



**An Investigation of Sustainability Awareness and Residential
Energy Consumption in Qatar**

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**A thesis submitted in partial fulfilment of the requirements of Nottingham Trent
University for the degree of Doctor of Philosophy**

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Declaration

This thesis is submitted to Nottingham Trent University (NTU) for the degree of Doctor of Philosophy. I declare that the work has been carried out by the author alone. Neither the whole nor any part of the work has been submitted before in order to qualify for any other academic degree. I further declare that the work in this thesis was carried out in accordance with the regulations of NTU, and it is original, except where shown by specific reference in text. The content of the thesis is the result of work that has been carried out since the date of approval of the research programme. All ethics procedures and guidelines have been followed properly while preparing thesis. Any views expressed in the thesis are those of the author and in no way represent those of the University.

Signed:..... (Candidate), Date:

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Abstract

Qatar is well-known as a country with abundant natural resources, and this enables the state to distribute energy to its people at little or no cost. This has led to significant over consumption and raised questions about how the country can achieve sustainable energy use. This study explores energy consumption behaviour in Qatar and considers the role renewable energy can play in supporting sustainability. One way to reduce energy consumption and achieve sustainability while promoting the development of renewable energy is to manage domestic demand. This paper draws on a number of motivational theories, notably Maslow's hierarchy of needs, self-determination theory, economic theory, social cognitive theory, the theory of two factors, and planned behaviour theory to assess energy consumption habits in Qatar with the aim of identifying the factors that motivate people to take steps to improve sustainability and support renewable energy use.

This study adopts a mixed methods approach. Quantitative data was collected via a survey of members of the public in Qatar which focused on their awareness and behaviour with respect to energy consumption. Another survey of Qataris in the UK, where energy charges are levied, was conducted to establish how energy costs influenced their consumption behaviour. Qualitative data was obtained using interviews with Qatari experts in the energy sector, including energy policy makers, academics, and managers of energy companies.

The main finding of the study is that knowledge and awareness development in relation to energy consumption and sustainability in Qatar can be used to influence attitudes and behaviour regarding sustainable energy use. Knowledge development has a significant impact on human and social capital, and these can motivate energy consumers to change their attitudes towards the use of renewable energy. Knowledge about energy enables consumers to use energy more responsibly and understand the long-term negative effects of traditional energy use on the environment and society.

Current research on renewable energy in Qatar is still limited. This study provides additional insights into the importance of using renewable energy in the country and highlights the key motivational factors that could drive a transformational approach towards renewable energy and environmental sustainability. This will have significant implications for key stakeholders involved in promoting future sustainability in Qatar, including policy makers and energy users.

Publications

- Al-Marri, W., Al-Habaibeh, A. and Abdo, H., 2017. Exploring the relationship between energy cost and people's consumption behaviour. *Energy Procedia*, 105, pp. 3464-3470. ISSN 1876-6102
- Al-Marri, W., Al-Habaibeh, A. and Abdo, H., 2016. Exploring the relationship between energy cost and people's consumption behaviour. In: The 8th International Conference on Applied Energy – ICAE2016, Beijing, China, 8-11 October 2016.
- Al-Marri, W., Al-Habaibeh, A. and Watkins, M., 2018. An investigation into domestic energy consumption behaviour and public awareness of renewable energy in Qatar. *Sustainable Cities and Society*, 41, pp. 639-646.

Abbreviations

Billion cubic feet (BCF)

British Petroleum (BP)

Conference of the Parties (COP)

Foundation for the Rights of Future Generations (FRFG)

Global Horizontal Irradiance (GHI)

Global Sustainability Assessment System (GSAS)

Greenhouse Gases (GHG)

Gulf Cooperation Council (GCC)

Mega Watts (MWs)

Ministry of Education (MoE)

Photovoltaic System (PV)

Qatar Environmental and Energy Research Institute (QEERI)

Qatar Foundation (QF)

Qatar Petroleum (QP)

Qatar Science & Technology Park (QSTP)

Qatar Solar Technologies (QSTec)

Renewable Energy (RE)

Return to Work (RTW)

Self-determination theory (SDT)

The Qatar National Vision 2030 (QNV)

Trillion cubic feet (TCF)

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1 Introduction

1.1 Background

The six states of the Arab Gulf (Saudi Arabia, the United Arab Emirates, Kuwait, Oman, Qatar and Bahrain) are famous for hydrocarbon resources. These countries have discovered enormous amounts of oil and possess some of the biggest fields in the world. Even so, Qatar and Oman are currently working towards turning out greater capacities of natural gas than has previously been produced. The BP Statistical Review of World Energy (2004) pointed out that the Arab Gulf countries' reserves comprise approximately 42% (oil) and 24% (natural gas) of the entire world's reserves (Patlitzianas, Doukas and Psarras, 2006).

Qatar is an independent state in the Gulf region, which has recently gone through, and continues to go through, significant change and development. It occupies 4,416 square miles of peninsular land that spreads north into the Persian Gulf from the Arabian Peninsula. The land is mostly flat and consists of rocky terrain with the highest point being 103m above sea level. Its inland environment harbours many oil fields. On the west coast, the Dukhan oil field lies under the seabed and is amongst the largest oil producers in the region. Halul, a small island off the East coast of Qatar, is about 90 km east of Doha, the capital of Qatar. Halul is one of the most important islands for Qatar as it serves as a storage area and stocking terminal for oil from the surrounding off-shore fields, while a large port and a terminal for loading natural gas is located at Ras Laffan Industrial City (Global Investment Center, 2000). Most importantly, in recent years Qatar has been deemed to have the third largest natural gas reserves in the world and has developed policies which appear to be focused on securing Qatar as a resource rich nation on a global scale (Peterson, 2006).

In 2008, the Qatar National Vision 2030 (QNV) was launched, which outlined Qatari long-term goals. As well as directing and supporting government sponsored projects and private individuals, Qatar values the intergenerational justice concept, which brokers the balance between the current needs of the people and future demands on the nation's resources (Luomi, 2012). As Jörg (Chet) Tremmel, founder of the Foundation for the Rights of Future Generations (FRFG), has stated (cited in Weston and Bach, 2009, p.18-19) "the concept of intergenerational justice may very well become an intellectual leitmotif of the new century...when the accumulated capital, which the next generation inherits, is at least as

high as what the present generation inherited.” As Weston and Bach explain (p. 19), there are different aspects of capital, including:

natural capital, which is the stock of environmental assets important for supporting human life, such as biodiversity and the atmosphere; *real capital*, such as consumer goods and infrastructure; *financial capital*, such as financial claims and debt between countries; *social capital*, which derives from solidarity within society, stable relationships between individuals and groups, and values; *human capital*, derived from our health, education, skills, and knowledge; *cultural capital*, including institutions such as the political, economic, and legal systems; and *knowledge capital*, which is the accumulation of individual knowledge within a society.

Furthermore, Qatar is deemed to be a country of innovation, as Watson (2011) indicates, and INSEAD's recent Global Innovation Index revealed that Qatar, as a state, had moved to 26th place out of 125 countries with regards to innovation in business, with the United Arab Emirates coming 34th, a ranking that, despite being slightly lower, was still significant as no other Arab states made the top 40.

1.2 Problem Definition

In less than a century, the Gulf States have changed beyond all recognition and their governments are now beginning to realise that they must address issues within their economies, with the understanding that oil reserves are finite (Watson, 2011). Williams, Bhanugopan and Fish (2011) explored the idea that population growth, the change in the socio-economic climate and the fact that the wealth of these country is increasing through oil and gas resources are generating a need to engage in new energy solutions. What is noticeable in Qatar is that, besides the increase in population, there is an active growth in the economy, with a resultant increase in energy, gas and water consumption. Given this, in future, Qatar will need to find a strategy to balance natural wealth with its environmental and ecological needs, or what Luomi (2012) terms ‘natural sustainability’.

According to the Global Investment Center (2000), oil reserves at the time of print were at 3.7 billion barrels with gas reserves at 300 trillion cubic feet (TCF). However, to understand the balance between present and future generational needs, an investigation is required. Such an investigation should include research into the increasing population’s knowledge about energy conservation and its crucial role in safeguarding the future of the

country, including the implications of energy and resource waste (Marafia and Ashour, 2003). The behaviour of people in Qatar has to change for its future to be secured. For example, they currently live a life without consideration of energy, utilising more electricity than they actually need, due to the fact the electricity is free for Qatari citizens (Meier, Darwish and Sabeeh, 2013), and energy regulation policies, where they exist, are not strongly implemented. Qataris also tend to drive large 4x4 cars that consume a lot of fuel, and do not use energy efficient products as part of their everyday lifestyle.

1.3 Research Aim and Objectives

This research aims to understand the current situation regarding renewable/sustainable energy in Qatar, and to identify the factors that motivate Qataris to increase their awareness and perceptions of renewable/sustainable energy.

