it is just energy that doesn't get depleted as it would, and its has the potential to regenerate or renew naturally without any or with very little human influence. So it is natural systems that are in place, or have been long before we have. But they do, as part of the process, or as by product they do generate energy and then re-find ways of using that energy without destroying (…) the source.

M: Okay, so can you give me some examples of the renewable energy sources that we can use domestically…

1: Ja the main, the most common ones are solar, wind and then one that does not have a lot of application is tidal energy as well. And then there are stuff like bio-gas, (…) although there are arguments out there that those are not terrible renewable, but rather sustainable.

M: okay, which of the renewable energy sources could one use domestically, could you install, let's not say to replace the system that you have, but to support the system in place.

1: Solar panels are one used specifically in South Africa, although solar panels are not feasible because they are still very expensive, they have a lot of stigma and a lot of arguments attached to them. But solar energy, specifically solar water energy, there's quite a significant grant from the government's side, or a lot of talk in that direction at least. I think they should start subsidising solar water, not as a replacement of a geyser, more like a pre-heater. Using solar energy to preheat the water. And then that get poured into a normal geyser, the more obvious one. But then those are sort of all the high tech solutions. In my opinion better ways of (…) stuff like correct house orientation, the sizes of windows with a bit of an overhang, (…) very basic things that last forever and that work. You could ague on the pro's and cons and whether they really work or whether they make a difference, but the fact of the matter is, from a conceptual side, they do work, they do make a place warmer or cooler. I think that is the one. And then, not specifically energy, sustainability, or cutting down their water use, that is the big one.

M: Hot water?

1: any water, and then the idea is to also reuse grey water from taps and that sort of thing. And then also looking at ways to minimising that amount of grey water that we use, re-using water from washing your car to irrigate the lawn. But the fact is that people are starting to…

M: Are you saying that people are becoming more confident in sustainable issues…?

1: Ja I think they are becoming more aware of it. But I believe that most people are aware of the concept but that they don't really create (…) the actual schlep to use the high tech system that it takes, or they couldn't be bothered.

M: Okay, now how necessary do you think it is to start looking at implementing this…

1: I think it is necessary in the sense that it is not going to replace the current system that we have, not in the near future in any case. But I think it is the biggest necessity is cutting down on electricity use, I think finding more sustainable methods are secondary, I am not saying secondary is less important, but wee have to look at ways to lessen these The primary sort of target at the moment and then coupled with that more sustainable ways to generate energy, because if you only have the one… You have to have both, more sustainable and less energy use and the two, you know they come sort of quite in parallel. But I think it is becoming more necessary, because if you take a simple example like Eskom with all their power failures, they are really struggling to meet the demand. And then on the other side, well that is sort of the middle and upper class, on the other side the more lower class will come from a more urgent… you know… more and more and more people living in an urban set-up and they also need ways of (…) their environment. And the only options available to them at the moment is either very expensive through electricity or they don't have access to at all, or (…) finding ways to serve more people…But it is very urgent and needs attention.

M: Nowhere is it really a crisis that people would start realising NOW something should be done, …

1: I believe it is going to get to the point where it is going to start to be a crises, and people will start to realise and they will then start to want to do something about it. Not large organisation and government or whatever, but when people start to realise themselves that something needs to be done. We don't feel the impact yet, when people start to experience it. The real drive depends on your product and the impact you know will be when the average Joe Shmo starts using it.

M: What are the things that would stop you from implementing such a thing in your house? You don't feel the need for it, what other things do you think are important in that regard…

1: The one you just mentioned is by far the biggest problem, the one that is most important, but cost to some extent… Lets take those compact florescent lights as an example. They have been around\d for a while now, and people haven't been using them because they were quite expensive. But now, there is an organisation, I forgot their \name, but they have started making them more affordable and making people more and more aware of it. I think they call it the (…)

and I think in the last year or so compact fluorescents have really been started to be used more. Because it is a lot more affordable. So getting the cost down.

I think something like in my mind another one of the most important things are the legal side of it. I think a lot lot more needs to be done from planning and from your detailed design. And from what I've read and what I have heard from people it is slowly starting to happen, that is somewhere in…. You will have to force someone…not force, but if they are required to do it…

M: If people start looking at other alternatives..

1: Ja, and couple it with things that people know. You can't expect the people to now start doing things in a completely different way, with possible financial implications, you know, you have to give a little… And then still I think they can come back and start using the media. I think they should start using the media more effectively…because everybody knows about this now, but still, they are aware of it, but they don't really understand it. I don't know of ways you can do it, but using the media may make people more

and more aware of it not the existence of it but actually dealing with it on a day to day basis.

M: (…)

1: Okay you have got two poles. You have got the high tech, active part of the solar energy…

M: are you talking about the current?

1: Well if I just look at the household scale of things, there are two ways basically of generating energy. One by active means… the more technologically advance and the other by passive means, which means you design it in a specific way, and that requires minimal operation. I strongly believe that passive means are the way to go they impact on your life much less, They require less operation and they are things that if you do them right they are more guaranteed to work. For one they have been around for ever, for instance some of the hottest places on earth that stay between three or four degrees of a certain temperature…

M: summer and winter…?

1: day and night, summer and winter. I think it is around 23 degrees, and that is very convenient. If you use the more passive methods. They usually require less operation during

lifetime and even the design of the architect could influence the way it looks…(…) the style of the architecture… the more

high tech things are much more visible, you have to have a panel on your roof and something on the side for water so…I think people are reluctant to let into their lives something that requires a lot of maintenance and operation and whatever…

M: I would like us to focus more on the small scale high tech. Like a hot water system that work with solar panels, but not generating a current, would you describe that as an active or a passive system?

1: Probably more passive because that requires minimal from (…). So I would say passive.

M: Okay, so let us talk about that for a minute. When we talk about passive we talk about that, and when we talk about active we are talking about a solar system that generates a current as opposed to a by product. Okay, if we could get back to tha\e fact the people talk about solar they talk about the maintenance and the fact that they don't know how it works. Do you thing that it could be resolved by pure education?

1: I think to a large degree, I mean. Ja, I mean if we look at the way people responded to the first computer, I mean, even having a pc, like a personal computer. I read somewhere that even Bill Gates said that the idea of a personal computer is a bit far fetched. And that was somewhere in the mid eighties. And a couple of years later… you know. I think it is something that can catch on… ja I think it is something that can catch on.

M: Do you think that the price of electricity reflect the cost?

1: no even a bit, no. I mean we have the cheapest electricity in the world and we are one of the worst (…) I mean if you drive around Pretoria, or where ever and see what is happening, how it looks. I mean we don't need to look at whatever, you just see a grey smug hanging over the city…

M: Okay, does government subsidise electricity in South Africa?

1: …to be honest, I am not really sure. I have not really looked at that side of it. I think they might, I think they do…

M: Is it possible that maybe they don't subsidise it but that they subsidise other sectors that help in the generation of energy…?

1: Ja I think that is more the case…

M: On the point of economies of scale, like what happened with cell phones, the more people get it the better and cheaper the product, do you think that solar systems and energy efficiency would develop along that line and become cheaper? Let's talk about the passive system, do

you think it will become cheaper? Because at the moment it still cost quite a lot…

1: I think it will to a degree but I think any way that the same way than the compact fluorescents, the same way they..

M: To advertise?

1: Ja, to advertise and to … I know the one thing that they are looking at is to subsidise, I don't know how they plan on doing that, but if you use one of those things you get a rebate on your electricity costs. And that is a way of compensating people for using that. I think they will have to do something like that. The problem with solar panels and florescent light bulbs, unlike computers and cell phones that keep on getting cheaper and cheaper, they aren't that trendy. And therefore there isn't that drive to make improvements and to make redundant the older models. That drive that keeps on advancing the thing. It is very trendy whereas in a solar panel it is not going to change much. There isn't that much stuff that you can use to make it more exciting and make more people want to use it.

M: Ja

1: I think that is the problem

M: Do you think that the cost of renewable energy compare to the cost of conventional energy, do you think there are coast comparisons in the long run

1: in the long run. I think it does have potential to be effective compare with renewables in the long run. Business wise for one, I think it (…) and in (…) or whatever, somewhere twenty percent of their energy supply is renewable, and that is a very, well quite extensive use of renewable energy. And if they can do it I am very sure that we can also…

M: How do you think a hot water system in your house would impact on your physical comfort that you experience?

1: Well I know somebody who has a hot water system in their house and there are some days that the water is not quite as hot as you would want it, today could be one of them, so I think again, you can use this system quite effectively in conjunction with the system that is currently in place. And then you have got the one as kind of a backup.

M: Serving as a supporting system and thus not trusting solely on one system.

1: Ja

M: If you have a system like that in your house, would you feel insure and not psychologically comfortable with having such a system installed?

1: I think other people might feel that. I think the more in infiltrates our everyday life the more people would come to accept it. If I had a system like that in my house, I wouldn't worry.

M: So would the backup of conventional energy in your house also put your mind at ease?

1: At the moment ja. I think at renewable energy is more reliable, more widespread, not quite as new. And even if there are more in, you know if more people has it, then it is not like (…)

M: So the last question is (..) but you already answered that that you will not be able to use a renewable energy system on its own and that it will have to work in unison in order to have a reliable system>

1: Ja, I think, I mean, from a technology side they are dependable, these things have been around for quite a while now. I think they are dependable; it is just because they rely on something that is not as dependable as the system which depends on it.

M: So the system itself you would say that it is rather dependable and that you would use it

1: Ja, I think so, because it will work if the sun shines. If the sun is not shining then it is inherent in the system that it will not function optimally.

M: Would you feel comfortable to use such as system as part of a whole system in a flat that you rent on a month to month basis.

1: Uhhm

M: Or you know the alternative is that you go for as place with a consistent supply of electricity because you are going to go for a system that works…

1: (…)

M: Okay, and if you were the one letting out a place, would you install such a system, that could form part of your direct cost expenditures?

1: If it is a flat and it is possible to install such a system in it. At the moment I live in a complex where it would just not be possible to erect such a system in enough sunlight.

M: In terms of installing a renewable energy system in your house do you think you would limit you daily routine?

1: I don't think it would

M: Do you think that you would have to change certain things in your life in order to be able to accommodate this system?

