

## CHAPTER THREE

### DATA COLLECTION AND INSTRUMENTS

#### **3.1 Introduction**

This chapter focuses on the research design and methodology procedures used in this study. The chapter begins with a discussion of the qualitative and quantitative research design and methodology. This section is followed by a full description of the mixed methodologies (triangulation) approach used in this study. Included also are details of the population selected for the study, a description of respondents, sampling procedures, qualitative and quantitative instrumentation used, data collection methods and the treatment and analysis of data.

#### **3.2 Overview of research methodologies in the social sciences**

To satisfy the information needs of this study, an appropriate methodology has to be selected and suitable tools for data collection (and analysis) have to be chosen. There are two distinct approaches that inform the gathering of data in this research project, namely the qualitative approach and the quantitative approach to answer the research question. Both qualitative and quantitative methodologies are governed by specific paradigms.

##### ***3.2.1 Quantitative research approach***

A quantitative research approach is grounded in the positivist social science paradigm, which primarily reflects the scientific method of the natural sciences (Kitchen and Tate, 2000). This paradigm adopts a deductive approach to the research process. In social science it thus commences with theories, hypothesis or research questions about a particular phenomenon, gathers data from the real-world setting and then analyses the statistics to support or reject the hypothesis (Veal, 1997).

This research adopted a more deductive approach which used theory to guide the design of the study and the interpretation of the results. The overall objective for using this

method was to answer the research question. In essence, the research method determined the household energy consumption pattern in Diepkloof using statistical method. The theory on household energy consumption pattern offered a conceptual framework for the entire study, serving also as an organising model for the research questions or hypotheses and for the entire data collection procedure.

A quantitative methodology abstracted data from the participants using a survey into statistical representations. The entire research was objectively constructed and the findings were representative of the population of Diepkloof. The main strengths of the quantitative approach lie in precision and control. Control was achieved through the sampling and design, and precise and reliable quantitative measurement. Furthermore, hypotheses are tested through a deductive approach, and the use of quantitative data permits statistical analysis (Welman and Kruger, 2001). The method thus provides answers, which have a much firmer basis than a lay person's common sense, intuition or opinion.

One of the limitations of quantitative research reported by critics is that many researchers are concerned that the scientific quantitative approach denigrates human individuality and ability to think (Walle, 1996; Massey, 2003). Gilbert (1993) argues that its mechanistic ethos tend to exclude notions of freedom, choice and moral responsibility. Quantification can become an end in itself rather than a human endeavour seeking to explore the human condition. It fails to take account of people's unique ability to interpret their experiences, construct their own meanings and act on these (Gilbert, 1993; Massey, 2003). This limitation will be addressed by incorporating a qualitative approach to the research process to explore attitudes of people towards alternative energy sources and policy analysis. It is worth noting, however, that quantitative approach cannot in fact be totally objective, since subjectivity was involved in the very choice of a problem as worthy of investigation and the interpretation of the results.

A quantitative research method was considered suitable in answering some of the research questions. This research method facilitated in the gathering of household energy data. This data was, therefore, manipulated using statistical techniques to answer the following research questions: the range of energy sources used in Diepkloof, factors affecting fuel choice and the attitude of people towards alternative energy sources. This method facilitated conclusions regarding the assumption that poor people switch to electricity if it is available. Since it was difficult to explore some of the experiences of the community using quantitative methods alone, qualitative method was employed. A qualitative research method collected data from the community and key stakeholders through in-depth interviews and was integrated to conceptualise the interpretation of statistical data.

### ***3.2.2 Qualitative research approach***

The qualitative research approach is grounded in the interpretative social sciences paradigm. Qualitative forms of investigation tend to be based on the recognition of the importance of the subjective, experiential 'lifeworld' of people. Such reflection is the province of phenomenology reports (Babbie and Mouton, 1995). Again, qualitative or inductive research commences in real world settings, that is, in the empirical social world, where data about real phenomenon are gathered, then analysed, and theoretical constructs are either generated or modified. Research that utilises a qualitative methodology will draw on data collection methods such as participant observation, in-depth interviews and/or focus groups (Jennings, 2001). As a consequence of its underlying paradigm, qualitative research is subjective, since it relies on the texts and discourses of participants and involves small numbers of participants in the research process as a result of the process of gathering in-depth information (Gilbert, 1993; Walle, 1993). Moreover, qualitative research, because of the small numbers of participants, does not presume to represent the wider population. Qualitative research enables researchers to represent detailed snapshots, as it were, of the participants under study (Blanche and Durrheim, 1999).