To achieve the research aim, the following objectives have been set up:

- To investigate the current state of renewable energy and sustainability development in Qatar.
- To investigate the factors that motivate people's awareness and perceptions of the actions that improve sustainability and renewable energy use in Qatar.
- To examine what types of motivation most effectively influence Qataris' awareness and perceptions of using renewable energy.
- To develop a clearer understanding regarding the ways in which renewable energy resources can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perception.

1.4 Research Questions

Qatar has been carefully chosen in this research because it has some of the most abundant oil and gas resources in the world, and because the country distributes energy to its people almost for free. This inevitably raises the question of how the country can achieve sustainability in energy use and how to maintain tradition energy through balancing present and future generational needs. Qatar is understood to be the country that has the most significant ecological impact on the earth due to its current ways of living, as consumption and pollution are, on average, 6.5 times that of the earth's carrying capacity (Luomi, 2012). Moreover, there is a recognition that mass consumption of electricity generated in Qatar accounts for about 80% of the natural gas and petroleum being produced (Marafia and

Ashour, 2003). Additionally, there is limited research into renewable energy within Qatar, and a limited understanding of whether the environment is suitable for adopting new technologies or not. For these reasons, this research aims to answer the following research questions:

- What is the current situation in Qatar regarding renewable energy and sustainability?
- What factors influence Qataris' awareness and perceptions of renewable energy/sustainability?
- How are Qataris motivated to improve their awareness and perceptions of sustainability/renewable energy use?
- To what extent can the factors identified be employed to increase awareness and enhance perceptions of using renewable energy in Qatar?

1.5 Methodology, Research Methods and Data Analysis

This research is an exploratory and descriptive study, which seeks to identify attributes for and obstacles to, sustaining and implementing successful and efficient renewable energy policies.

The philosophy used in this research is interpretivism, which assumes that truth is subjectively constructed. This philosophy is consistent with the aims of qualitative approach, which seeks to gain insight and understanding from the perspectives of those who have experienced or are experiencing the phenomenon under investigation.

The recruitment and participation of a population consisting of energy users in Qatar, Qatari citizens in the UK, and experts in renewable energy in Qatar, was pursued through a purposive and random sampling method. Random sampling was aimed at the recruitment and participation of energy users among the general adult population in Qatar. Random sampling was used for the participation in the surveys and purposive sampling was used for participants in the semi-structured interviews. Interview participants were from a population of experts on renewable energy in Qatar. Therefore, the first survey targeted 200 Qatari citizens studying in the UK, the second survey aimed at a target population of 500 in Qatar, while the interviews were aimed at a target population of 10.

Figure 1-1 below provides a graphical description of the methodology adopted in this research:

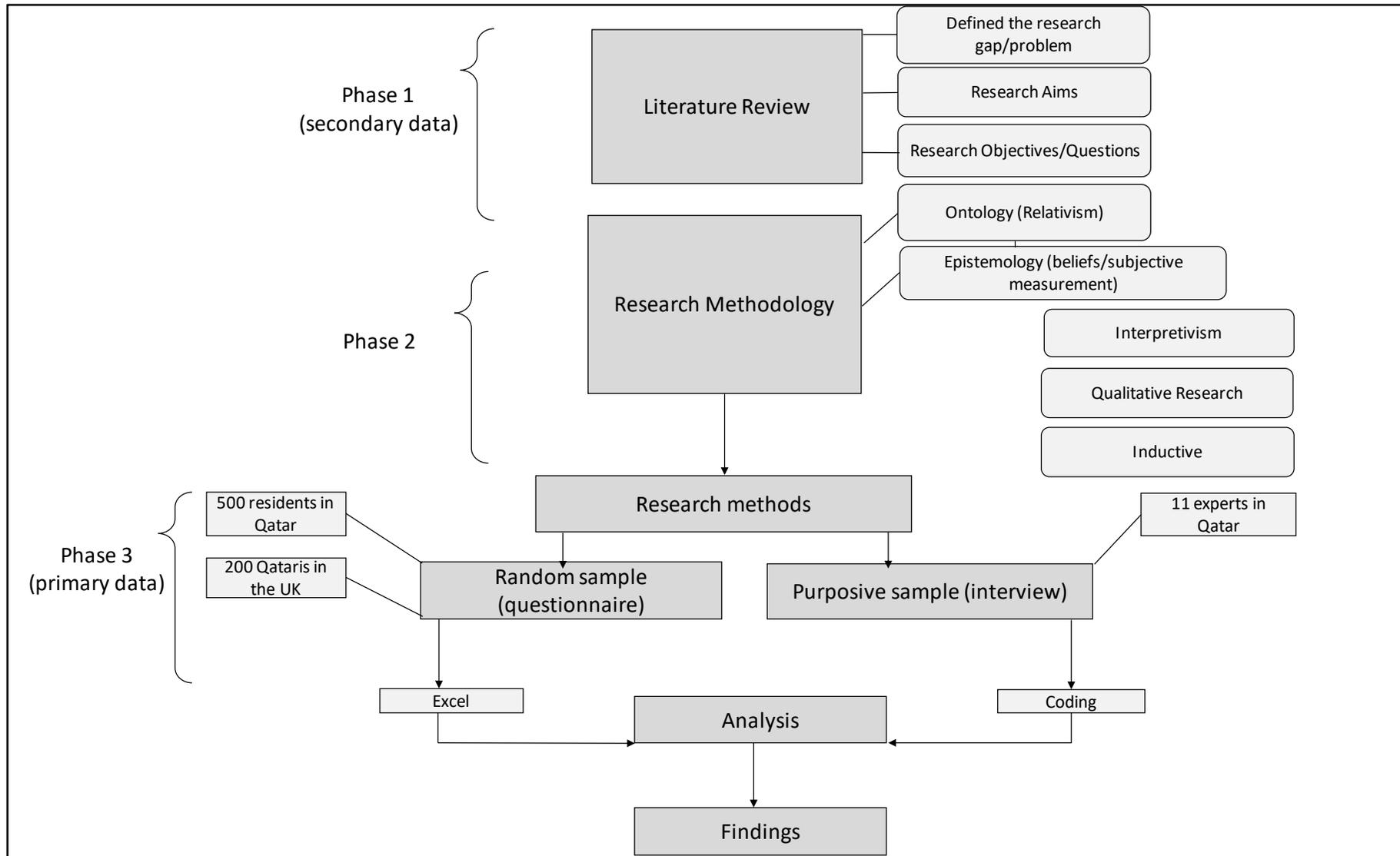


Figure 1-1: Research Process and Methodology (Author's Creation)

Mixed methods research requires the use of two research instruments. A survey, which is lacking in detailed responses is used in the quantitative data collection. The brevity of the responses allows for the collection of data from a relatively large population sample. The qualitative data is collected from a smaller population sample as it is much more robust and detailed. In complying with research ethics, the data was collected from the participants with their knowledge, consent and voluntary participation.

The triangulation mixed method used in this research ensured that results are compared and merged pursuant to consistencies and inconsistencies in the results.

The results of each of the data sources are compared and contrasted for confirmation, complimentary and support implications. In other words, the results of surveys and interviews are combined and converged for comparative and contrast values. These data sources also improve reliability and credibility.

The qualitative data was analysed using an exploratory approach. In other words, the results were explored and observed until all explanations were exhausted. The quantitative data was analysed using excel software.

The reliability of the survey was tested by using a pilot sample through a small number of the researcher's colleagues. This measure was taken to ensure the reliability of the research results, the clarity of the questions asked, creating safe custody of the data and the replicability of the study.

1.6 Original Contribution(s)

Existing research in relation to renewable energy in Qatar is still limited and this study will help to identify the current and expected role of renewable energy in Qatar, taking into consideration the motivations in place to support this. In Qatar, this research work is expected to develop a clearer picture regarding energy sustainability and to develop a clear road map to help stakeholders work towards a better future for the State of Qatar.

1.7 Value of the Work

According to Colombo (2014), none of the GCC states, including Qatar, have “undertaken any concrete measures for the promotion of energy efficiency” (p. 200), and, although they ‘have recently adopted a more proactive approach towards environmental sustainability...

despite some relevant initiatives, no consistent or coordinated strategies or policies have yet been established (Ibid.)

Qatar, however, has shown greater promise in terms of energy efficiency initiatives through its commitment to research on sustainable development and, in particular, its Energy City which is aimed at adopting the ‘latest green energy technologies and solutions for energy efficiency and pollution reduction’ (Colombo, 2014, p. 202). Other initiatives include the Cooperation Programme on Energy Efficiency relative to the Qatari Electricity Sector, Qatar Airlines’ Oryx Flies Green programme, and the initial stages of the Qatar National Plan for Energy Efficiency, Optimization and Resource Utilization (Colombo, 2014).

As an oil rich country and one that depends on the income from oil exports in a world where other countries are increasingly turning toward renewable energy and alternative energy sources, Qatar’s reliance on tradition energy and energy exports calls attention to its own sustainable development issues. Therefore, this study is important for identifying the appropriate renewable energy and energy efficiency policies and practices for Qatar.

The following chapters will outline a discussion and literature review that will investigate the ways in which motivation and decision-making takes place in terms of public policy. The broader application of this in the following chapters will be to investigate the current situation within Qatar with regards to oil and gas energy reserves and Qatar's future strategy and vision for a sustainable generation and renewable energy.