1: That, yes, I think it would probably require some degree of adaptation, but I don't think it would limit me…

Transcriptions - Respondent # 2

M: Kyk altyd waar is die mikrofoon van hierdie ding.

2: Dit sal voor wees

M: Hierdie is net die: (.) ja, kom ek sit hom maarnet so (battery)

2: Ja

M: Okay, .aaam. Wat ek graag wil doen is om te verstaan wat is dit wat jy verstaan onder renewable energy (forficis)

2: Mmm, ja

M: Aaam. Ek gaan nou in Afrikaans praat want ek moet sê ek het nie my interview schedule gebring nie.

2: Is dit, hie hie hie

M: Hie hie, maar, so ek gaan net onthou wat ek moet vra. As 'n mens 'n situasie het waar drie mense langs die straat staan en kyk na hulle buurman se nuwe=

2: =uh huh=

M: =solar panel wat hy op die dak het en die een persoon sê: "Ek is seker dit is regtig 'n duur ding om te installeer, maar van nou af behoort dit redelik gemaklik te gebeur" en dan die ander persoon sê: "Ja: dit maak ekonomies sin oor die lang termyn, maar hoekom sal ek so iets installeer as wat ek het werk ek het 'n hele sisteem wat vir my warm water en elektrisiteit gee hoekom sal ek en dan die laaste persoon sê: "Ek verstaan dat 'n mens dit wil doen, omdat die, die koste aan die, omgewing baie hoog is op die huidige manier hoe dit werk MAAR hy glo dat die .am omstandighede om so 'n sisteem wat jy in jou huis installeer, baie moeilik is, dit maak jou lewe moeilik, dit maak dat jy nie kan stort as dit bewolk was nie, en dit maak dat jy nie warm water het die volgende oggend nie, en so voorts. =nou watter een van die drie, ek sal weer hulle standpunte noem, stem Jy meer saam? Die eerste een sê dit is baie duur, maar as dit eers in is, is dit gemaklik. Die tweede een sê (2.5) .aam (2.4) .am nou kan ek nie onthou nie hie hie hie=

2: = (hy het gesê) hy is trevede met wat hy het=

M: =ja, hoekom, hoekom wil hy iets anders insit en dat dit wel ekonomies sin maak oor die lang termyn. En die derde een sê dit maak nie environmentally sin nie omdat dit .am omdat elektrisiteit te goedkoop is of wat ookal, maar dat dit baie inconvenient is om so 'n sisteem te installeer

2: M Ja. Ek dink die eerste een sou ek mee saamstem, dit is=

M: =duur om=

2: =duur om dit te installeer maar veral om ‘n , jy weet ’n betroubare stelsel (ensovoort) om warm water te stoor ’n verlede, ouer en dan (0.1) ja. F: jy weet, om ’n goeie stelse te kry wat werk, sal duur wees, maar dit maak op die lang termyn beslis sin om dit te doen.

M: Okay.

2: (dit werk in) my beroep uit ook (jy weet... reserwes is) besig om vinnig af te neem, vinniger as wat die meeste mense dink dit neem af.

M: is dit so?

2: Ja (albei lag)

M: (lag)

2: So ons staar die toekoms tegemoet waar im (1.0) ons al meer te doen kry met soort van krag onderbrekings en prys van elektrisiteit sal opgaan (1.5) en, ja, en i:: bloot net om

mense soos Evkom of Escom (1.0) vandag al kyk na, jy weet, na hernubare energië

M: M, okay, im

2: Moet ek eintlik Engels praat?

M: Nee, nee, nee, praat maar Afrikaans want ek het

M: In elk geval my::

M: Im, wat verstaan jy onder energieë wat bereikbaar is in ’n mens se huis? Daars baie renewable energies wat mens kan gebruik, nuclear en wind

M: En so aan Wat ’n mens na jou huis toe kan bring en op ’n klein skaal kan implimenteer Is bietjie minder

2: M ja,

M: Watse

2: Imm::, kyk die beste een is waarskynlik im (1.0) [die werk van] son energie met ander woorde hitte, straal die die son deur die aarde So im:: ek dink dis die maklikste ene om te, op kleinskaal te doen. Wind energie maak nie regtigwaar sin:: weet in die binneland nie want omdat daar te min wind is, dis onbetroubaar (nie ’n groot probleem nie) daar is ’n probleem vir die installasie

van wind energie in Suid Afrika, jy weet dat jy al jou wind grootste mees konstante wind is aan die Weskus op

M: O, so hulle moet liewer 'n

2: Ja

M: In die see tipe

2: Ja, dit, of op die kuslyn, jy weet, en so Im::, dan het jy die probleem het jy te lang afstande nodig om die krag oor te dra na netwerke

M: Ja, okay

2: Dis een van die wat hulle het.

M: Ja, so im: dit wat ons huishoudelik kan gebruik is son energie

2: Ja, kyk daars ander goed ook nog soos v:: goed wat van, jy weet van van van metaangas, met ander woorde, wat ook van die verrottingsproses jy weet en so, maak ek dink dis ek so dit nie graat in my tuin wou hê nie (lag)

M: Lag

2: (dan praat jy) so van alle ander probleme jy weet veroorsaak ('n ander ding" wat baie maklik ontbrand en jy weet

M: Ja

2: ontplof en daai tipe ding so ek sal huiwerig wees om

M: [lag] en dit werk op 'n op 'n groot maat is as jy beeste en goeters het bietjie meer agricultural kan dit ...

2: maar // dan kan 'n mens daarna kyk jy weet as 'n

M: // werk

2: ja

[lag]

[lag]

2: die reuk van beesmis is (vorm) meer van die plaas (vorm) nie deel van my agterplaas nie [lag]

M: ja darem nou nie

[lag]

M: im as 'n mens kyk na son energie, kry mens direkte en indirekte aktiewe en passiewe son energie. im (2.0) wat, wat ek wil hê ons moet oor praat, is passiewe sisteme wat nie noodwendig 'n elektriese stroom opwek nie maar im jou geyser byvoorbeeld ondersteun want 'n geyser vat omtrent vyftig persent van 'n mens se huishoudelike energie gebruik. So as 'n mens oor die algemeen die, kom ons sê die hele im suburb almal kan kry om nie wel nie op gereëlde basis hulle geyser te gebruik nie deur dit te ondersteun deur 'n sonsisteem, kan 'n mens regtig die grid wat nou bestaan maak dat dit meer reliable is. In die begin het jy gesê daar is meer im elektrisiteits onderbrekings en so aan so die, die, dit waaroor ek graag wil hê ons moet praat, is, is die ondersteuning van bestaande sisteme in 'n mens se huis. Dink jy dat dit, dat dit nodig is of dat dit enigsins 'n toekoms het om so 'n tipe aanklag aan te wend?

2: Ja ek dink beslis so, jy weet, im ek dink in Suid Afrika is ons nog baie lui jy weet (in verband met) goekoop energie plekke soos Israel byvoorbeeld het al lang jare begin en Israel in Israel elke huis het 'n sonverwarming op sy dak, jy weet en so. So:: hulle, hulle (1.0) toon beslis jy weet dat dat dat dit 'n goeie oplossing is vir medermale huislike net gebruik net en so aan jy moet natuurlik besef (so van) dat, im by verre die meeste:: energië in Suid Afrika gebruik die industrie soos van huishoudelike (.....kon niks uitmaak nie.....)

M: ja

2: getalle stroomgebruik

M: okay

2: so 'n mens moenie verwag dat groot besparing in terme van van i:: van die totale energie van 'n land nie

M: ja

2: jy weet energie verbruik nie

M: die rede hoekom ek im hierdie aanklag omdat im industrië kan baie baat vind by as die as die regering kan begin om dit te subsidieër sal hulle meer baat vind as die privaat gebruiker waar im die privaat gebruiker baie van homself moet insit van sy eie geld eie inisiatief moet gebruik om hierdie ding in jou huis in te sit, te installeer, im. Hoeveel volgens jou idee van wat dit behels, hoeveel, im, onderhoud is daar nodig aan so 'n

2: m, waarskynlik bietjie meer as 'n die bastaande stelsel jy weet, en so die bestaande stelse het ook maar probleme (ketel vervang) (..... kon niks uitmaak nie.....) so, dis goed, ma wat maar sal gebeur en so en im:: ek dink as 'n mens begin met 'n goeie stelsel nie 'n van 'n slap dash tipe ding nie dan gaan jy im:: waarskynlik nie veel meer onderhoud nodig hê as 'n gewone stels. Daar sal 'n paar meer koppelings wees

M: ja

2: (meter kettings) miskien ek weet nie

M: okay

2: en:: so:: maar dit behoort nie meer, vreeslik baie meer tyd of geld te kos nie

M: m, en koste gewys, hoe vergelyk im (1.0) eers om dit te installeer

2: m

M: hoeveel skat jy is dit?

2: ja, m, sjoe, dis nou 'n duimsuig nê?

M: ja [lag]

2: im, ek weet ek het op 'n stadium navraag gedoen oor sonverhitting vir die swembad, jy weet, ietwat van 'n witolifant hierso by ons, dit vir die kinders gekoop wat nou uit die huis is im:: maar toe het hulle vir my 'n kwotasie gegee vat wat (1.0) sestien duisend rand vir die swembad, jy weet, en so maar 'n paar pype en daai tipe ding. So ek verwag dat 'n oordentlike funksionerende sonenergie stelsel vir 'n of passiewe stelsel vir 'n vir 'n woonhuis, gemiddelde woonhuis waarskynlik heelwat meer gaan kos as dit. Sê maar vyf en twintig duisend rand maar dit is nou absoluut (2.0) (ballgame)

M: ja, en dan im dink jy dat dit dat die energie die elektrisiteit prys kan die koste tot die omgewing insluit of wat, wat waarvoor betaal mens as jy vir elektrisiteit betaal in Suid Afrika?

2: Jy betaal basies vir die jy weet vir die vir die m (1.2) verskaffing van energie jy weet om (2.0) in Rand en Sent basies om die energie te

genereer jy weet en::

M: so vir die steenkool

2: ja

M: en die //proses

2: // proses en die:: om dit by jou te kry, transmissie jy weet en so aan en vir die onderhoud van daai stelsel jy weet soos transformators wat daai tipe dinge wat klaar raak na 'n paar jaar

M: okay, so is die die mense wat in die omgewing van 'n kragstasie bly en die impakte op hulle en die lug en so aan is dit in die prys gekoppel?