Inherent in the elaborative discussion above are the advantages and disadvantages of using qualitative methods in research. In essence, the selection of a qualitative methodology provided an avenue that led to the discovery of the deeper levels of meaning from people's experiences and expert's knowledge on energy issues in Diepkloof. A qualitative methodology was used to capture complex energy data from the people in Diepkloof, SECC and Eskom, and allowed an understanding of the current energy crisis from multiple viewpoints. Within the same domain, qualitative methodology was able to gather information from energy policy documents as text based data, which represented the policy perspective in South Africa. The policy data was then integrated with data gathered from interviews to answer research question on the effectiveness of policies supporting the supply of electricity in Diepkloof.

### **3.3 Towards triangulation as an approach**

In practice, both qualitative and quantitative approaches are frequently appropriate within a single investigation (Easterby-Smith *et al.*, 2001). It is up to the researcher to choose specific methodologies that will permit a clear understanding of the topic to emerge. Within academia, it has been common practice to associate particular epistemologies with distinctive methodologies (Neuman, 1994). For example, in the discipline of geography, positivism has traditionally been linked with quantitative methods, whilst more recent epistemological perspectives such as humanism and postmodernism have qualitative dichotomy. Researchers have often been forced to choose one paradigm over the other, and, as a result, there are few accounts of integrating quantitative and qualitative approaches in the social science methods literature (Neuman, 1994).

However, more recently, social science researchers have exhibited a growing recognition of the benefits of a multiple methods approach, especially as positivism has been discredited and new approaches such as postmodernism have emerged (Blaikie, 1991). Also, while in the past policy makers have tended to display a preference for quantitative research, they have gradually begun to demonstrate a heightened awareness of the role of qualitative research in informing policy formulation (Massey, 1999).

Bowen (2003) contend that a combination of quantitative and qualitative approaches should be viewed as an acceptable methodological approach for research occupying a variety of epistemological positions and concerning a wide range of substantive research areas like this one. In this research report the multiple methods approach represents a poly-vocal approach, where employing a range of methodological strategies means that the researcher does not necessarily privilege one particular view of social world over other. In recognition of these and other such arguments, many social science researchers are increasingly rejecting the automatic association of particular methodologies with particular epistemologies (Bowen, 2003; Massey, 2003). Instead, they are exhibiting flexibility in selecting the method or methods most appropriate to a particular research project.

When these two methods were combined, the advantages of each methodology complemented that of the other, making a stronger research argument which yielded to valid and reliable findings. The inadequacies of individual methods were minimised, and more threats to internal validity were recognised and addressed. In selecting an approach for the study, the benefits and shortcomings of various methodologies were considered, and an integrated approach combining elements of both qualitative as well as quantitative data was decided upon, thus making triangulation possible. Both qualitative and quantitative methods made it possible to gather the most needed data to address the research question and ensures that the objectives of the study were successfully met.

### **3.4 Method of data collection used in the study**

#### ***3.4.1 Primary research methods for data collection***

##### ***3.4.1.1 Household energy survey***

The household energy survey was carried out in Diepkloof on 300 households from the 1<sup>st</sup> of October 2005 to the 30<sup>th</sup> of November 2005 to generate data regarding household energy consumption patterns in Diepkloof. After piloting the questionnaire, it was extensively changed to make it more flexible and reflexive (Appendix A). Basic household data regarding household socio-economic status, energy sources, fuel

switching and multiple fuel use was collected through structured questionnaire while information regarding affordability, cost recovery and free basic services was also collected through detailed questionnaire survey. This improved method worked much better, allowing the interviewers to combine qualitative and quantitative data methods of data collection at the same time.