1.8 Research Structure

Chapter 1: Introduction.

This chapter introduces the research problem. It develops the research objectives by defining the research gaps and sets out the research questions intended to address the aforementioned research gaps. The methodology that has been followed is also introduced as well as the structure that the research adopts. In addition, this chapter introduces the research contributions that are expected and explains the value of the work. The last section explains the content of each chapter, its main focus, and explores how the content of the chapter links with the chapters that follow.

Chapter 2: Theoretical Foundations

This chapter sets out the theoretical foundations of the research. Several motivation theories are discussed, including the two-factor theory (motivation-hygiene theory), the theory of planned behaviour, social cognitive theory, the hierarchy theory, economic theory, and self-determination theory. It has been established that the practice of motivation theories can be utilised to encourage positive actions towards renewable energy and sustainability. The two theories that the analysis focuses most closely on are self-determination theory and Maslow's hierarchy of needs.

Chapter 3: Renewable energy and sustainability as an Alternative Approach

The chapter focuses on renewable energy as an alternative approach to meeting energy needs. It seeks to stimulate and deepen the understanding of some of the advantages and disadvantages of the utilization of renewable energy and its sustainability. Solar energy and its potential use as an alternative source of energy is discussed, and other forms of renewable energy, such as nanotechnology and the ability to harness oceanic energy, are also considered. In addition, the chapter also explores the current position of Qatar in relation to renewable energy and sustainability and explores the stewardship, efficiency and diversity effects of renewable energy. Aspects such as the geography of Qatar, the future vision of the country, and its education system and their relevance to the current position of Qatar in terms of renewable energy are also discussed in this chapter.

Although there is relatively little information about renewable energy in Qatar, this chapter relies on existing information to help develop a proper analysis of the system that currently exists in terms of alternative energy generation. This discussion is likely to result in a number of benefits. Through proper education on matters of renewable energy, for instance, the needs of individuals will be promoted. In addition, the discussion is expected to highlight how renewable energy can be used effectively to meet the growing needs of industries, businesses and the population at large. The chapter also explores the importance of adequate funding to support activities on this subject and to curb over-reliance on one particular forms of renewable energy.

Chapter 4: Methodology

The methodology used to conduct this research is discussed in this chapter. The mixed method of research which entails the use of both quantitative and qualitative approaches to data collection was chosen as the research method for this study. A survey involving members of the public in Qatar was used to collect qualitative data about the awareness

and behaviour of citizens with respect to energy consumption in the country. How the cost of energy influences energy consumption behaviours among Qatari students in the UK was established in another survey. Interviews with Qatari experts in the energy sector helped the survey obtain qualitative data.

Chapter 5: Results and analysis

The chapter presents the results and analysis of the two surveys, as well as the interview data collected in this study. In the first part of the chapter, the first survey's results and analysis are presented. The results and analysis of the second survey are presented in the second part while in the third section, the results and analysis of the interviews are presented.

Chapter 6: Discussion and findings

In this chapter, the research and findings of the study are discussed. The objectives of this study are used as a reference throughout the discussions.

Chapter 7: Conclusions, Contribution and Further Research

The final chapter provides a summary and a conclusion and pulls the research results together. Identification and explanation of possible areas for further research are also captured in this chapter. In addition, the chapter also sets out the contribution this thesis makes to academic research and to theory and discusses the limitations and delimitations of this study.

2 Theoretical Foundations

Several theories of motivation will be discussed in this research; these include economic theory, social cognitive theory, the theory of planned behaviour, self-determination theory (SDT), the hierarchy theory and the two-factors theory (motivation-hygiene theory). These theories are appropriate basic theories for this research as it deals with exploring motivators of behavioural change within the context of improving sustainability, as well as seeking to understand how decision-making could be initiated and motivated at the public policy level. However, the analysis will be focused on two theories in particular, self-determination theory and Maslow's hierarchy of needs.

2.1 Self-determination Theory (SDT)

Self-determination theory (SDT) is catalogued into three classifications. Intrinsic motivation relates to motivation through encouragement to achieve in order to meet an individual's needs that benefits them and their enjoyment of life by engaging in action. Secondly, extrinsic motivation relates to motivation stimulated in order to conclude tasks for secondary needs, such as earning a reward, avoiding a punishment or sustaining pride. The third classification relates to an absence of motivation (Tanaka, 2013). Extrinsic motivation is further classified into four groups: external regulation is affected totally by external influences, for example reward and punishment. Another form is introjected regulation such as stress or values imposed externally. Identified regulation is the third form and involves bonding the activity with an individual aim. Integrated regulation is the fourth and is the most self-determined (Tanaka, 2013). Assor, Vansteenkiste and Kaplan, (2009) suggest that introjected regulation can be divided into avoidance motivation, which includes avoiding low self-esteem, shame, or blame, and approach motivation which goes with high self-esteem or pride in an effort to gain social appreciation.

Furthermore, Deci and Ryan, (2000) state the SDT classifications and extrinsic motivation regulations are a continuing series (from the most self-determined form to the least) and that, when gathered together, they have a greater capacity for motivation compared to the sum of the individual parts (See Figure 2-1).

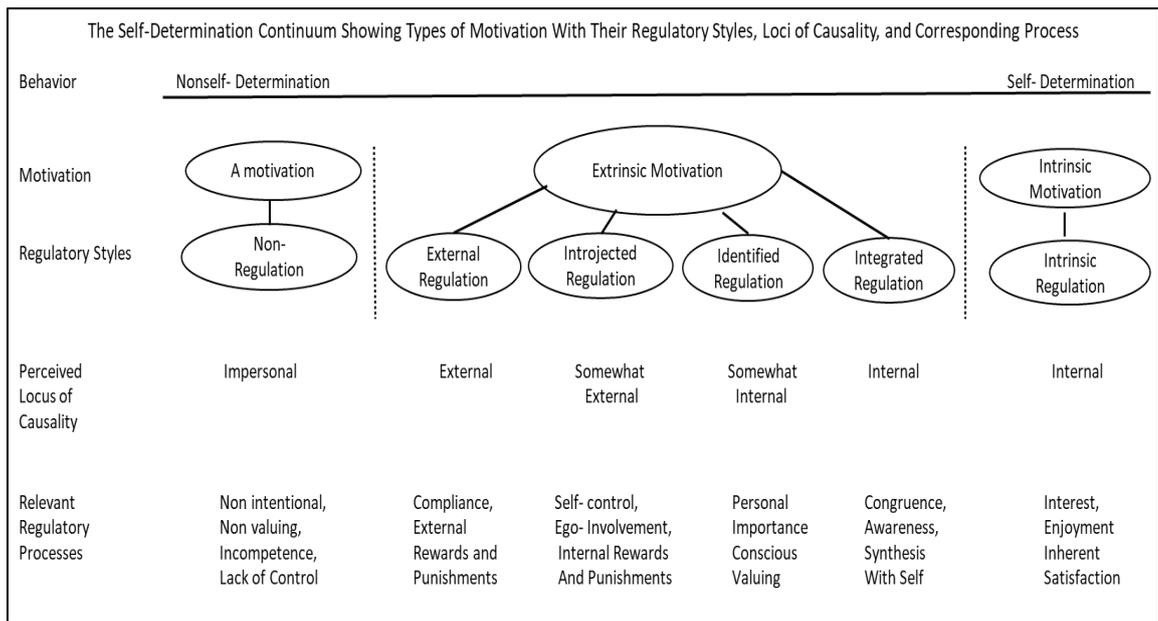


Figure 2-1: The Self-determination Continuum (reproduced from Deci and Ryan, 2000, p. 237).

There is some debate around the importance of motivation and its most effective form. Koestner and Losier (2002) believe that identified regulation becomes more significant and positive at affecting motivation than intrinsic motivation due to its base in exciting activity and its capacity to be affected by identified regulation in that it provides power and the long-term determination of learning, engaging positively with actions such as academic tasks and other activities that encourage responsible morals.

Some researchers believe there are both similar and different points between motivations and various affective positions. As Tanaka (2013) suggests, there is a correlation between integrated regulation and identified regulation with regard to individual insignificance and the value that an individual attributes to an activity. Identified regulation can happen when the values an individual holds differs from their self-feeling, whereas integrated regulation occurs only when values are completely integrated to the self. In this situation the behaviour of an individual is fully independent or self-determined.

Identified motivation describes the direction of an individual’s personally important behaviour that matches with their aims and identity (Koestner and Losier, 2002). Wang and Biddle (2001) agree that people’s behaviours are created by identified regulation due to doing what they want rather than acting on compulsion. Other authors have suggested that intrinsic, integrated, and identified motivations are associated with improved success,

positive movement, determination, exertion, and well-being (e.g. Koestner and Losier, 2002). Baard, Deci and Ryan (2004), Deci et al. (2001) and Bono and Judge (2003) found that intrinsic forms provide autonomous motivations and factors that are enhanced in contexts such as autonomy-supportive environments that are directed towards better well-being and efficiency. On the other hand, Deci, Koestner and Ryan (1999) observed that extrinsic rewards issued relate directly to job engagement, for example through salaried positions, and are not related to intrinsic motivational weakness which is affected by extrinsic rewards.