2: Nee, sover ek weet is dit nie daaraan gekoppieër nie .hh daarin gekorporeer nie of ingesluit nie en ek meen dis 'n groot ding daai wat jy daar noem, so die:: daai prys is dink ek voor (gestyg) vir verskeie redes en dis eers NOU wat mens begin besef van wat die prys is nou en dan wat mense nie besef nie mense dink nogsteeds dat dat steenkool is meer omgewings vriendelik as kernenergie byvoorbeeld jy weet.

M: ja

2: wat nie die geval is nie

M: m, okay, im, dan oor die prys van die energie dink jy dit dat elektrisiteit in Suid Afrika deur die regering im gesubsidieër word op enige direkte manier kom ons praat nou nie van indirekte:: im:

2: ja:: weet nie. Ek dink ja, indirekte, manier, wats direk en indirek – kyk im:: Evkom:: weet is maar semi-staatsssorganisasie dis nie regtigwaar weet loseerders net so van:: besigheidseenheide en daai tipe ding wat waar is weet dis nogsteeds as jy kyk na die salarisstruktuur en daai tipe dinge is dit maar van staatsdiens of semi-staatsdiens.

M: ja

2: Weet in daardie opsigte (...) word nog deur die staat gesubsidieër.

M: Okay

2: Ek weet nie of ons nog sal kan bekostig om regtig 'n privaat firma te kry om energie verskaf nie. Ek kan my dit amper nie indink nie.

M: Ja, die bestaande infrastruktuur is net te groot.

2: Ja dis regtigwaar makulu size daai, daai klas van (...)

M: Ja, im as 'n mens nou dink dat jy so 'n sisteem in jou huis moet hê,

sal vinnige for lack of a better word im ongemak sal jy ervaar soos im deur nie te weet of dit gaan werk of dit betroubaar is nie of goed. Dink jy dat dat 'n son, 'n passiewe sonsisteem ter

ondersteuning van die huidige sisteem im baie probleme gaan veroorsaak in jou huis? Regtig tyd vat van jou om

2: M Goed ... ek dink soos soos soos van hoe kan ek sê, dis inisieël gaan (so effens van) 'n stres wees (actually/ek sal eers) graag bietjie wil navorsing doen oor wat dit behels, jy weet, en so, wat is die (indement) van die stelsel, en im, dis presies dit weet en jy redelik seker is jy het 'n verskaffer wat weet wat hy doen dan dink ek sal ek redelik gemaklik voel daarmee jy weet en so aan.

M: Okay

2: (Dan nou nie die) vervoer jy weet en die donder in, so so so as dinge nou NIE werk nie dat

M: ja. As jy 'n woonstel koop of 'n ekstra woonstel naby jou huis sal jy, indien dit moontlik is so 'n tipe sisteem wanneer jy nou 'n woonstel bou, koop, vir mense sê om so 'n sisteem in te sit? Dink jy dat dit jou koste sal bespaar oor die langtermyn en dat dit betroubaar genoeg is om iemand anders daarin te laat bly?

2: M Wel, eerstens (alternatief) 'n mens gee vir hulle elektriese energie nou afgesien van omgewingskoste im:: a:: iewers soort van:: van:: weet wat hulle voel vir die goed wat hulle mors nie afhangende van die huurders natuurlik,

jy weet (of wat of wat) op sosiale vlak jy na kyk maar eintlik sê dit ook nie veel nie (...) vandag ook seker maar 'n ander plek nê. [lag] Mense wat op hoê vlakke sien ja-nee (to less set) kan mens maar sê so

im: (hoeveel geld) eintlik wat hy verdien nie so im:: ek sal veral in die afsienbaare toekoms soos die stelsel verbeter, sal ek geneig wees om te sê goed reg, kom ons kyk maar daarna

om 'n passiewe ondersteunende stelsel te installeer

M: Okay, so, die antwoord is ja,

2: Ja

M: oor 'n paar jaar?

2: Ja

M: Indien die sisteem homself bewys het Okay im so dan wil ek die vraag omruil en vra indien jou situasie so sou verander dat jy by iemand 'n huis of 'n woonstel of wat ookal moet huur, en

die huis is met so 'n sisteem, sal jy dan im: die huis huur of wat sal jy dink is die voordele of nadele aan so ding as jy die huurder is

2: M, ja net so (...) dis maklik om te sê jy weet, en so maar ek dink TOG jy weet wel ek sal eerstens vir die ou vra jy weet bewys dat die stelsel werk, so, voordat ek my handtekening daarop sit. maar as hy dit vir my kan jy weet beaam jy weet op 'n betroubare wyse dan sal ek sal ek dit doen.Dis nie 'n probleem nie.

M: Okay

2 Dis dit?

M: Ja

2 As jy nog vrae het dan kan my maar laat weet

M: Dankie ek sal.

Transcriptions – Respondent # 3

M: We are going to start off with a story, just listen: Three people are standing on the sidewalk. They are looking at their neighbour Greg's house that has a new solar system installed on the roof. They discuss the new system but they soon realise that they have very different viewpoints on this new development.

Patricia says: I think that that must have cost a pretty penny to install, but I am sure that once it is installed, it doesn't require a lot of effort for Greg to do upkeep.

Simon says: Even though it must have cost a lot to install, it makes economic sense in the long run, don't you think? My only objection is that I already have a very efficient system, why would I switch to an alternative if my current system is working just fine?

Geoffrey says: I don't believe electricity costs reflect the cost to the environment, and therefore it could be a good idea, but I don't want to wait for the sun to shine a whole day before I can take a shower. Now that you have heard the story I am going to sum it up for you again and I would like you to identify with which person you

3: =and if there's more then one?

M: = (1) then just say why

3: =oh, okay…

M: Patricia says it cost a lot to install, but once it is installed it would not be a problem. Simon says it makes economic sense but (1) why would he do such a thing if he already has a current system that is working. And Geoffrey says (1) he believes it is a good idea for the environment, but (…)

3: I think I am going to make it difficult for you but I actually agree with all of them. all of it has got it's pro's and con's. There are obviously changes that you will have to make in your lifestyle, but not that much. Maybe that is the least one that I agree with. Patricia said that it cost a lot of money, but afterwards it is supposed to work fine. it does but sometimes you do have problems. I have had experience on the farm that it actually cracked or somebody throw stones at it or whatever, and then your panel is broken and your whole system is sort of… (3)

And Greg said that you have got the comfort of having hot water and electricity and all that, why would you actually change that?

M: What do you understand under the domestic use of renewable energy resources.

3: Uhhm, from wind generation or whatever, I guess that there's less cost to the environment, and you actually get the same product in the end

M: Uhhm, there's many forms of renewable energy, but not all of them are usable under (…) having a wind turbine on your roof, which forms of renewable energy could you use in your house with comfort

3: =solar panels, uhhm, I don't know of anything else… ja I suppose.

M: there's different forms of solar panels, passive and active. Active ones turning sunlight into a current and passive ones turning water into hot water or not actually making electricity but making (…). How necessary do you think it is (..) in general

3: I think it is very necessary, electricity also got a negative impact. I think when you think about how much it costs to actually put up power lines, I mean how many power lines can you have? you have to look at alternatives, why not you know?

M: Do you think it is necessary that people to start
using it in their own homes or is it only on a large scale that…

3: I think if you want to have it actually if you want to get they buy in from the people because they started using it, they will start using it…

M: what are the things that would stop you from personally installing such a system in your house.

3: =you know what? it is too much hassle to change, because you have got it now, so why bother? One should because you should be more… But I have go it somewhere else. You know but not at my house where I am staying right now

M: is it because your father is not connected to the grid at all? Or for additional purposes?

3: My father use it to generate power for the water pumps.

M: Does it work well?

3: Yes

M: =unless somebody through a stone at it..

3: =unless somebody through a stone at it.

M: Do you think the price of electricity in South Africa reflect the cost to the environment?

3: I don't think we pay too much for it because the actual cost and then the impact it has… if you think how much it costs to put up transmission lines…

M: Do you think the government subsidise electricity to get it so cheap?

3: I think so…

M: An example of economies of scales is cell phones, you know, the more people get cell phones the more people the more people can get… would it help if the government kind of subsidise… Would you say it is not a lack of trust in the system necessarily.

3: No I don't know it is a new thing for a lot of people. I think some people might know why to change and other people might know but they don't want to change. Uhmmm I think the younger generation ..function.. that they know more what is going on in terms of the environment. So I think they can benefit them I think… uhhm, it is difficult to judge you know, depending on economies and what type of system as well.

M: Let's talk about a supporting kind of system that supports your current system. let's say you have a geyser in your house that take 50% energy, and you use a supporting system that does not mean that you no longer use energy, only that the geyser never switches on because it never gets cold. Do you think that would make an impact on the energy use in the home?

3: yes because that is because they can't satisfy the peak demand, then the peak demand, I assume, would be less.

M: How would renewable energy price compare with conventional energy, if you buy a renewable system, or if you just carry on paying for your electricity. How much years would make a difference.

3: Not that long because you really . I think that you in anyway have instalment costs, but for instance your geyser breaks and you have to get a new one, how much would that cost? I am sure a new geyser, even if you have the whole system, might cost more than that…

M: how much would you guess such a system cost, an active system cost, and a passive system cost, obviously there is a difference in price…

3: I would say an active system cost more than a passive system, but how much it will cost… I think it will be more than a thousand rand, but if more people star using it….

M: the initial instalment?

3: no, no no just the thing, the instalment, I don't know how much the instalment would cost, I really don't know, I don't know. But I am sure that if a lot of people support it and put it in it must become more affordable too, I am sure it must be. Otherwise why promote it you know?

M: okay now I would like to explore that impact on your physical comfort in your home.

3: no I think it would be the same.

M: do you think it would impact on your emotional comfort? Would you worry about it? Would you feel you have to fix it every month?

3: it is difficult to say, something can break, something can go wrong, you know I wouldn't worry

M: so what you said is that these systems are very dependable, especially in support o the current system?

3: ESPECIALLY then Yes.

M: So you would feel comfortable installing such a system in a flat that you rent out to other people?