Loosely structured interviews provided an opportunity to explore some issues of significance on the energy policy in greater depth (Appendix B). These interviews were used in generating greater details on issues of affordability, free basic electricity policy and its challenges, cut-off, illegal reconnection and attitude towards alternative energy sources in Diepkloof.

#### ***3.4.1.2 Semi-structured personal interviews with key informants***

A limited number of open-ended interviews, were conducted with specific actors in this field (Appendix C-SECC; and Appendix D-Eskom). Amongst these were the key members of the Soweto Electricity Crisis Committee (SECC) and Eskom. These members included the SECC Chairperson, SECC Secretary and SECC senior member as well as Eskom senior customer service officer and a customer manager at Eskom. These two key informant groups were selected to capture the diversity of information with regard to their understanding of the effectiveness of energy policy reforms in terms of its implementation. The following information regarding policy was generated: challenges facing free basic electricity policy (FBE), perception of the current electricity prices, problems caused by affordability and energy saving options.

#### ***3.4.2 Secondary research methods for data collection***

Secondary research is research based on secondary resources that already exist (Veal, 1997; Jennings, 2001). Secondary research methods in the current study included articles in academic journals on household energy, published books, the 1998 Energy White Paper, SECC and Eskom research reports, newsletters, newspapers, unpublished reports and internet sources. Other documents include, the Eskom document dealing with average tariff increase since 1989 to 2005, brochure on free basic electricity policy,

customer satisfaction report were all collected from the Eskom offices in Johannesburg Branch. In addition, the documents containing population data and the GDP of the three zones were collected from Statistics South Africa in order to analyse the socio-economic status of the people. The 1998 Energy White Paper was accessed from the internet.

### ***3.4.3 Ethical considerations***

The study followed the generally established principles as laid out by the Ethics Committee of the University of Witwatersrand. Informed written consent was obtained from the respondents after the study aims and objectives, risk and benefits of the participants were explained. Respondents were given the option to refuse to answer any question that they did not feel comfortable with or to decline to be interviewed at any time during the interviewing process. Furthermore, during data collection process confidentiality of participants was also maintained. That is, respondents were assured that their names would not be disclosed in the research report. Alternatively, during the analysis, respondents were identified by their positions held or name of the location in the case of residents i.e., using position held or zone instead of names, e.g., SECC Chairperson or respondent in Zone Two.

### ***3.5 Sampling design and sampling methods used in the study***

The main purpose of sampling is to achieve representativity; the sample should be assembled in such a way as to be representative of the population from which it is taken (Gilbert, 1993; Jennings, 2001). To achieve this, the sampling units are randomly selected. This is the commonest approach to sampling, but it is by no means the only one, nor is representativity in a numerical sense the only aim of the sampling procedures.

#### ***3.5.1 Population and sampling frame***

Jennings (2001: 136) defines population as “all the study subjects (family, friends, employees and managers) or the study units (housing structure and appliances in the case of this research) that are the focus of the research project”. In this study, the target population consists of Diepkloof residents living around the Zone Two, Three and Five. The assumption made was that the income variation within each zone in the same income

category is less than the variations across residential areas in different income categories. The first step in the sampling process was therefore to classify residential areas according to income categories. Data on income levels by residential area was not readily available. Neither was it possible to determine income levels accurately from the households themselves.

### ***3.5.2 Sample size***

A sample of 300 households living around the three zones of Diepkloof was selected for the quantitative part of the study. A combination of systematic and stratified random sampling approaches was used for sample selection.

### ***3.5.3 Sampling techniques followed for quantitative research design***

The population of Soweto is estimated at 1 million and 1.3 million people (Stats South Africa, 2003). There is no official figure available for the number of households living in Diepkloof. A study sample of 300 households was therefore drawn from the resident household population in Zone Two, Three and Five. The first step involved stratified random sampling; accordingly sampling the population of Diepkloof was first subdivided into subgroups (i.e. zones). Each zone was divided into blocks, these blocks were numbered and were randomly selected. In each block, a route or street to be followed by the enumerator was selected. Systematic sampling was then applied through the selection of every 5<sup>th</sup> household unit along each street that would be surveyed until the enumerator's allocation was finished. Interviews would start at the first house of the selected street and continue along the street until either the enumeration was exhausted or until the street came to an end, in which case the enumerator would go to the next street in the next block. In all, 100 units in each zone were selected, making a total of 300 household units that were sampled. In essence, the sampling of households in this fashion represented all the households in the township.