Baard, Deci and Ryan (2004) indicate that the role of the individual and the influence that they provide with respect to self-motivation and self-determination, in the way in which they will engage with a specific issue, is the greater consideration. This understanding can be expanded and have a positive influence in the professional world. As well as Baard, Deci and Ryan (2004), Baard (2002), and Deci and Ryan (2000) point to the fact that it is necessary for self-determination theory to engage in three distinct compliments that are notably absent from the other theories, this is mostly in relation to aspects of competence, autonomy, and relatedness.

Firstly, with respect to competence, self-determination theory is based on the premise that the individual citizen is ultimately competent with respect to those motivational strategies and how they will affect their overall best interest and the interests of the firm. Thus, unlike social determinism theory, self-determination theory is directed toward the rational mind of the individual. Social determination, on the other hand, assumes that social influences, norms or some socially dominant actor or actors influence behaviour (Williams and Edge, 1996). However, it must also be understood that a level of competence signifies the degree and extent to which the individual is able to make informed decisions. The informed decision-making structures that are represented with respect to self-determination theory help to reinforce the degree and extent to which self-interests and effective choice are illustrated throughout a litany of different situations involving employee and employer relations and motivational best practice. Furthermore, the autonomy that is shown with respect to self-determination theory is unique when compared to other theories. The autonomy that the individual illustrates within self-determination theory is tantamount to individual decision-making based upon both positive and negative factors. Self-determination theory approaches motivation from a much more nuanced and individualised perspective; one in which the autonomy of the individual employee is the ultimate focus

upon which any and all motivational factors must be synthesised. By contrast, Herzberg's motivation-hygiene theory (Maslow, 1943) is based on an understanding of the organizational group as a whole (as will be discussed in section 2.2).

Psychological relatedness is another primal factor in helping to determine the overall degree and extent to which motivation is shown within an individual and in turn within a group of individuals. Interestingly, this engenders a different approach to the way in which motivation should be understood, as compared to the other elements described above. As such, the individual impacted upon by psychological relatedness comes to an appreciation of the distinct factors within work experience; they will not only have an impact upon their own psychological well-being and the approach that they take to their work but will also impact others. Within such a mechanism, self-determination theory comes to be represented less as an individualised focus and more in terms of a group dynamic. Although it might seem as though this particular theory attempts to compare irreconcilable differences, essentially, these mechanisms are related with respect to the means by which an individual reconciles the world around them in regard to the challenges that they face and, by extension, the challenges that other individuals or groups of individuals will likely face as a result. In other words, contrary to social determinism, people make decisions about their behaviour for themselves; they are not just adapting behaviour without first having some inner debate.

Even though this generally relates to negative externalities, positive externalities with respect to psychological relatedness can also be illustrated. For instance, the reader can adequately interpret a situation in which motivational theory is engaged by an individual within a firm/organisation as a function of the fact that it is not only beneficial to them but can be beneficial to others and to the firm in general. This is the root goal towards which all self-determination theory should be employed within a particular firm or organization due to the fact that it allows a level of tacit and innate appreciation for the goals and norms that a particular entity is trying to achieve.

As the scholars who have been referred to thus far illustrate, self-determination theory is a particularly effective mechanism by which decision-making structures and motivational practices can be determined. However, it is not the only mechanism by which these are effectively understood. As such, the remaining portions of this literature review will focus on the Herzberg's motivation-hygiene theory and Maslow's hierarchy of needs. Although

these are specifically related to a more macro approach, they are nonetheless still relevant to the ways in which businesses and organisations seek to maximise motivational tools and practices for their employees.

2.2 Hierarchy Theory

Maslow (1943) developed a hierarchical theory of needs. This theory is based on the five needs relating to personal importance and survival, including: physiological needs such as food, sex, drink, sleep; security needs such security of health, of employment, of property, protection; social needs such relationships, friendship, acceptance, workgroup, family; esteem needs such as confidence, achievement, respect of others, respect by others, reputation and needs for actualisation in personal growth and fulfilment. Maslow asserts that primary needs are those that are required by every individual (physiological and security needs) while the others are deemed to be secondary needs which relate to external satisfaction, that can be met in a variety of ways, such as through monetary payment (Robbins, Odendaal and Roodt, 2001, p. 158).

However, Ţicu (2013) argues that the process of decision-making for public policy needs to be focused on the people who have the responsibility to apply the decision and programmes proposed, and who define how they behave, or who value specific actions, or all the issues of objects transactions. All of that depends on the application of the decision made, whether perfect or not, or the process whereby the decision makers access resources and account for both external and internal factors of decisions. As part of decision analysis, motivation is important in order to reach the planned aims (Gautschi, 1992). The hierarchy theory is defined once the appropriate motivation theory of the decision-making process has been made on a public policy level.

In trying to apply Maslow's hierarchy of needs to motivational strategy, it is immediately apparent that the firm or business organisation that seeks to apply this will need to analyse what determinants and metrics are present and which ones are lacking. In this way, it is possible for Maslow's hierarchy of needs to be integrated effectively with regards to motivational strategy when trying to generate a higher level of satisfaction or profitability from the workforce/employees in question. However, Štrach and Everett (n.d) believe that environment culture impacts knowledge management and each culture has a different influence. Therefore, even before Maslow's hierarchy of needs was researched, employers were effectively using it as a means of trying to understand levels of efficiency and

profitability. The inherent nature of Maslow's hierarchy of needs creates a situation in which the analyst comes to appreciate the fact that the organisation that promotes the needs of its employees based upon these metrics is inherently well-positioned to seek to maximise motivation.

Of the many vital theories that assist in understanding human resource relations and management, the overall role that Maslow's hierarchy of needs exhibits is perhaps one of the most profound. It is without question that the average human resource manager, or the average human resources department, seeks to fulfil different needs, and, regardless of the approach the individual takes, whether human resources or human resource management, this fundamental role underpins nearly each and every decision that such a department makes. In order to understand these roles more clearly, the following literature review of Maslow's hierarchy of needs will represent some of the salient approaches and effective understandings that different authors have evidenced over the past few years. Recent scholarship is preferred as the information used in this thesis should be timely and up-to-date, and, in this case, cognisant of the most recent changes in interpretation that Maslow's hierarchy of needs has been subject to over the past few decades.

Researchers such as Ilieva and Terzieva (2000) indicate that the job/task of managers at every level is to oversee and improve the needs that individual employees, departments, or groups exhibit. From such a broad interpretation and understanding of the role of the human resources department, it is apparent that Maslow's hierarchy of needs is directly associated with the degree and extent to which human resource management can be effective. Moreover, scholars such as Newsome (2003) indicate that this role as an internal advocate, a role that almost all stakeholders agree human resources departments are required to exhibit, is uniquely interested in representing and improving upon the reasonable needs and expectations that employees might exhibit. Within such a function, the human resource department seeks to minimise the costs associated with the workforce, comply with existing and relevant laws, improve and maximise efficiency, and/or reduce overall losses. None of these tasks can be readily accomplished without first trying to define, measure, and seek to improve the fulfilment of the needs that the individual employee, or group of employees, might exhibit. This is done not only as a means of creating harmony within the firm/business organisation, but also as a means of maximising motivation. This understanding is essential to realising the role and impact that Maslow's hierarchy of needs plays with respect to effective and proper human resource management. Furthermore, as

Amoura et al. (2014) asserts, this particular dynamic exhibits a situation in which the analyst can easily recognise that maximising motivation requires an understanding and appreciation of the means by which profitability, utility, and stakeholder satisfaction all tie in to one another. They believe that controlling needs and awareness impacts independence and physical aspects, and that this could be enhanced by maximising motivation.

Dumitrescu (2009) argues that human resources departments are the means of creating a virtual organisation and environment to motivate employees so that their jobs are not so far removed from their personal lives. The firm that is able to effectively manage motivational strategies and to engage with Maslow's hierarchy of needs as well as understand the approaches that will best fit with their employee base is the firm that is the most dynamic and able to survive within the business environment. With such a broad and categorical dictum, the reader can immediately understand the overall relevance that Maslow's hierarchy of needs has to current business strategies that any firm seeks to adopt.

Ghafoor et al., (2011) further clarify that human resources departments are sometimes incorrectly denoted as being responsible for motivation in and of itself. However, motivation and motivation strategy are essentially created by the leadership of the firm and in turn, provided to the human resources department as a means of affecting the employee base. Thus, it is important to provide an understanding within leadership and stakeholders of the overall applicability that needs fulfilment has with respect to motivation and the effect that a further understanding of Maslow's hierarchy of needs can have on the overall profitability of the firm in question.