3: yes

M: okay, and you would feel comfortable renting a flat fitted with such a system

3: yes

M: okay, thank you for your participation in this research, I really appreciate it…

Transcriptions – Respondent # 4

M: Het u die vorms gelees wat ek gestuur het?

4: Ja, ek het daardeur gekyk ja.

M: Okay, so ek gaan nie alles dan verduidelik nie, ons gaan dit net teken sodat dit legal is en alles. Die groot ding daar is dat ek die gesprek gaan opneem en dat dit wel konfidensieel is en nie noodwndig annoniem nie.

4: is dit reg?

M: Ja, en dan hierdie…Okay, ek het nou al ‘n paar onderhoude met mense gevoer en gevind dit is beter om net ‘n bietjie agtergrond te kry oor van waar af kom die persoon waarmee ek ‘n onderhoud voer. Net in terme van werk…

4: Goed, ek is ‘n akoestiese reaadgewende ingenieur, dit beteken ek werk met verskeie probleme wat te doen het met klank en geraas, so dit behels eintlik ‘n groot verskeidenheid van werk, want akoestiek gaan oor enige iets waar klank ter sprake is. Daar is verskillende hoofvelde. Een hoofveld is geboue akoestiek.

M: Soos ouditoriums en…

4; Ja maar heelwat wyer, gebou kan gewone kantoor geboue wees, dit kan winkelsentrums wees, waar die lugreeling masjiene en allerhande masjiene probleme kan veroorsaak in die naasliggende woon omgewings. So daar is regulatoriese vereistes en impak studies wat gedoen moet word op groot winkelsentrums. En geboue akoestiek selfs, strek heel wyd die kan self mense wees wat in hulle woonhiuise teaters wil installer. Dan is daar ‘n ander wye veld, soos nywerheids geraas. Dit gaan oor, gewoonlik oor geraas wat gevaarlik hoog is en om dit stil te maak. Of in die ontrwerp stadium of in bestaande aanlegte en fabrieke waar hulle bevind hulle oorskry die wetlike beperk en hulle moet dit dan verminder en ek doen dan ondersoeke toetse en ontwerp om dit stil te maak.

Die ander groot veld is dan omgewingsimpak studies. Waar ek dan betrokke is by die geraas deel daarvan. Weereens kan dit enige iets wees. Dit kan ‘n nuwe pad stelsel wees, dit kan opgradering van ‘n pad wees, veral myne of partykeer is dit geboue ontwikkelings of so, en ook

woongebied ontwikkelings. ‘n Ontwikkelaar wil ‘n nuwe woongebied plaas langs ‘n snelweg en dan moet daar ‘n impal studie gedoen word om te bepaal jy weet, is dit toelaat baar..

M: Of wat moet gedoen word om dit toelaatbaar te …

4: Dis reg wat moet gedoen word indien dit nie toelaatbaar is nie. En dan is daar ‘n verskeidenheid ander goed. Diverse ander goed. Wat ook baie wyd is . Dinge soos voertuie, dit kan padvoertuie wees, spoorvoertuie, ek doen baie werk op lokomotiewe en treine. Vleigtuie. Dan is daar goed soos ontwikkelings werk, kyk na nuwe bou stelsels, of om mense te help in produk ontwikkeling of materiall ontikkeling. Hulle het ‘n material en hulle vermoed dat dit gebruilk kan word vir een of ander klank toepassing en ek sal dan kyk of daar potensiaal is. En dan nog ander snaakse goed soos ontploffings en artelirie…

M: So. Okay. Ek is besig met my M in navorsing sielkunde. Meeste mense wat saam met my geswot het is in mark navorsing en ek wou regtig nie dit doen nie, Ek wou regtig in iets ingaan waar jy ‘n verskil kan maak. Waar jy iets tasbaar kan doen. So waar ek werk is meestal in die sosiaale deel van die impak studies, en wat die cumulative van die impakte. Wat ek vir my meesters graad doen, ek het besluit ek wil weet wat is meeste Siud Afrikaners se gesindheid oor die omgewing. En dit is ‘n bietjie ‘n wye veld en so het dit kleiner en kleiner geword. So my fokus vandag is op energy, meer spesifiek herwinbare energy, en die huislike gebruik van herwinbare energy. Daar is natuurlik herwinbare energy wat op grootmaat aangewend kan word en wat in die grid in kan gaan,. Maar wat ek kyk is of mense dit sal begin gebruik in hulle eie huise en tot watter mate, en wat weet hulle en wat wonder hulee. So dit is hoekom ek hier is vandag…

M: We are going to start off with a story. I am going to read you the story the story to you, please listen carefully and decide with whose argument you agree the most. Three people are standing on the sidewalk. They are looking at their neighbour Greg’s house who has a new solar system installed on the roof. They discuss the new system, but they discover that they have very different viewpoints on the new development.

Patricia says:” I think that that must have cost a pretty penny to install, but once it is installed, I am sure it does not require a lot of maintenance from then on.

Simon says:’ Even though it must have cost a lot to install, it makes economic sense. But what he does not understand is why wo9uld you install such a system if the current system operates fine.

Geoffrey says:" I don't believe that the cost of electricity reflect the cost to the environment, and therefore it would be a good idea. Although I don't want to wait a whole day for the sun to shine before I can have a shower.

So just to recap, Patricia says that installation costs are high, but it is a comfortable system once it is installed. Simon says that it makes economic sense in the long run, but he has something already that works fine. And Geoffrey says that he would install in because of the cost to the environment, but he does not think it is a very comfortable system you have to wait for the sun to shine, you have to do a lot of maintenance. With whose argument do you agree

more. And if you agree with more than one, which aspects do you agree with..

4: Look, I like the one with the … the ideal to develop new sources of energy and solar energy is one of those things. I would like to support it, but I am also practical in the sense that I feel I would be prepared to pay a limited cost for contributing to such a system. So I would be prepared to pay and additional cost. In addition to… in other words I would be willing to pay more than what I pay for electricity…

M: Ja

4: But within reason, because you know, I think it is important to think of the future and we know that fossil fuels are going to be exhausted eventually. I don't want to go into that at the moment. But I would be prepared to make a small sacrifice, provided that it works. And it is to just a novelty idea.

M: So you are talking about making a monetary sacrifice, as opposed to a sacrifice in terms of comfort in terms of lifestyle.

4: Ja…. I suppose… the solar system as we know it today is limited to heating. I don't think there are systems on a house scale… there shouldn't be too much inconvenience, only in terms of heating you know sometimes it might not make the water as hot as you would like. So I am prepared to make a small sacrifice in that regard as well. And that is entirely without being sentimental about it. I don't have sentimental issues but I am willing to make a small contribution towards developing viable solutions… And we won't get there if we don't start using…

M: Yes, because then you get to identify the problems that you need to address…

4: Solutions will only be developed once the demand grows…

M: yes… one of the things I wanted to ask you is… do you think that as the demand goes up… like cell phones, as the demand goes up and people want a better plan to pay for it in the first instance, and then that better quality, a better quality for cheaper. Do you think it will follow that trend?

4: Absolutely yes, it will. I think it is just at a stage where we haven't really started, it hasn't started to gain it'd own momentum. It's still very early days..

M: Do you think that, seeing it is such early days, how necessary do you think it is to start using it yourself. Or do you think we are a t a stage where it is not really applicable yet?

4: Ja, you see, the applicability of the thing. Other factors such as the initiatives taken by government. For example, we don't see solar heating in this country really. Except for, one that I see actually very early attempts. There was a time that there was some nterest in it. If you go to Botswana, as poor as those people are, I mean I is a wealthy government, what is noticale, is when you go into Gaberone or Lobatse, you see fairly large housing developments, where the government has funded solar heating, every house has a solar heating system on the roof. So I think there should be some inspiration coming from the authorities side. Encouragements …

M: Like tax incentives…

4: Ja, but in areas where the government IS spending money. To show that these are viable, and that these can be used. At a cost, because it is not a cheap solution.

M: Not initially no.

4: If the government send on that the industry supplying those systems and the infrastructure will get on their feet. And in am trying to say that everything must come from government, but they could play a very important role in this, because they are spending a lot of money on housing

M: They could be using it there…

4: Ja.

M: The cost of electricity in South Africa compared to the rest of the world. What do you think.. How does it compare?

4: I am not really qualified to compare…because I really don't know. I don't think our electricity is way out in terms of cost. If think of it as a cost in your total budget, you know in you

household expenditure, it is not negligible but it is not something that, it is not one of the things I get most excited a bout, telephone bills… I don't feel that it is not fair. I am not so much concerned about electricity cost at the moment.

M: Do you think that the cost of generating electricity come into the price that we as consumers pay for at the end. Do you think that we as consumers pay for the burning of the coal. The extracting of the coal, the respiratory diseases in the areas where energy is generate? When we are electricity?

4: do you want to know….

M: whether somewhere in the process the government subsidised electricity, the mining industry, or somewhere, the cost get cut.

4: no, other that the fact that many people cannot afford electricity, where most of the community subsidise that. I am not aware of any instance where that community as a whole or the government subsidise that… I am not aware that any of the basic cost that we consume as a whole will be subsidised in another way or that the government subsidise it.

M: Do you think that some costs are neglected, or not looked at, that is not part of the production costs. That people in the close vicinity of the power station have a lot more asthma…

4: the indirect cost, sure I think there are certainly environmental costs attached to not only electricity, but to many aspects of pour modern life, there certainly are those costs. Whether that makes it a crime or something else. Yes certainly there are those costs. And it is easy for us living in Pretoria and not close that any of these refineries and the mines, but there are various types of pollution taking place in and around the mines. For example sulphur that release from coal that is washed up in …

M: in rivers…

4: and in the soil that surrounds the plant… but it is not the end of the world… I feel sorry for the people who suffer from air pollution, but I have a… I think,…I am certainly not an environmentalist, and certainly not a environmentalist… or green environmentalist, I am aware of these things. I am concerned about it, and I think we should manage as well as we can. I t shouldn't be irresponsible about it… if we are responsible about it… so yes we are paying costs as per units, not necessarily covering the indirect costs…

M: I would like us to look at quality of life, and how a solar system in your home (let's talk about a passive water heating system) in support of your current electricity in your home. Maybe cutting out 80 or 90% of your geyser use in your home, supporting your geyser in supplying hot water, so that it never goes off. Do you think that when you have such a system installed in your house it would detract a lot from your comfort, the physical comfort in your house, the times that you can use hot water, the times that seven people can use the shower after one another

4: No I don't think it will, I don't think it will be as completely as reliable as electricity at this stage. I don't see it as a large impact on our comfort.