## **3.6 Data analysis of household energy survey**

The Statistical Package for Social Sciences (SPSS) was used to analyse the household data. The quantitative data collected was categorised and coded. The responses to open-



ended questions were not included. In this process, the raw data was firstly transformed into numerals to facilitate counting and tabulation of data. Secondly, the organised data was entered into a computer and simple frequencies and percentages were calculated to make sure that all answers to each question fell within the coding limit. Thirdly, simple tables and cross tabulations were constructed so as to examine the relationships between variables. According to Jennings (2001), the SPSS software package enables researchers to:

- enter and store data
- utilise retrieval strategies
- engage in statistical analysis
- generate tables and graphs.

Most of the household data collected (e.g., household economics and energy sources and types) facilitated the understanding of the socio-economic characteristics and the range of energy sources people use in Diepkloof. Socio-economic data generated information on educational levels, employment characteristics, household size and fuel use culture of the households. The range of energy sources covered the following themes: variety of energy sources (energy for cooking, lighting, heating and appliances); factors affecting fuel choices (i.e., multiple fuel use, fuel switching); and attitude towards alternative energy sources.

### ***3.6 Description of qualitative methodology followed***

#### ***3.5.1 Semi-structured personal interviews***

The personal interviews were semi-structured in nature and were conducted on an individual basis. The interviews made it possible to explore other themes for further enriching the data. In cases where the respondents consented, tape recordings were made, which enabled the interviewer to pay close attention to discussions; transcriptions of recordings were made later. In many instances, however, the researcher found the respondents reluctant to allow the use of a tape-recorder, and in those instances the researcher resorted to note taking. Each unstructured interview lasted approximately 30 minutes. The researcher explained the purpose of recording the discussion to the

respondents in detail. The respondents were assured that the information recorded would be used only for the purpose of the study.

Semi-structure interviewing is based on the use of an interview guide (Veal, 1997; Jennings, 2001), which is a written list of questions and topics that need to be covered in a particular order. The interviews were broadly guided by the series of questions (appendix, B, C, D). The respondents were free to expand on the topic as they saw fit, and to relate their own experiences. The interviewer intervened only for clarification or further explanation (Veal, 1997). The interviewer used probing questions for clarification of concepts and ideas. Blanche and Durrheim (1997) and Veal (1997) conclude that the benefits of a semi-structured interview include the opportunity it affords the interviewer to interact with respondents in a conversational setting so as to reach the heart of the subject under investigation. Semi-structured interviews are generally the most useful, in that they allow full exploration of the topic and yet retain a degree of structure, which ensures that most of the information obtained is relevant and manageable (Veal, 1997).

### ***3.6.2 Qualitative sampling***

Easterby-Smith *et al.* (1991) and Neuman (1994) describe four commonly used qualitative research data collection methods, namely the case study, ethnographic, phenomenological and grounded theory methods. Since the researcher was interested in understanding individual respondent perceptions of the effectiveness of energy policy in Diepkloof, the phenomenological method was deemed the most suitable for qualitative data collection. The phenomenological method suggests that respondents from organisation are chosen specifically because of their knowledge of the topic under investigation (Easterby-Smith, *et al.*, 1991; Neuman, 1994; Veal, 1997). In keeping with this method, representatives from two organisations were selected for interviews. SECC is an activist group formed to fight for affordable electricity in Soweto and Eskom is a service provider.

Purposive sampling, which is a type of non-probability sampling, was applied when conducting in-depth personal interviews (Veal, 1997; Jennings, 2001). It involves a researcher making a decision about who or what study units will be involved in the study.