Of all the theories put forward and analysed within this chapter, Maslow's is perhaps the most simplistic. Unlike social determinism, Maslow's theory individualizes decisions; it is about how an individual comes to determine a course of action and not how others around him/her influence that course of action. However, the reader should not misunderstand its overall simplicity and decide that it is ineffective or overly broad. Figure 2-2 below illustrates Maslow's hierarchy of needs and how it functions. From a cursory glance at this figure, it is clear that each successive level of motivation corresponds to an increased level of profitability/efficiency/self-actualization. As such, employees who find themselves trapped in a situation near the lower half of Maslow's hierarchy of needs will struggle to produce a level of motivation and effective work performance within their organizations. By contrast, human resources departments that are able to leverage the upper half of the

hierarchy are more likely to experience greater levels of profitability/growth/production. The reality is that human needs differ depending how far away from the lower order needs they are. While it is absurd to expect a given firm or business organization to be responsible for meeting Maslow's lowest level needs, one's livelihood is quite relevant to these higher order needs, and, when one looks at the environment, these needs are called into question.

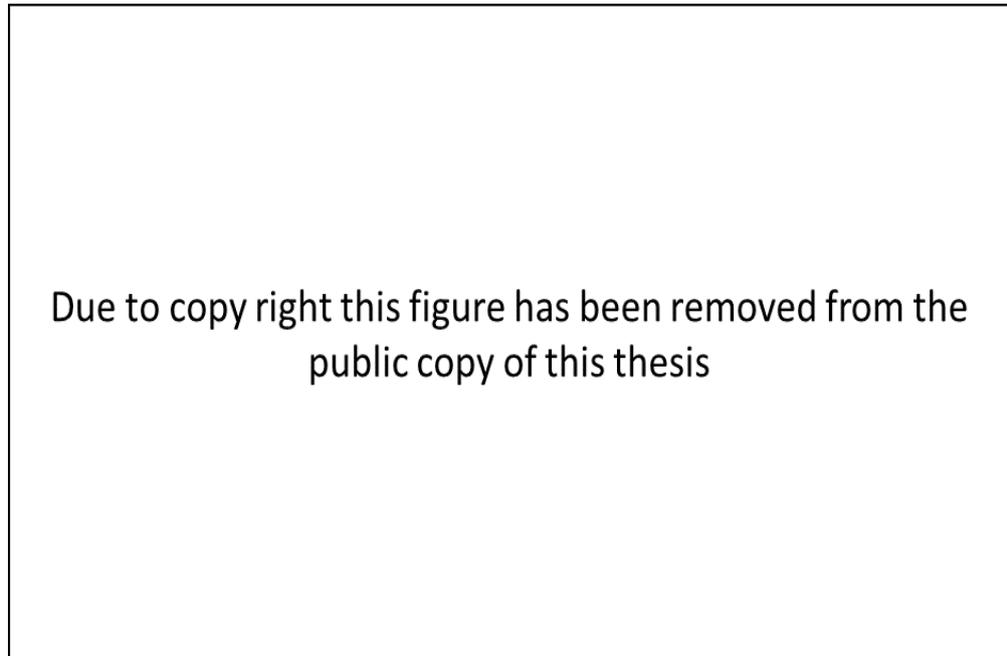


Figure 2-2: Maslow's Hierarchy of Need (Maslow, 1943).

The overall ability of Maslow's hierarchy of needs is only constricted by the degree and extent to which the human resources professional chooses to engage with it. For instance, within the interpretation of needs and motivation that workplace security might provide, basic physiological and safety considerations can be impacted. Pojidaeff (1995) notes that continuing to move up the list through each and every substrata of the pyramid, the engaged employer understands that human resource motivation is keenly impacted upon by trying to bring each and every employee closer to self-actualisation at the point at which the greatest potential for efficiency, productivity, and feelings of involvement and buy-in are represented. Toh and DeNisi (2005) imply that it is essential that any productive firm or business organisation's human resource departments appreciates and works to fulfil subsequent stages and bring employees towards self-actualization. Merely making progress is not by itself self-actualization.

Although there are a litany of different metrics through which motivation and stakeholder support can be affected, Maslow's hierarchy of needs is perhaps one of the most important of these with respect to understanding the growth potential within human behaviour towards the conservation of energy.

2.3 Theory of the Two Factors (Motivation-Hygiene)

Ticu's (2013) two factors theory (motivation-hygiene) can be employed in decision-making at the public policy level. This theory was first examined by the psychologist Frederick Herzberg and is based on people's expectations of work. Individuals' good or bad expectations help to situate their level of satisfaction at work. This affects the decision application process, whether the satisfaction received increases the effect on the process successfully and vice versa (Herzberg, 2008).

Robbins, Odendaal and Roodt (2001) argue that hygiene factors are a condition of the successful implementation of decision-making which include hiring policies, the organization type, the circumstances of the workforce and the methods of the activities assessment. If these are met, the process has been successful. Furthermore, Abramson (2012) adds that one must understand the influence of culture on human production by understanding which cultural elements affect action as a function of circumstance. This is indicated with respect to Maslow's hierarchy of needs. However, once again, the overall level of simplicity with which this particular theoretical approach is presented, with respect to motivation and stakeholders, is somehow considered useless in understanding the deeper nuances of motivation that are shown in terms of the employee/employer relationship.

The simplicity of Herzberg's two factors theory does not indicate that it is weak or inefficient when used to understand or define workplace satisfaction/job satisfaction. Ultimately, the motivation-hygiene theory asserts that a certain number of key factors are inherent when it comes to creating workplace satisfaction or dissatisfaction. In trying to measure the overall factors that influence these satisfaction levels, stakeholders can seek to interpret a quantifiable analysis of whether or not satisfaction outweighs dissatisfaction; whether or not certain individual mechanisms can be utilised/employed as a means of decreasing dissatisfaction and in turn maximising satisfaction at work. However, Deng and Gibson (2008) believe that cultural awareness is not enough but that leaders' expertise also has an important effect on the outcome. The two factors are applied simultaneously to understand what good or bad factors move leaders to employ their experience, which itself

affects the outcomes for employees. Although Maslow does not indicate that human resource personnel or other individuals within a given firm or organisation are responsible for maximising the self-actualization that the individual or group of individuals might experience, Herzberg suggests that leadership is essential for creating an environment in which job satisfaction can be worked towards and dissatisfaction can be ameliorated.

Independence with respect to job satisfaction and dissatisfaction is a theme that has been considered by Liebmann, (2002). Increased productivity is expected from increased motivation levels, good work environment quality, and training support. These are, in other words, a measure of employee satisfaction.

Baril et al. (2003) state that motivation is part of what makes the return to work (RTW) strategy successful, that more satisfaction gives more success. This supports Herzberg who observes a relationship between increased oversight and potential with regards to effecting job satisfaction/dissatisfaction. Accordingly, in order to appreciate and understand Herzberg's motivation theory, it was necessary to engage with the understanding that a separate but equal focus upon minimising job dissatisfaction and maximising job satisfaction must be undertaken. As Mizuno et al. (2006) postulate, the crux of this matter has to do with human resources and the overall level and extent to which human resource stakeholder/managers can seek to analyse the environment in which they perform operations and denote those factors that ameliorate or reduce the level of satisfaction that exists within the firm/organisation/company. This entire process is not possible until a survey and/or analysis of the given company is performed.

Thus far, the scholarship that has been used has been concentric, providing a merely theoretical interpretation of either Maslow or Herzberg. However, from an interpretation of the discussion with regards to the motivation-hygiene theory, it is immediately apparent that certain incentives, job characteristics, or other factors can be used as a means of decreasing job dissatisfaction and/or maximising job satisfaction. As such, Zoogah and Abbey (2010) found that motivations – integration, learning, and legitimacy – are created by a social context that influences the employer's preferences.

2.4 Theory of Planned Behaviour

The theory of planned behaviour argues that the consumption decisions and behaviour by individuals can be predicted based on the individual's "attitudes toward the behaviour, subjective norms and perceived behavioural control" (Ajzen, 1991, p. 179). Essentially, the

theory of planned behaviour is built around the concept of intentions and holds that an individual's planned behaviour is dictated by his or her intentions (Chatzisarantis et al., 2006). Thus, if one observes the preparations and plans of an individual, one can almost always predict what that individual will do.

The theory of planned behaviour states that when an individual plans to do something, that individual will typically consider the degree of control that he or she has over the behaviour (Kraft et al., 2005). The individual will consider the difficulty associated with the behaviour and whether or not he or she can overcome those difficulties (Ibid.). Thus, the individual's perception of the degree of difficulty associated with the planned behaviour will determine whether or not the individual goes through with the plan (Ibid.). Therefore, if there are insurmountable difficulties attached to planned behaviour, it can almost always be accurately predicted that the individual will not follow through with the planned behaviour (Ibid.).

With respect to attitudes toward the behaviour, the theory of planned behaviour holds that individuals will typically evaluate expected outcomes pursuant to the "expectancy value model" (Ajzen, 2015, p. 127). In general, "we form behavioural beliefs by associating performance of the behaviour with certain outcomes" (Ibid.). For instance, an individual, after reading or hearing about a report in the news, might come to believe that if one reduces sugar, his or her energy might decrease but the risk of diabetes will also decrease. Since the outcome associated with the behaviour has a negative or positive value, "we automatically and simultaneously acquire an attitude toward the behaviour" (Ibid.). Depending on the perceived value, an individual will form behavioural intentions accordingly. For example, if a positive value is associated with an outcome, the behavioural intention will also be positive, providing the behaviour is within the control of the individual (Ajzen, 2015).