M: okay, if you have to guess and say what you think how often maintenance would be necessary on such as system, monthly, six monthly…

4: on a solar system…I don't have first hand knowledge, but I think if you have a system that is properly designed and built, as I have seen in Botswana, those are systems that weren't built in a backyard, they come from a production line. I don't think there should be major, regular maintenance required; I think the maintenance should not be much different from your electric geyser, which also goes every now and then as well.

M: Do you think that if you had such a system installed it would impede on you level of psychological comfort, would you worry that there would be something wrong with it or…

4: I wouldn't worry about it.

M: If you had a flat or an garden flat or something that you could rent out to somebody and that would lower your costs significantly while upping your profit, do you think that, would you install a warm water system in a place that you rent out, that you have to be responsible for?

4: that's is maybe slightly different, because I am thinking about my own system, I don't mind fixing my own system myself, but if it is a flat that I rent out, you are dependant on specialist or that type of thing, so I would think twice there.

M: And if you were to be the person who rents, would you rent a place fitted with such a system?

4: That wouldn't worry me

M: because then you would be able to go to the landlord and say that the system does not work…

4: yes, that's right

M: Thank you very much for your time, I will probably send you a copy of the article or a summary of the study once I am finished. Thank you for your participation.

Transcriptions – Respondent # 5

M: Hoekom ek wil interviews doen met mense wat bietjie meer met die environment te doen het is die hipotese wat ekhet dat mense wat meer gereeld met environmental issues te doen het en meer in aanraking met die omgewing is het 'n hoer geneigdheid om environmentally responsible te wees, OF nie. Dit gaan altyd albei kante toe. If we could speak English…?

5: Okay yes that's fine. I am comfortable with that.

M: I am going to read you a scenario, I would like you to listen carefully and decide with whose argument you agree with most. Three people are standing on a sidewalk and they are looking at their neighbour Greg's house that has a new solar panel installed on the roof. They are discussing the system but they soon realise that they have very different viewpoints about this new development. Patricia says: I think that must have cost a pretty penny to install, but I am sure once it is installed Greg can live comfortably from then on. Simon says: Even though it must have cost a lot to install, but it makes economic sense in the long run. His objection is that he already has a very efficient system installed. Geoffrey says that the cost of electricity does not reflect the cost to the environment and therefore it could be a good idea. But he doesn't want to wait for the sun to shine a whole day before he can take a shower. Patricia says it cost a lot to install but once it is installed it is comfortable, Simon says it makes economic sense but he already has something that works well, and Geoffrey says that the cost of electricity does not reflect the cost to the environment, but it would be a very uncomfortable system to use.

With which do these do you agree most.

5: I'd go with Patricia

M: Okay, but why

5: Because I think every little bit counts, in the environment, I mean if one person does it it might trigger somebody else to do it and ultimately it is not about the big things in the world, it is about the small things. Every little bit helps at the end of the day, to improve the quality of our environment. It is also the more sustainable solution. I mean currently if you take our conditions in South Africa, we are using non-renewable resources for electricity, and that affects us all, so…

M: Okay, if we start talking about renewable energy sources, what domestically usable energy sources are available in South Africa?

5: Renewable resources?

M: Yes, that you can use in your house, not large scale…

5: From an energy perspective or from a recycling perspective?

M: from an energy perspective

5: Well the first one that comes to mind is gas. Gas is not necessarily renewable, it comes from the earth, but you can also, you know, gas from composting or waste material. But I think from an energy perspective it is more than likely something like that.

M: And any other…?

5: No that I can think of now that would b efficient to use at the end of the day.

M: Okay, is it possible to, or let me say, how feasible do you think the solar technology is at the moment, do you think it is very usable or …

5: Look I have some experience with solar, having worked in Europe and having been here, I mean South Africa does not use it efficiently, because they have a lot more daylight hours than a lot of the European countries do, and there are some very interesting work going on in Germany. I think there the people are actually being paid to convert their garage roofs to solar panels systems and then feed back into the grid, and then they get a certain amount of energy compensation for that. I think it is definitely there, I think it is a problem of awareness and ultimately looking at the installation costs. And sometimes (…) can be an issue depending on costs. I think it is definitely something that can be used more that it is currently being used.

M: Do you think it is environmentally necessary to start pushing renewable energy sources into, ja, getting people to use it?

5: Well look I mean you can go back to wind and you can go back to solar, and you can go back to gas

generation from waste. If you particularly want to push ANY renewable resource I think it is a worthwhile endeavour. Because you give yourself a bit more time to phase-out non-renewable resources. And find something, if I could use the word ‘better’ for renewable energy generation. The big (…) would also be, it is fine to push that kind of energy, but you will have to develop certain skills, because there are not many people who have those skills. So okay some mines might close because they are not using that much coal, but there is another alternative in terms of skill. You don’t lose the labour component. Which I think would be a concern for government. For

everyday man on the street, I think it is a matter of awareness. And I think that is the big issue because of the (…)

M: Would you use the system in your own house? Or do you think that the unconfortableness that comes with it, would it be too much?

5: No I would definitely use it, I mean my parents had (…) even just to heat the water, it makes a big difference. I don't you will use it only for electricity, but I think you will have to make some changes in your perception and changes in your lifestyle, but I don't think it is… I don't have a problem with it.

M: If you think of the major barriers at the moment, what would you say those are?

5: In terms of the actual resource or in terms of the marketing or whatever…?

M: Problems that come intermitted in your daily life. Let's talk about the upper suburban areas. What do you think stop them from starting to use solar, gas in their house

5: I think it is lack of perception and lack of awareness. If you were an architect or a engineer, particularly and you could motivate that this could work, then it is not an issue.

You are looking at a lot of that kind of stuff, particularly in the new developments sand the eco-estates where they have started where they have started with water, where they started recycling water and grey water and all of those issues. So I don't think it is going to be long before the solar panels are going to be there. I think one just needs to distinguish between what kind of solar panel you use. Are you using it solely as what we traditionally know as or which is more known to the market, which serves just to heat the water. And it is a passive system and it heats the water and that's it. Or are we actually talking about having voltaic cells on you roof and then we go from there, to wherever. Depending on the number of cells determines the number of volts that you have. So if you are talking water heating systems, I think that the it just, I don't really think that is such an issues.

If you are talking about architect and people supplying the houses it probably wouldn't be a problem. On the other hand, with the voltaic cells, it is quite expensive, and if the architect can show, that yes, in ten years you have paid it off and thereafter you have free electricity, that you can add (…) but it is not going to affect the TV's and all these other things that one gets, these other comforts that one gets so used to. And luxury, like under floor heating and all of that, that

should come with the upper market. If you can show that that can work with that, that the voltaic cells can deal with that then it is just an issue of cost I think.

M: Okay, so if we could discount the cost a the end of the day, and in ten years time you will not have the continuous cost any more, do you think it will have a big influence rather using that than non-renewable sources of energy?

5: I think that maybe on a voltaic cells basis I think that there are definite areas where I don't think it is feasible, because

I think that we might not want to put up so many voltaic cells, but if you take again the example of Europe and Israel and those places that literally have fields of voltaic cells, they have fields of those windmills that generates electricity. I don't see why not because you can still, the municipality or whoever can still guarantee a current flow, of power, so I think it is maybe at this stage before we can go to the microwave units kind of the thing, because we all use (…) I think it might not be practical and it is more a sort of thing you know, put it out there, not as such out of mind's way, but I just think it makes more sense that putting it in for every single unit in suburban areas. In more rural areas, I think definitely that could work. It would be a lot cheaper that trying to get some volts over there.

Ja, it could work. I think the one aspect that they do need to address, would be a thing particularly in the big upper market areas and for business use is like BP, the oil company had a big thing where they said that they would be totally energy independent. And all the roofs for their filling stations were solar panels. And there was an example of a case on William Nicol, and eventually they installed those panels, that was two or three years back already, and they crumbled, because the temperature extremes in our country is just too great. So I think one needs to make sure that the technical aspects are sorted out. Because I don't think one can just look at public perception, you should look at the technical capability, and if these things can actually deal with those aspects. Because once that thing gets damaged, there's a lot of, particularly with a lot of movement and that. But I think with technology, we can move beyond that, That will be the big thing in terms of ensuring that we are more comfortable and trusting in using that.

M: Okay, so you think it would be a good idea to initially install renewable energy in support of the existing ad getting them to lessen their energy use in their home and getting the buy-in

from the people. Do you think that that could be a feasible way in which to get people to start using it?

5: No I don't think necessarily that that is going to, because I think it will be very difficult to encourage people to decrease their energy use within the house, because that is pretty much habit and again goes back to awareness, but I think at the end of the day if it talks to their pockets, take it from a savings point of view, that yes, if you do convert your garage roof to voltaic cells, you will be able to contribute to the national grid, and the meter checks out what you have contributed and accordingly that gets deducted from your account, or whatever. The question though is who is going to be responsible for putting up those cells. Is it the owner, or

would it be some other organisation like, local government, or government. Because I think that is where the big thing is, which costs goes to whom… for the initial (…)

M: So if we are talking about incentive we are talking about reimbursement for electricity,

5: Ja, or increase in property value

M: So the drive as to be financially

5: Unfortunately I think it must be financially, I don't think it will happen because of environmental concern…

M: Okay, do you think it will become cheaper the more the market starts using it. Like cell phones, the more they use it the cheaper it gets?

5: Potentially yes, but I still think it is going to increase first, because they are going to have to cover their costs of putting in the infrastructure, like local government, their costs for that will not decrease substantially once there are many users. You could say that on a private home owned basis, I think it will be like (…) they have just got more and more users, and therefore they have a scarcity on the market, and then they started to become cheaper. But I don't think it will be very difficult to go into that kind of are that you are talking about, I think it will (…)

M: If you had to guess how much a passive solar system cost in South Africa for one household. What would you guess?

5: That is just heating water?

M: Yes

5: You are probably looking at a system between 8 to 10 thousand Rand.

M: And if you go to an active system, which actually generates electricity.

5: For that you probably talk more about in the region of 30 or 40 thousand Rand.