### ***3.6.3 Sample size-qualitative study***

In using purposive sampling, the researcher decides when enough participants or units have been sampled. This occurs when there is redundancy with regard to data. In this study, this was achieved after conducting 20 personal interviews. The cut-off is not predetermined, but emerges from the research process and concurrent data analysis (Babbie, 1995).

## ***3.7 Data analysis***

### ***3.7.1 Qualitative study***

According to Blanche and Durrheim (1999), qualitative data analysis tends to be primarily an inductive process of organising data into categories and identifying patterns. For this study a content analysis was followed to understand the procedures and importance of qualitative data analysis (Gunn, 1994). Babbie (1995) states that the most general guide to analysing qualitative data involves looking for similarities and dissimilarities. The focus must be on those patterns of interactions and events that are generally common to what the researcher is studying (Babbie, 1995). This type of analysis formed the core of analysing the qualitative data collected during this study. Themes were identified, and the data was then classified into categories and themes. In-depth interviews were analysed in themes to assess the attitude of people towards alternative sources, factors affecting fuel choices or switching, fuel use culture, range of energy sources, free basic service policy, electricity prices in Diepkloof, arrears and cut-offs. This helped to understand the position of both the SECC and Eskom on the current energy policy and service delivery.

### ***3.7.2 Policy analysis***

Analysing the energy policy contexts of South Africa forms an important part of the research methodology. Energy policy and the role it plays in development has come

under considerable recent criticism (Watts, 1983). Much of the energy policy reforms are shown to revolve around simplistic grand narratives of how to address the question of connectivity and affordability (Williams, 1996). In essence, these narratives do not consider factors that affect fuel choices such as cultural beliefs, poor service delivery, electricity cut-offs and arrears. Consequently, textual analysis was used to critique the policy documents, such as the 1998 Energy White Paper at a theoretical level, whilst at a practical level, South African policy was assessed in terms of concrete impacts, for example on urban communities in Diepkloof. Policy that explicitly affects poor urban households has been focused upon. Eskom, policy dealing with free basic electricity (FBE), electricity prices, billing procedures and energy saving has been analysed

### **3.8 Accessing the population**

Gaining access to respondents or the population of a study area can in many cases be a major challenge, and the study area was no exception for a number of reasons. The first difficulty identified was that, potential respondents routinely resisted outsiders who were investigating their lives, especially the idea of outsiders knowing how issues relating to energy consumption cut-offs, illegal reconnection, arrears, their livelihood and their attitude towards alternative energy sources. This is understandable given that Diepkloof residents are only now emerging from a bitter period of electricity cut-offs, with political and emotional overtones. A second difficulty faced in accessing the respondents related to the fact that the potential respondents sought to make economic gains as a precondition for cooperating with the researcher in these regard. Some of the respondents asked for financial compensation in exchange for information, a demand resisted by the researcher.

However, with time, the interviews were completed and confidence was built, thanks to some people who developed trust in what the researcher was doing. They were interested in knowing how they are going to benefit after this study is completed. Often the respondents who were available at home during the interviews were woman. They were more interested in issues relating to household energy patterns than males. What is evident from this research, is that woman are more directly affected than males by the challenges facing energy consumption.

The fact that most of the respondents understood English and Zulu facilitated the research. The researcher is fluent in both Zulu and English and there was no need for a translator. Also the fact that the researcher assured them that he was a student (by showing his student card and the letter from the school asking for the interview) seemed to help cultivate a trusting relationship between the researcher and respondents, making them fairly comfortable in the presence of the researcher. This helped to erase suspicions, which had resulted in their reluctance to be part of the study in the first instance.

### **3.9 Summary**

Chapter three furnished a discussion of the choice of methodology used to conduct the research. The range of methods and approaches that were applied fall within the paradigms of both quantitative and qualitative research. This study supports the choice of approach with a detailed description of the methods used and shows ways in which these methods were customised to suit the requirements of the study. The method of sampling, data analysis (frequencies, tables and charts) and the choice of statistics and data analysis used were described in detail. The following chapter focuses on the findings of the surveyed results including discussion on the socio-economic characteristics of people in the Diepkloof study area.