Finally, an individual will also rely on subjective norms when forming behavioural intentions. Subjective norms are informed by significant 'others' and may include close friends and family members. Subjective norms can also be informed by experts or others with the requisite knowledge of the behavioural outcomes. If the subjective norm referred to is positive in relation to the behaviour, the individual is more likely to form the intention to perform the behaviour (Ajzen, 2015).

In summary, the theory of planned behaviour argues that an individual forms intentions to perform and those intentions permit prediction of their behaviour. Behavioural intentions are formed based on attitudes toward the behaviour, subjective norms and behavioural control. Firstly, an individual forms attitudes or beliefs about the outcomes of a behaviour. Secondly, the individual refers to subjective norms about the outcomes of the behaviour. Finally, if the behaviour is in the control of the individual, the individual will act, provided there are positive values associated with their attitudes and subjective referents.

2.5 Economic Theory

Economic theory originates from Adam Smith's homo economics which focuses on "the prospects of future rewards" (Elster, 1989, p. 99). The individual who looks forward to rewards in the future is more likely to adjust as circumstances change while always doing so with an eye on improving. Where better opportunities arise, the individual will make changes to ensure that those opportunities are not lost to him or her (Elster, 1989). In other words, according to economic theory, individuals are characterised as optimizers who look forward to and act with an objective of "optimizing behaviour" (Elster, 1989, p. 99).

Essentially, economic theory is based on the premise that individuals are rational thinkers and as such, will act with regard to outcomes (Elster, 1989). As a rational thinker, the individual knows that if he or she wants to achieve a specific outcome, they will have to follow through with specific behaviour (Elster, 1989).

Thaler and Shefrin (1981), delving further into the theory, introduced and articulated the concept of self-control. This arm of economic theory, according to them, views the economic individual as one who looks to the future and evaluates current performance against future outcomes. In doing so, the individual will not want to compromise their future outcomes and will constrain or expand their current behaviour accordingly. For instance, if an individual opens a savings account, the individual will consider whether or not the interest rates makes this investment more profitable into the future than another type of investment. Therefore, the current behaviour relating to whether or not to open a savings account or make some other type of investment will be constrained accordingly (Thaler and Shefrin, 1981).

Alchian (1950) also argues that, an individual's planned behaviour and actions are not predicated on the maximisation of profits. The study went further to state that an individual takes into account that future outcomes are not always certain, thus, individuals are prone

to take risks and learn from them in the pursuit of positive outcomes. However, the individual must be motivated by higher prospects of positive outcomes and their ability to adapt to a changing environment as it occurs (Ibid.). Therefore, economic theory assumes that individuals can never be certain that their expected positive outcomes will come to fruition if they perform certain acts to achieve those outcomes. They accept uncertainty but will take risks in executing their actions if they have high positive expectations and have the wherewithal to adjust to changes in the environment in pursuit of high positive expectations.

2.6 Social Cognitive Theory

According to social cognitive theory, individuals form behavioural intentions based on three factors: personal agency, proxy agency and collective agency (Locke, 1997). Essentially, Bandura (2001, p. 1) argues that individuals have the ability to control the “nature and quality” of their lives and this is the “essence of humanness”. This control occurs through human agency which is tied to “phenomenal and functional consciousness” (Ibid.). This level of consciousness is informed by one’s intention and premeditation, regulation of the self via how the individual will be influenced by the action, and reflecting on one’s abilities, the “quality of functioning and the meaning and purpose of one’s life pursuits” (Ibid.).

Still this level of human agency which is personal in nature is informed by the social world (Bandura, 2001). The research goes further to posit that individuals are both contributors and recipients of social processes, thus, they make decisions and form intentions through both the personal agency which is the self, and the proxy agency which is the social world, and individuals can act alone in achieving intended outcomes or they can act in a collective nature through social coordination and interactive attempts (Ibid.). Also, through collective agencies, individuals are able to achieve outcomes that allow their control over their “personal destinies and national life” (Bandura, 2001, p. 1).

Bandura (1991, p. 248) states that social cognitive theory assumes that the individual is largely “motivated and regulated by the ongoing exercise of self-influence”. The most important self-regulatory pathway functions via three main functions: “self-monitoring of one’s behaviour”, “its determinants” and “its effects”; “judgment of one’s behaviour in relation to personal standards and environmental circumstances”, and affective self-reaction” (Ibid.). Self-efficacy plays an important role in this self-regulation process and

has a significant impact on one's thoughts, motivation, action and affect. However, social influences also factor into self-regulation (Bandura, 1991).

2.7 Conceptual Framework

This chapter looks at six motivation theories: economic theory, social cognitive theory, the theory of planned behaviour, self-determination theory (SDT), the hierarchy theory and the two-factors theory (motivation-hygiene theory). However, the analysis which follows focuses on the two most applicable to the current issues under study: self-determination theory and Maslow's hierarchy of needs.

It must be appreciated that the theories discussed above relate to both internal and external components of motivation. These in turn impact on the way in which goals are understood and applied, both within the individual as well as within the group context. An illustration of this can be seen with respect to the way in which SDT can be applied effectively in certain situations and ineffectively in others. For example, one can use the case of Qatar and the means by which Qataris are rewarded for using renewable energy. The motivation for this particular action is based on the fact that they are encouraged by the state to behave in a way that includes external regulation. The inverse of this would be a situation in which motivation for efficient products in their homes would be borne solely out of self-volition/a sense of duty and responsibility. Within the context of this study, it is expected that external regulations serve as a much larger motivation to change behaviour than internal motivation (as has been referenced briefly above). However, prior to coming to the appreciation that internal motivation is less useful in this particular context, it should be understood that the sense of reputation is a powerful mechanism by which the identity and culture of Qatar is formed. Therefore, individuals not only care about the regulations that define the law, they are also intimately concerned with the manner by which society, and indeed individuals within society, define them and the basis through which this definition impacts upon other aspects of their interactions and daily life. As a function of this dynamic, it is necessary to note that the theoretical interpretation of motivation leaves distinct gaps for the researcher, namely the differential that exists between internal and external influence, how this is achieved and whether or not the two can be engaged simultaneously. Furthermore, a secondary gap is contingent on the fact that many researchers have focused on punishment of external regulation rather than the pleasure of reward.

Maslow's hierarchy theory clarifies self-actualisation as the ultimate objective which each level aims to achieve. It is possible that a number of strategies and visions could be used by Qatar's policy makers in response to the factors that motivate individuals to engage in encouraging practices and behaviours. These behaviours could help to protect Qatar's environment, notably by adopting and using renewable energy. However, as this thesis unfolds, it will become apparent that some factors on the hierarchal order in Figure 2-2 may need to be re-ordered if renewable energy is to be implemented successfully within the Qatari context.

2.8 Summary

This chapter has provided an overview of the main theories that should be used to explain the key factors driving the motivation and change of consumer behaviour regarding renewable energy usage and has begun to identify how they might be used to improve decision making on public policy to achieve energy sustainability in Qatar. The next chapter examines the potential of renewable energy as an alternative approach to meeting the country's energy needs and discusses the importance of stewardship, efficiency and diversity effects in the broader Qatari context.

3 Renewable Energy and Sustainability as an Alternative Approach

3.1 Introduction

The research and conversation around the subject of renewable energy as an alternative approach to meeting our energy needs has become one of the most popular topics around the globe. The rapid depletion of natural resources like coal has necessitated the efforts to develop alternative sources of electricity. This research presents an alternative approach, and seeks to stimulate and deepen our understanding of some of the advantages and disadvantages of renewable energy utilisation and its sustainability (Bull, 2001). While discussing this topic, the research recognises that alternative energy cannot be used without first considering certain essential requirements, including the specific geographical location and policy context (Goh et al., 2014; Liu, Perng and Ho, 2013). This chapter will discuss the potential future use of solar energy as an alternative form of renewable energy and sustainability, notably through the use of nanotechnology and the ability to harness oceanic energy. Here, we will also explore the stewardship, efficiency and diversity effects in the broader Qatari context.

3.2 Nanotechnology and Implications for Renewable Energy

One of the most promising aspects of current technology is the potential of increased efficiency that the use of nano-materials could provide with regards to solar panels and the collection/retention of solar energy. Essentially, nanotechnology refers to the manipulation of matter, either in the atomic, molecular, or super-molecular state (Mnyusiwalla, Singer and Daar, 2003), and developments within this sphere could vastly contribute to the increased efficiency of different processes, even going so far as to enable previously inefficient and unviable processes to become low cost and thus a great deal more useful.