M: Okay,

5: Sorry, I think the one think which you need to consider in all of these aspects is maintenance. And maintenance cost, we saw that with my parents, maintenance is a nightmare, maintenance wise. Usually nothing much happens, but when something does go, the maintenance is absolutely horrendous. And even if it is just the glass sheet that covers the whole thing, you know the neighbours threw a cricket ball… It is quite a substantial thing to repair (…)

M: Do you think if you install a passive solar energy system in your house that it would change you daily routine?

5: No

M: And you monthly routine in terms of maintenance or…

5: No

M: That is it. That is all I wanted to know

5: Just a suggestion that you include the people's original qualification, because gender is important and that, but I think it is important for you to know where the person comes from, you know? Because if you were trained as an engineer, I think it would also change your perception and give an indication of where you come from.

M: Thank you, I will keep that in mind...

Transcriptions – Respondent # 6

M: Okay, ek het nou al met ‘n paar mense onderhoude gevoer, en ek het uitgevind dit is beter om ‘n bietjie uit te vind wat is dit wat is dit wat jy elke dag doen, en dan sale k jou vertel waarom ek hierdie navorsing doen en so aan.

6: Goed, I am employed by the Legal Resources Centre as a lawyer, I am on the role of advocate so I am not an attorney, I am an advocate but I am employed to do general law work in the Legal Resources Centre. The Legal Resources Centre has a background of human rights law since 1979, and with the coming in of the new constitution it changed it’s focus, not away from human rights, but more particularly by ensuring that human rights contained in the Bill of Rights, become a reality. So we have divided our work into different projects, and each project deals with a person’s rights as written in the Bill of Rights. My project, of which I am the coordinator and one of the lawyers operating within the project is the Environmental Justice project. The objective of the project is to assist community and other vulnerable and marginalised and poor people,

that it our sort of demographic group from which our clients come, where they encounter environmental problems which also has some type of human rights aspect to it. So it is typically where environmental problems coincide with human rights issues. A typical example is industrial pollution affecting poor and marginalised communities. So I work broadly in that line. My daily routine is basic case work, so I would act on behalf of clients, either a community or community based organisations, individuals or an NGO, and I would work the specific case. Either through following a litigation process drafting papers and going to court, or through a negotiation process, particularly with Environmental Justice stuff through assisting clients to comment and participate in environmental Impact Procedures.

M: I am busy with my M in research psychology, and what I initially wanted to do was to look at the average South African’s attitude toward the environment, but that proved to be a bit difficult because the average South African…

6: Is a rainbow…

M: and so is the environment…So it got narrowed down and narrowed down to renewable energy sources and more particular people who often work with environmental issues and their attitude toward the environment, and then the use of renewable sources of energy and possibly

other things that are environmentally friendly. And I work at Afrosearch and Mawatsan, we often do public participation and social impact assessments for an EIA. So that is where I come from.

6: Okay

M: I am first going to read you a scenario, I would like you to listen carefully and then tell me with whose argument you agree more. Three people are standing on the sidewalk and they are looking at their neighbour Greg's house that has a new solar panel fitted on the roof. They discuss this new development for a while, but they soon realise that they have every different views on it. Patricia says: "I think that must have cost a lot to install, but once it is installed I believe that Greg can live comfortably". Simon says:" Even though it must have cost a lot to install, it doesn't make sense, because he already has a system that works fine". And then Geoffrey says:" I don't believe electricity costs reflect the cost to the environment and therefore people should start putting systems like that in place, but he doesn't want to wait a whole day for the sun to shine before he takes a hot shower."

So these three people have very different viewpoints on what such a system would entail…just to recap: Patricia says it is expensive, but comfortable once it is installed, Simon says it costs a lot and he doesn't understand why one would install it and Geoffrey says electricity does not reflect the cost to the environment, so he understands why but he does not believe it is a very comfortable option.

6: I have a solar panel on my house, so I would agree with the first one…

M: So it is a lot to install but it works well?

6: Ja

M: Okay

6: But I also agree with the first part of the last guy, that the electricity that we have available in the grid actually doesn't reflect the cost to the environment. The fact that… well I don't have to wait for the sun to shine a whole day before I can take a hot shower, so I don't agree with that part.

M: Good, when we talk about renewable source of energy, what do you understand under the things that we can use domestically? What technologies are available for home owners?

6: Are you speaking purely domestically?

M: Yes, at the moment.

6: Okay, at the moment it is really only sun, solar power as far as I know. But there is sort of a range available depending on how much effort you want to put into it. For instance I know about this solar stoves, which are those contraptions with the plastic covers that closes that works very very well. It is just not the type of thing that tannies in Lynnwood would normally put out on the stoep to cook their meal in. But I mean there's to my knowledge, and I haven't done work in that field, there is the option of getting the more costly solar panel installed on your roof and the geyser that works from that. Uuhm to these low

cost things, that you put out in the sun.

M: Passive systems.

6: Ja

M: Okay, do you think that it is necessary for people to start looking at alternative methods and start moving towards the…

6: I think it is very necessary, I think that the solution for the bigger problem would probably not come from having the big provider of electricity going the route and using renewable sources of energy. I think it is something that has to happen and that it has a very high potential of happening in small household or within smaller regional areas. I just think there is very little awareness of it. And I also think that whatever is available, Is it available in the mind of people? For instance, I only know about fairly expensive solar systems to be installed. So to my mind that is critically important, that it must be more available and accessible for people to use and you know to take the initiative to say well we save some energy here and we save some energy off the electricity grid there and we use a renewable source.

M: One of the things you mentioned is that people may not be aware of what is out there and what, how it would impact on your life. What other things would stop people from using various types of renewable sources of energy in their homes? The fact that you have gone the mile and installed such a system… What did you need to get over before you installed it in your house?

6: First of all, it was quite a search to find the right product you know it is not like you walk into Builders Warehouse and there it is, So I think that was perhaps one of the first hurdles to take the decision, to put in the effort, to research the idea and to see what is available on the market, to see how does it work, etc.etc. The second thing obviously is cost. And I can't wait for the day that those kinds of solar energy can become much more readily available. And even in

our instance, the cost meant that we could only install up to a certain level. Our entire house can not run on what we have, a very large part of it can, but we couldn't afford to run the entire house on that in terms of energy use from solar. I think that and then largely maybe a mental shift, to understand how easy it actually works once it is 9installed. It is not a lot of effort, it works by it self actually, it is not like you have to switch between energy sources.

M: And you don't need to do a lot of maintenance

6: No, nothing whatsoever

M: When you think about the implications that it would have for your life, many people are under the impression, that once you have such a system you have to have a look at it every three weeks, you have to get somebody to come on see what is going on, and in general you have a psychological uneasiness with that…

6: We put in our system…9 years ago. We haven't gone up to look at it once! It just works. No we haven't had ANY difficulties with it at all. It just works.

M: Wow, so did you initially maybe feel, did you feel…

6: We were fairly sure, the only thing that we weren't sure about was how to get the system to function in such a way that the geyser kicks over on ordinary electricity when there is not enough solar power. One difficulty with solar power of course is, if your geyser heats up during the day and at night time you empty it, there isn't hot water for a warm shower if you need one the next day. So that was the only thing that we needed to sort out, but that was fairly easy to sort out in the end.

M: Okay, so you would feel very comfortable installing such a system in a flat or something that you rent out, that you are responsible for? Obviously if you have such a system in place you could make more money on rent. Would you feel comfortable doing that?

6: Absolutely

M: Would you say that electricity does not reflect the cost to the environment?

6: Yes I believe it doesn't

M: And do you believe that government sponsor, or subsidise electricity to a degree, or not?

6: Ja, but in a variety of senses. I know from experience how difficult it is for renewable energy to get into the grid. Just because of the beaurocracy. They (…) the fact is that the policies aren't in place, the systems aren't in place, that type of thing. I would include that in government

protecting or in a way subsidising the use of electricity. By making it unavailable. The cost to the environment is vast, if you just begin to consider the CO2 emissions from coal fires power stations and the impact that that has in terms of climate change and so forth, it is very hard to quantify exactly what the cost is, it is definitely not the few cents a unit you pay at the end of the day.

M: Do you think that, from where you come from, do you think that through positive policies and legislation and subsidising the use of renewable energy and where they build low cost housing to try and use. Do you think that that will happen through strong policies and are we moving towards that?

6: O yes, well certainly, I mean there must be the political will behind it otherwise it depends largely on private concerns to get it pushed and that is not going to have the massive impact that we would like to see it having. If the political will is there the policies will come into place and that will ensure that is happens much faster and much easier. I mean, I represent a whole lot of communities who live in the Vaal Triangle, there the air pollution problem is obviously not only concerned with the two power stations in the area, but power stations play a very important part where the weather conditions are such that the pollution is sort of dumped right next to the station and not get dispersed because it is quite… And the whole issue of coal fires within the home. There's such a lot of health benefits, if one could use renewable energy sources. And actually incorporate it into the development of low cost housing, that type of thing, but I think cost is a major issue.

M: Do you think it is viable to somehow start doing that, incorporating it into low cost housing?

6: I don't know enough about where the research is, but I do know that quite a bit of research is being done and trying to develop technology that is much cheaper than the technology currently available. And I would say that if that was subsidised that would come to some sort of meaningful conclusion very shortly, and that would be a sensible way of doing it, because

at the moment it is too expensive. You can't do it on low cost housing if this is what it costs.

M: If in some way it could be used in low cost housing, what effect do you think it would have? Do you think that it will also help richer people to start using it because design problems get sorted out etc.

6: O yes, I think so, because in housing that is where you have the economy of scale, because you have such a lot of low cost houses. Ja, if you manage to sort it out there, there is no reason why it wouldn't find it's way up the ranks and into our homes. The other way of course is to get the cost in such a manner that it is not necessarily good for low income houses, but that it could actually work for middle income houses. That would also have a benefit.

M: Do you think that you, if you follow that route, do you think that people would start implementing something that is available to them?

6: Well, it would depend on a lot of things, it would depend on how readily available it is, it would depend on the cost, and it would probably depend on the kind of publicity, broadly speaking, that this is put into promoting it.