The potential of solar technology and the massive amount of energy it could provide is something that has been focused on to an increasing degree in recent years (Smil, 2014). By and large, nano-technology has the potential to greatly increase the overall transmission rates and collection efficiency of the photonic energy that the sun provides, readily transferring it into useful electrons that more advanced batteries/storage systems can utilise as required. One potential breakthrough that has been discussed with regards to nano-

technology and solar panels is the ease and efficiency with which nano-tech can transform photons directly into useful energy without the loss of efficiency or utility (Vayssieres, 2009). However, consideration should also be given to what else nano-technology can provide with reference to renewable energy. Ultimately, the most utilised resource on the planet is liquid water. Yet, as the human population has grown and the overall pressure on existing water supplies increases, the level of potable water has consequently decreased. While the uses of liquid water might not readily be understood in terms of a type of renewable energy, the broad application of water, for example, for cooling nuclear reactors and providing energy for hydroelectric dams, is an issue of profound importance, both in terms of renewable energy and in terms of green energy.

The overall level of pollution in water resources throughout the world is an issue of major concern, and one that currently requires the expenditure of tens of millions of pounds each year to filter or neutralise these particulates. Using nano-technology to target specific toxins and eliminate them, or to bond them to a non-harmful compound, could perform water purification much more efficiently than existing technologies in the form of expensive and difficult-to-use filtration systems. With the advent of a more advanced level of nano-technology, it is feasible that purification could be performed at the nano-level thereby freeing up resources currently expended in the filtration process, and allowing global water resources to become purer and less adulterated over time (Hillie and Hlophe, 2007).

Another potential use for nano-technology that has recently been analysed is utilising it to promote overall energy efficiency. For instance, the typical incandescent light bulb only transforms 5% of the overall energy it consumes into light. This statistic reveals the fact that there is a 95% inefficiency ratio in the traditional incandescent light bulb (Goh et al., 2014). However, with a greater understanding of the properties of luminescence that certain molecules are capable of promoting, research into this particular field of renewable energy is exploring the potential for nano-technology to one day diminish reliance on traditional light sources, and to reduce the extraordinarily high levels of electricity that are required to create light in this way. For example, one set of experiments that has taken place has focused upon utilizing nano-technology as a means of creating naturally reactive/glowing particulates that, when charged with an electrical pulse, are capable of emitting light for an extended period of time. Utilising the incessant and exponentially increasing energy needs

as an impetus, nano-technology shows great promise for providing a much more efficient transformation of energy to useful light (Nizamoglu et al., 2007).

3.3 Solar Energy

Solar power is now becoming a more attractive source of energy than traditional sources. Compared to traditional forms of energy, it is more sustainable, less costly, abundant, easily accessible, quiet, and renewable (Abbasi and Abbasi, 2012). Due to these benefits, solar energy is becoming popular in all human societies as a means of saving resources for the future.

Despite the many advantages of solar energy, there are some disadvantages associated with it, for example, solar energy is currently very expensive to develop. However, this challenge does not necessarily prevent people from exploring and developing solar energy because further research and studies generally lead to the creation of lower cost technologies with time (Lewis, 2007). As researchers and scientists explore efficient technologies, so solar energy could become more economical over time. About 10 years ago, solar energy was derived solely from solar panels; however, recent technological advancements and scientific research have led to the development of solar energy using certain types of paint. The paints collect solar energy and direct them towards electrodes which are connected to storage devices such as battery banks. This development might not be the most preferred way of sourcing solar energy, but it shows the possibilities of new developments which could change the way people in society view and use solar energy for day-to-day activities (Kenisarin and Mahkamov, 2007).

Another disadvantage of solar energy is that it may require a large space to generate energy. For example, small households may not have sufficient space on the roof or in the yard to install solar panels (Wagner, Twesme and Hidalgo, 1992). Due to this challenge, most small homes have not embraced solar energy as a source of power for their households. Thus, solar energy may not be the best means of generating enough electrical power in Qatar at the present time.

Even though solar energy remains unpopular in Qatar, serving less than 10 percent of all energy needs in the country, the development of renewable energy has increased significantly over the past decade. The current state of solar energy in Qatar is significantly different from that experienced 10 years ago when natural sources of energy had not been explored. Environmentalists also continue to push for the development of solar energy as

an alternative means of generating power due to moral and logical concerns for the environment and this has contributed to its rising popularity. Indeed, renewable sources of energy are practical, efficient and sustainable means of producing natural power for human consumption.

3.4 Current and Future Prospects Regarding the Ability to Harness Oceanic Energy

For the purpose of this thesis, the most promising method of generating renewable energy is the use of currents and tides in the ocean. Qatar has sufficient natural resources, most notably the Persian Gulf, which offers good tides and currents for the generation of electricity, and different regions experience varying weather conditions, so one area could provide more efficient oceanic energy than other places. However, the exploration of ocean tides and currents as viable sources of energy has not yet been fully developed. Furthermore, the creation of oceanic energy could pose significant risks to coastal ecosystems. Another problem that prevents the development of sea tides and currents is prohibitive costs (Cruz, 2007). The devices used to tap energy from oceanic currents and tides may require a significant amount of funds to install and maintain. Considering these challenges, only a few steps have been taken to harness oceanic energy across the world.

Despite the challenges of developing oceanic energy, the geographical location of Qatar offers a good opportunity for future developments. As the best way to achieve an efficient source of electrical energy in Qatar is currently unclear, so policy makers should compare the strengths and weaknesses of each alternative to determine the best renewable source of energy to meet future economic, social and environmental needs. Governments and private firms in the energy sector should also focus on energy efficiency as the best method of saving existing resources and developing new ones for a sustainable future.

3.5 Efficiency and Broader Economics

Another global trend which is currently being promoted emphasises energy efficiency. From the information we have to date, it is clear that efforts to save resources and develop new means of energy generation often leverage new developments within the market as a means of pioneering sustainable energy sources, such as solar, or other forms of technology, to meet existing energy needs. However, responsible and sustainable energy production and use is also centred upon the manner in which current resources are effectively managed

(Reno, 2011). Some individuals believe that renewable and sustainable energy must only involve technological development for a better and greener world; however, sustainability is contingent upon the efficiency and stewardship that a particular resource can yield, rather than the assumption that the current rate of production cannot be altered due to environmental concerns or potential future realities, a more amenable and realistic approach that is put forward by many. For example, conservation has to do with the overall level of stewardship with respect to these resources (Lee and Zhong, 2014). What this means is that even existing, relatively cheap, and abundant sources of energy must not be taken for granted. Several hundred years ago, it appeared that the vast forests and woodlands throughout the world were virtually inexhaustible, yet deforestation is now a significant issue. Likewise, it must be appreciated that resources such as natural gas, coal, and hydropower are not guaranteed within an ever-changing environment that cannot be relied upon to exhibit immutability.

For this very reason, researchers and analysts have begun to promote the opinion that diversified, renewable, and sustainable approaches to energy must be adopted in order for a broader benefit to society to ultimately be realized (Kolios and Read, 2013). What this means is that rather than allowing a singular energy policy to define the way in which a given region or nation provides for its energy needs, a sustainable and renewable approach will engage with technology, improve stewardship of existing energy production, and seek to diversify this as a function of ensuring future needs and the existence of resources for further generations. While it might appear unnecessary to some that the continued use of exhaustible resources should be discussed alongside renewable and sustainable energy, the rate of destruction of these resources and the means by which they are used ultimately demand that the individual consider them rather than merely promoting a level of resource use and acquisition that has thus far been defined around the globe.

3.6 Sustainability and Renewable Energy Development Policies in Qatar

Global leaders adopted the sustainable development agenda of 2030 during the United Nations Sustainable Development Summit in 2015 (Richer, 2014). The Qatar National Vision 2030 (QNV) has aligned itself with this agenda in relation to environmental protection against pollution, reinforcing the use of renewable sources of energy for sustainable development. Through its environmental conservation agencies, industries, and corporate bodies, Qatar has integrated the goals adopted at the summit into the national

development strategy to protect the environment (AbdelAzim, Ibrahim and Aboul-Zahab, 2017), and various resources have been allocated to facilitate the achievement of the national strategic development policies on environmental conservation within the specific timelines.

Although Qatar has been criticised in the media for emitting GHGs for an extended period, the country has recently increased its efforts to fight against global warming and sudden climate change in the Middle East. Indeed, Tosun and Leininger (2017) state that through its strategic plans, Qatar has placed itself as a global benchmark for the use of renewable sources of energy for a sustainable future. Qatari policy makers are now focussing on providing a clean and efficient energy environment that can contribute in various ways to addressing the challenges of climate change and protecting the environment against pollution in order to achieve sustainable development (Ameen, Mourshed and Li, 2015).

To address these challenges, Qatar has now adapted several essential policies aimed at reducing overreliance on the use of fossil fuels such as petroleum. In addition to this, measures have been considered to explore renewable sources of energy. Renewable energy is environmentally friendly since it does not pollute any aspect of the environment (Atalay, Kalfagianni and Pattberg, 2017). Therefore, it could enable the state to achieve both its national development strategy as well as the sustainable development goals on environmental conservation within the set time limits.