M: Media, education…

6: Ja, making it the easy option, ja

M: Okay, we've answered most of the things, and because you already have a system in place we kind of skip the last question. It is very interesting when you interview someone who has experience with it it differs immensely from someone who has not had experience with…

6: Like…

M: One of my respondents said that he is willing to make a small monetary contribution, but not if it just a novelty item. It really explains very nicely what his thoughts are about this.

Transcriptions – Respondent # 7

M: Vertel my wat jy in jou daaglikse lewe doen.

7: Okay, uhm, basies environmental impact assessments. Hoewel my focus is meer op public particiation en social impact assessments. Ek doen algemene project management. Ons focus is meer op waste management, een van ons groot areas, en dan ‘n paar tolpaaie, krag lyne, water pyp lyne en so aan. Dis maar die breë uitlyn van wat ons elke dag doen.

M: Op hoe ‘n gereelde basis kom jy in aanraking met die omgewing en die impakte van ontwikkelings, en so aan?

7: Dit vorm maar eintlik die basis van wat ons elke dag doen, so eintlkik elke dag. Dus so 8 ure ‘n dag.

M: Okay, so jy pas die kriteria. ek gaan in Engels aangaan vir kontinuiteits onthalwe.

7: Okay

M: I am going to read you a scenario and would like you to listen carefully and tell me with which argument you agree most. Three people are standing on a sidewalk looking at their neighbour Greg’s house, that has a new solar panel installed

on the roof. The three discuss the system, but they son realise that they have very different viewpoints on this new development.

Patricia says: I think that must have cost a pretty penny to install, but once it is installed I am sure that Greg can live comfortable. Simon says: Although it makes economic sense in the long run, I don’ t understand why he did that seeing as he has a system that works fine. Geoffrey says: I don’t think that the cost of electricity reflect the cost to the environment, but I don’t want to wait a whole day for the sun to shine before a ca take a hot shower.

Which one do you agree with most?

7: I think probably the first one, it’s initial outlay it quite a bit of capital, but I think from there on, I think the benefits to the environment and the benefits to oneself. Ja, I think…

M: If you talk about renewable energy sources, which are available to be used int eh home?

7: I think mainly solar, I have seen some projects oversees where they don’t only use solar, they use landfill gas. Solar is obviously a big one all

over. A lot of people use cow-dung.

M: Methane?

7: Ja.

M: Of these methods which are usable in South Africa in the home, that you can buy somewhere and use?

7: I think the only one that is available to the general public is solar, there isn't some else that is available to use, like gas or wind.

M: (…)

7: I definitely think so. if you take into consideration that ½ of South Africa has access to electricity and running water and we mainly rely on coal resources for generation, which is not sustainable to keep on producing electricity…

M: so you …

7: Well unfortunately coal is still the cheapest form of energy

M: it is available

7: It is available. I know there are a number of initiative to look at other resources, like the wind farm in Cape town and Durban is looking at landfill sites…If you do not get out side funding like USAID

or the World Bank and get funding structures in place. Those sort of renewable energy resources are just not financially viable. I don't think it is not fin viable as resource per se, I think it I not viable for a third world county like SA.

M: Do you think it is financially viable for people who live in SA, to start making a difference. What prevents them from starting to implement it?

7: I think the perception is there that it remains expensive, and I think a lot has got to do with people's attitudes towards money and the resources available to them, I think a lot of people often think why should I, even though it would be good for the environment, People think why should I pay more for electricity of a cheaper option is available to me. Unless people are forced to make use of renewable energy through legislation their attitudes is not going to change.

M: Do you think that the availability of the renewable technology and the availability of it. It is not like you walk into a Dions and buy a solar panel.

7: I think it is also about education. there isn't

yet a widespread campaign out there trying to educate the people about the advantages of renewable enenergy that tell them where to find it, how much it costs, and what the benefits to them would be.

M: Do you think that a pay plan would help…

7: I think it would go a long for people to start using it, if they know that they have some contribution from government towards renewable energy and sustainable development.

M: One of the respondents in my interviews, said that the use of renewable energy is not supported by government, and because government is not subsidising this they are in fact supporting Eskom. Do you agree whit that statement?

7: I don't think they are subsiding electricity there are a number of initiatives from DEAT to go toward renewable energy, I think what lacks is the legislation to support it. There is not legislation to force people to use renewable energy in the first instance, And people are less likely to implement change if they don't see the direct benefits to

them. I think government will go a long why by providing rebates on their renewable energy.

M: Incentives…

7: Whether it be paying less property tax, or cheaper water, but I think until people see that it is beneficial to me and my pocket, you are not going to change their attitude to the environment because it is good. People are just not like that.

M: you wouldn't say that the price of electricity reflect the cost to the environment and the cost of generation

7: Well I think the price still reflects that it is the cheapest available energy and people are prepared to pay that. For the luxury of having electricity, But hey are not given a choice of the electricity and at the rate they currently pay, or electricity by another source, by another rate. There is just no variable in the system where they can make a choice. There may be some people who are willing to pay for electricity from coal generated by Eskom or some other source. They may be willing to pay that premium

M: the option is not available

7: No it is not, and obviously it has huge implications for the electricity grid. If you had to now go and put up a separate network, obviously that would have it's own cost implications for who ever it generating the electricity. And it would also have further environmental impact

in terms of generators, distribution lines and transmission lines. But there is a balance that needs to be struck. I think unfortunately there will have to be a big push from government's side, to make that push, to make (…)

M: Do you think if we start using solar in our house, what effect would that have

7: The solar systems I have seen, in Morocco, they use solar panels in some of the villages, only solar panels. The problem they experience is that you can not run you entire house on solar energy alone, with the modern equipment we have. I think a lot of SA only use their solar panels to heat their geyser, which is fine because the geyser only use the most of the electricity on the house…. But for example, in Morocco although the solar panels are smaller there, you can not run a colour TV, you can

only run a small black and white TV on that, You can not power a fridge or a freezer.

M: It needs to be in support of another system

7: Either that or, the panels have to be big enough but at this stage just don't think it I possible to have a panel that it big enough.

M: or you need to use gas and other sources in conjunction with that.

7: Ja…ek dink dit sal 'n kombinasie van verskillende bronne van elekrtisitiet as dit vir huise is. Ek dink die enigste ander opsie is om byvoorbeeld 'n groot windfarm op te sit en op een punt elektrisiteit te genereer en dit dan deur die bestaande grid te sit. maar dan moet daar insette wees van jou nasionale owerheid wees wat wetgewing instel wat dit enable. Jou plaaslike munisipaliteit want hulle koop elektrisiteit by Eskom en versprei dit dan verder. Hulle sal ook dit besluit moet maak dat hulle nie meer eleks\trisiteir by Eskom koop nie, maar by watter ander entiteit ook dan. En ja dit los Eskom ook weer dan soort van uit die prentjie uit.

M: Eskom het darem ook 'm funksie, wat hulle

vervul en as hulle identifiseer, dso dit gaan nie daaroor om Eskom toe te maak nie

7: om hulle toe te maak nie. Ja kyk, Eskom het baie programme waarna hulle self kyk, ne ren en en en effi. Soos die windfarm in die Kaap is een van hulle initatiewe.

M: So hulle is self besig om werk te maak daarvan

7: Ja dit gebeur nie in isolasie nie, ek dink n die industrie en op owerheids vlak is daar commitement om te verander, maar ek dink daar is nog 'n langpad wat gestap moet word om

daardie besluit te maak, jy kan nie net een entiteit se commitment nodig om die verandering te maak en ‘n totale ommekeer te maak.

M: En jy kan nie policies in plek sit as dit nie die bestaande situasie in ag neem nie,

7: Nee jy kan nie net ;n policy in plek sit en Eskom besluit hulle stel net nie belang nie.

M: Dink jy as jy so ‘n sisteem in plek sit in jou huis, dat dit jou lewe gaan verander?

7: Weet jy ek glo nie dit sal nie, ek dink die enigste manier wat dit regtig sal verander as jy ‘n

reder\llike klein sisteem in plek het, en nie teogang het tot enige ander bron van elektrisitet\ het nie, as jy nie ‘n kombinasie van energie bronne het nie, dink ek nie dit sal enige ander effekte he nie.

M: So jy hoef nie op ‘n ander tyd te stort en..

7: Nee, want kyk, so ver ek weet, en ek is nie ‘n ekspert nie, sover ek weet, alhoewel solar panels uit die aard van die saak net energie kry van die son, het hy ‘n reserve wat hy behou, behoort jy nie die volgende oggend koud te stort nie, a.g.v. die reserve. En ek dink ons is gelukkig in die sin dat ons hoë sonenergie vlakke het in SA, nie soos ander lande wat amper nooit die son sien nie.

M: In SA het ons die hoogste vlakke van son energie

7: Ja, soos Engeland waar hulle nooit die son sien nie. En ek dink dit tel in ons voordeel./ Ander lande het weer baie wind. Ons het nie regtig genoeg wind om regdeur die jaar genoegsame energie te verskaf nie.

M: Behalwe miskien in PE

7: Ja. Maar net in die somer hoor. Ja ek dink wanneer mens kyk na alternatiewe bronne van

energie nie, kan ‘n mens nie net fokus op een bron van energie nie. As jy kyk na Pelindaba, kerkrag energie, wat nie herwinbare energie is nie is sy leeftyd net soveel meer as steenkool, gegenereerde elektrisiteit. daar het jy nou weer die persepsie van veiligheid, En die meeste mense wat ek ken wat in die environmental veld werk sê dat hulle nie naby dit sal kom nie, so …’n fyn balans.

M: Ja, ‘n fyn balans. Kom ons doen gou die laaste paar vrae, dan is ons klaar. As jy ‘n plek het wat jy kan uithuur vir mense, sal jy so ‘n sisteem insit of dink jy nie regtig dat dit betroubaar is of nie.

7: Weet jy dit is nie die betroubaarheid daarvan wat my regtig bekommer nie, ek dink dit is meer die onderhoud daarvan. Ek dink nie daar sal ‘n probleem wees met konstante energie ewat verskaf word nie. Omdat jy nie elke dag daar is nie, het jy nie daardie konstante teosig daaroor om seker te maak dat dit instand gehou word nie.

M: Watse tipe onderhoud sal nodig wees.

7: Uhm, wel ek neem aan jy weet as iets gebeur en dit breek kom jy dit nie dalk dadelik agter nie,

want dit heelwaarskynlik nie [n sisteem waarmee jy vertroud is nie.

M: Of jou huurders verloor

7: ja, as hulle nou wakker word en hullehet nie mer warm water nie…

M: Anders om, sal jy ‘n plek by iemend huur wat so ‘n sisteem in plek het

7: Ja ek dink ek sal, ek dink die incentive vir my sal wees dat ek nie nog die elektrisiteits rekening om te betaal nie. Waaroor jy og ook moet worry nie.

M: En as die verantwoordelik by jou lê om dit te onderhou?

7: Dit is nie ‘n probleem nie…

M: En as jy so ‘n so ‘n siteem in jou huis het, sal jy ongemaklik voel..

7: Nee ek glo nie ek sal nie, ek sal net vooraf oortuig moet word dat ek nie nodig het om ander bron van elektisiteit ook hoef te hê nie, voor ek daai besluit maak. Ek geen ie regtig om waar my elektrisiteit vandaan kom nie, solank dit ‘n veilige bron van elektrisiteit is.

M: Die laaste vraag is, dink jy dat so ‘n sisteem

jou daaglikse roetiene sal verander.

7: Nee aag ek glo nie regtig nie, ek kan nie sien dat dit behoort nie.

Transcriptions – Respondent # 8

M: Hier is 'n paar vorms wat jy moet invul… Ek sal sommer begin soos wat jy skryf. Ek doen my M in navorsingsielkunde, en ek doen navorsing oor renewable sources of energy. Eintlik maar oor environmental concern and the preconceptions, misconception en so aan wat mense het. Ek fokus op renewable energy sources… Wat ek graag by jou wil hoor, is wat doen jy elke dag, watse werk doen jy, watse roetiene volg jy elke dag.

8: Spesifiek professionele lewe, of…

M: Ja,

8: Chronologies, of… Okay ons werk van 8 tot 5. So ek kom in die oggend in 8 uur. Dikwels het ons koordinering vergaderings, wel ek is 'n eenheid bestuurder vir EIA unit, wel ons is nie baie personeel nie, gewwonlik het ons koordinerings vergaderings sodat ons kan kyk na wat met die projekte moet gebeur. ek het een PM en een Env. assistant. Die E Assistant doen meer van die "legwork" en die PM doen meer van die koordineeringswerk. So ek dink 50% van my werk is projek tyd…

M: Watse tipe projekte?

8: Dit is in my eenheid meer die groot EIAs, bv. 'n 140km pyplyn of 'n 400 km kraglyn.

M: Okay, wel jy weet nou wat ek doen, ek gaan aangaan in Engels. I am going to read you a scenario and would like you to listen carefully and tell me with which argument you agree most. Three people are standing on a sidewalk looking at their neighbour Greg's house, that has a new solar panel installed on the roof. The three discuss the system, but they son realise that they have very different viewpoints on this new development.

Patricia says: I think that must have cost a pretty penny to install, but once it is installed I am sure that Greg can live comfortable. Simon says: Although it makes economic sense in the long run, I don't understand why he did that seeing as he has a system that works fine. Geoffrey says: I don't think that the cost of electricity reflects the cost to the environment, but I don't want to wait a whole day for the sun to shine before I can take a hot shower.

Which one do you agree with most? Do you want me to recap?

8: I can tell you that I have a solar system myself. And it makes economic sense and it makes environmental sense. It doesn't necessarily work as efficiently during winter, but during summer we use it all the time, and it is quite sufficient, unless it is a cloudy day, but then we

have dual system. So I don't buy the argument that… if you already have an existing system, it still makes sense to supplement it with electricity. The solar system can work and you can switch on the electricity when it doesn't work, which is not that frequent. But I agree with the fact that electricity does not reflect the cost to the environment. Those are things that are not included in the price, but we pay for that in other ways; acid rain, global warming.

M: Asthma Problems…What type of system do you have… is it in your house?

8: ja

M: Is it a hot water system, is it passive, or does it generate electricity? It is actually nice to speak to you because there are very people who have started doing it. Do you think it is necessary for people to start using it, to start getting used to it, to start educating themselves about it, and why?

8: I think if you look at what is happening world wide, there is a big move for energy efficiency and against global warming. And if you take South Africa, although it is a developing country, can't just shake that responsibility, because we have he lowest energy price on earth. And that makes us very energy inefficient. So I think we are much too much energy.

M: And we have the solar potential…

8: We have the solar potential, and we could look much more at wind energy as well. The other possibilities in terms of energy generation could be explored as well

M: because of the fact that there is enough cheap electricity in the country…How long have you had that system?

8: Since it was built in 1977

M: Did it come with the

8: It was one of the first solar systems installed in Pretoria

M: Wow, cool, do you have to do a lot of maintenance?

8: No, there's very little maintenance

M: How regularly do you think you do maintenance, once a year, once in five years

8: Once in five years, there's not much maintenance to do.

M: Okay, you will be surprised at what people think, Okay so before you moved to this house then, what thoughts did you have about how your new house would influence our

lifestyle, your daily routine, did you have ideas about how it will influence your life the new house. How long have you been living there…?

8: Since I was six years old.

M: Goodness, okay, let's skip that question. Okay do you ever feel limited in your daily routine by that?

8: No, just, if you forget to switch on the electricity when it is cloudy there is obviously not going to be hot water in the morning when you want to shower, but if you switch it on there's usually warm water within half an hour. So it is not really a constraint.

M: And can obviously also do something that would make that automatic

8: Ja, you can install a switch if you really want to, ja

M: You said that the cost of electricity does not reflect the cost to the environment. Do you think that the government at present sponsor and subsidise electricity in some way?

8: I don't know, I have never thought weather the government subsidise it…

INTERRUPTION

M: Okay, waar was ons…Let's get back to where we were. Okay we talked about the price of electricity being reflected in the environment. If we talk about what is not reflected in the electricity cost

8: Global warming, acid rain, and health effects, the coal comes from somewhere obviously so mines , the people who live and work close to the mines, those are the important ones.

M: If you had to guess how much a solar system costs. Maybe you wouldn't have such a good idea even though you do have a system

8: no I don't

M: Just take a wild guess, a passive system on the one hand and then an active voltaic electricity generating system on the other hand.

8: I guess a passive system would cost around R 3 000, and a photo voltaic system…

M: wild guess

8: (…)

M: And do you think it makes economic sense in the end of the day. Do you think the initial investment justifies what you get back, from your experience?

8: Ja, absolutely

M: The implications for quality of life are something that is very interesting because some people have very strange ideas about what a solar system is. It is very ugly; it stands very high on my roof, and… Do you have any of those preconceptions; even now after you have started to make use of … Do you think it is ugly?

8: Well, I suppose it can be regarded as ugly if you have a certain architectural design and it does not compliment the design

M: if it is retro fitted

8: ja, if it is not considered right from the start. But I think Architects also have the responsibility to be more proactive and provide these systems from the start.

M: Okay what do you think architects should look at when they design houses these days?

8: Obviously the most important thing is the slope of the roof and in which direction it faces. You can't have a solar system working on a roof where most of the roof slopes to the south. It has to be towards the north, the actual angle of the roof, like solar radiation is …

M: So it is actually part of the roof, you can't remove the roof, but it is integrated…

8: Ja

M: Do you think people are more aware, and more environmentally responsible than ten years back

8: Ja, I think there is a much greater awareness. It is become part of the mainstream press, if you read it, you can't miss it. Maybe the man in the street, or the person in the street is maybe not quite yet aware of the affect it may have on them, but I definitely think that there is a higher awareness than ten years ago, especially since the Kyoto protocol has come into play.

M: What do you think is standing in the way of people starting to implement various forms of environmentally responsible behaviour… like using grey water for irrigation, or whatever, whatever it may be, what is standing in the way of people to do that, because they don't do that, I mean, all the technology is there, it is possible to do it, why isn't it happening.

8: I think generally there's a perception amongst people that it is more expensive, even though they may not know how much more expensive it is, as you said there's a perception that it may require higher maintenance, that it may lead to a less comfortable lifestyle, I think people, it is just an inertia, they are used to what they have and they are not.. it is within their comfort zone and they are not prepared to look outside that comfort zone, I think also the government can play a greater role in facilitating the use of more environmentally friendly technologies, especially in large scale housing developments, through, very simple design changes, that don't necessarily cost much more, that at least will result in energy saving. I think also the parastatals like Eskom. They know they have coal reserves for the next 20 or 30 years, so they are not going to look at alternatives, and change that, to something that is maybe slightly more expensive. They are also in some kind of comfort zone., The Engineers are obviously the kind of people that kind of drive that thinking. Maybe there's also this fear in them that alternatives means competition for them.

M: They are doing.. something here and there looking at wind farms and stuff… it is either a module or a test plant or…

8: They aren't serious about it, they sort of do it to appease the greenies to prove that they are doing something about it. So they are looking in that direction, but they are not putting nearly enough effort into it.

M: The last couple of questions. If you were to let a house to somebody, would you fit your garden flat of what ever with such a system, because it will minimise your costs and it will minimise the problems that you will incur in future?

8: yes

M: Then inversely, you'd also rent a house fitted with such a system without feeling the need to have the landlords number on speed dial.

8: I have experience very few problems with it, so I don't expect..

M: If you experience a problem, is it a large scale problem or is it not too much…

8: No it isn't a large scale problem, if you take a geyser system it has more risks than a passive solar system, a geyser can explode, but what can a solar system…?

M: One of the respondents I spoke to said that the neighbours threw a cricket ball onto the glass sheet that covers the panel, and that the maintenance of that is very expensive. But

she eventually said that in comparison to how long she didn't have to do any maintenance, okay the whole system has to stop because of that. Nobody that I have spoken to use solar panels exclusively, they use it in conjunction with conventional energy. Do you think that it would make a difference if people in suburban areas, a geyser takes up 60% of the household electricity use, do you think it would make a difference, especially in winter with the grid overload we have and the more frequent power failures, because of maintenance of grid overload. Do you think that instigating it in suburban areas, on a small case, where people use their own money, do you think that that would make a significant difference?

8: Ja, it may not have a huge impact because a lot of electricity demand is created by industrial users, but cumulatively, if it makes a bit of a difference, it could either delay the need to built new power stations, or obviate that need completely.

M: And in the process sort out the technological problems..