Environmental conservation tops the four pillars of Qatar's Vision 2030 (Vision 2030 will be discussed in more detail in section 3.9), and the country intends to rapidly harmonise ecological protection, social development and economic growth (Abdmouleh, Alammari and Gastli, 2015). For example, Qatar is set to open a 200 megawatts solar power project, and it has also initiated measures to achieve 10 gigawatts of solar energy by 2030. Such initiatives renew the commitment of Qatar to pursue renewable energy sources like solar and wind to protect and conserve the environment against pollution (Ameen, Mourshed and Li, 2015).

Through the Ministry of Energy and Industry, in partnership with relevant stakeholders, Qatar has adopted its first-ever renewable energy strategy that seeks to diversify its sources of energy and reduce harmful emissions into the environment (AbdelAzim, Ibrahim and Aboul-Zahab, 2017). Since Qatar is the world's largest producer and exporter of liquefied natural gas, the ministry has undertaken to use gas to generate energy as opposed to coal

and petroleum which release carbon into the atmosphere leading to climate change. Moreover, the state has adopted a green building strategy for the infrastructure and construction sector (Tosun and Leininger, 2017). This initiative is engineered to create sustainability through quality standardisation in water, energy, internal environment and materials. Additionally, the committee responsible for the organisation of the World Cup in Qatar in 2022 has assured that the event will leave a neutral carbon footprint. Therefore, all the football facilities are being constructed according to the standards approved by the Fédération Internationale de Football Association (FIFA) to ensure sustainability (Abdmouleh, Alammari and Gastli, 2015).

Qatar's renewable energy policy focus on the realization of long-term gains in making renewable energy sources part of the national energy supply mix. The country has made efforts towards the creation of policy transfer mechanisms to ensure national adoption of renewable energy technologies, with policy transfer from developed countries focusing on areas such as tax credits for residential and commercial premises that install solar systems (Lester, 2016). Other aspects of policy implementation focus on the creation of a supportive research environment to aid development of renewable energy technologies, for example, the creation of Qatar Foundation Education City (Atalay, Kalfagianni and Pattberg, 2017). As part of environmental protection consciousness, Qatar has also formulated a sustainable energy strategy to help in reduction of greenhouse gas emissions which have been proven to have damaging effects on the environment. Therefore, the use of renewable energy sources is a step towards achieving national hybrid energy resources (Touati et al., 2013).

Furthermore, Qatar has taken measures to ensure its urban plan is in line with both the spatial interpretation of the Qatar national strategic plan and with strategic guidelines for the development and management of vibrant communities that are sustainable (Abdmouleh, Alammari and Gastli, 2015). Its strategy is to provide decent living standards for both expatriates and citizens with a view to improving the quality of life for all. For instance, Lusail city in Qatar is currently the largest multi-use city that has adopted the sophisticated Global Sustainability Assessment System (GSAS) standards for all its constructions. For that reason, it has been described as the world's most sustainable city, with a complete infrastructure development pack including health centres, schools, mosques and government offices (Atalay, Kalfagianni and Pattberg, 2017).

Throughout its development strategy, the government of Qatar has laid down significant policies to ensure that all citizens have access to affordable, sustainable, reliable and modern energy sources (Richer, 2014). For instance, Qatar District Cooling Company (Qatar Cool) has obtained a notice to use treated wastewater for its cooling operations to reduce pressure on the potable water supply. Furthermore, Qatar has implemented a rationalisation programme for water and energy consumption in order to reduce the per capita rate of electricity consumption by 18% and water by 20% (Ameen, Mourshed and Li, 2015).

Qatar with the help of its foreign affairs policy recognizes the essence of the global partnership for sustainable development. Hence, the state is undertaking measures to hold and strengthen its global presence. It has played host to high ranking sustainable development conferences (Richer, 2014) and instituted policies to provide financial grants to other developing countries to alleviate poverty and build infrastructure. Equally, Qatar has established robust educational and research institutions and has already sent many students to foreign states on scholarships to study alternative measures and solutions to the challenge of climate change and environmental conservation, in the interests of achieving sustainable development using locally available resources (Abdmouleh, Alammari and Gastli, 2015).

3.7 Sustainable Technology Potential in Qatar

Qatar's focus on incorporating renewable energy sources into the national grid is part of Vision 2030's aim to achieve sustainability and environmental protection and preservation, and the country is considering adopting renewable energy despite having large amounts of natural gas deposits to meet domestic energy demands. A survey by British Petroleum has suggested that Qatari oil reserves would last for the next 63 years if the production rate of 2007 continues (Gastli and Armendariz, 2013). However, the move towards renewables is prompted in part by the availability of high levels of sunshine and wind, and the fact that the use of renewable energy sources would enable Qatar to mitigate future problems such as food insecurity and water scarcity (Meltzer, Hultman and Langley, 2014).

Qatar's move into introducing renewable energy as part of the domestic power mix is motivated firstly by the need for reduced dependence of fossil fuels, and then to address new energy demands in supporting food systems production and distribution of water across the country. According to the report by Meltzer, Hultman and Langley, (2014),

Qatar is the fifth highest per capita emitter of greenhouse gases in the world due to its overdependence on fossil fuels, and, along with other GCC nations, will suffer the effects of climate changes as a result of uncontrolled emissions associated with the exploitation and use of fossil fuels in gas-fired electrical power generation. Additionally, Qatar's adoption of renewable energy focuses on saving its own oil and gas resources for export to generate foreign exchange and for use by future generations (Al-Maamary, Kazem and Chaichan, 2017).

The increase in domestic energy demand in Qatar has made it necessary for the nation to consider the exploitation of renewable energy resources. The country has a geographical advantage when it comes to solar power as it receives reliable amount of sunshine throughout the year, and adoption of renewable energy would ensure Qatar could make maximum use of natural solar energy, a renewable resource which is widely available within the country. Qatar has also focused on the implementation of sustainable energy programmes that will help reduce energy waste in the process of using renewable energy sources in order to reduce the energy intensity of electricity consumption in the country.

Steps are also being taken to raise awareness of clean energy opportunities through public campaigns and by facilitating energy management programmes in buildings, including measures to encourage energy conservation (Papadopoulou et al., 2013). Along with the development of photovoltaics and wind energy generating plants, sustainable buildings initiatives are an important step toward the realization of the economical use of renewable sources of energy (Meltzer, Hultman and Langley, 2014). Furthermore, in addition to meeting international obligations in relation to renewable energy, such green initiatives help to promote a positive international image for Qatar in terms of renewable energy implementation (Koch, 2014). For example, the Qatari government project hosting the 2022 World Cup has proposed solar power technologies to undertake cooling of stadiums (Sofotasiou, Hughes and Calautit, 2015).

Although Qatar has encountered several technical challenges in relation to the adoption of renewable energy technologies, notably in developing back-up and storage systems and in running commercially viable plants (Gastli and Armendariz, 2013), these have provided notable opportunities for economic and knowledge development. Therefore, the country should continue with the implementation of renewable energy sources since they have the potential to lead to further economic diversification and greater environmental protection.

3.8 Education in Qatar

Given that a central concern of this thesis is the role education can play in promoting the uptake of renewable energy among Qataris, it is helpful to provide an overview of the education system in Qatar.

From the 1950s onwards, compulsory education has been employed throughout the Qatari educational system, with the Ministry of Education (MoE) established in 1957 (OxfordBusinessGroup, 2004). Prior to this, methods of education were contingent upon boys and girls learning basic writing and reading skills through Islamic schools placed throughout the country (Fromherz, 2012). Recently, education in Qatar has undergone another notable shift in that it has been subsidised and primary and secondary schooling is now completely free. Moreover, the government also sponsors university education, providing that the proper standards and marks are attained by the student. In addition, studying abroad for higher education is promoted by the Higher Education Institute which defrays fees for students to employ their knowledge and experience in Qatar when they return (COP18/CMP8, 2012).

Qatar University, which dates back to 1973, has long provided a basic framework for how higher education would be developed within Qatar. With seven colleges of education, covering Sharia and Islamic studies, Law, Arts, Sciences, Engineering, Business and Economics and Pharmacy, Qatar University is an essential cornerstone for how higher education came to be represented and understood within the country (COP18/CMP8, 2012). As Professor Sheikha Abdulla Al-Misnad, Qatar University's current President, has said: "Qatar University has always strived to fulfil its mission as the country's beacon of knowledge. With seven colleges, over 30,900 graduates and a faculty community of almost 700 members, the university is also an active member in several prestigious regional and international associations, including the Union of Arab Universities, the league of Islamic Universities and the International Association of Universities" (COP18/CMP8, 2012). The Center for Sustainable Development at Qatar University, developed in line with Qatar National Vision 2030, is engaged in state of the art research and offers a number of programmes addressing renewable energy, natural resource management, waste management, and food and water security. Members of staff from Qatar University are among the renewable energy experts interviewed for this study (See Section 5.4).

A second significant entity in the field of Qatari education and development is the Qatar Foundation. Founded in 1995, it is a non-profit organisation which focuses on three core tasks: education, community development, and science/research. The foundation partners with universities, colleges and educational institutions across the globe, and also provides academic and training programmes within the country. In particular, it has established the Qatar Science and Technology Park (QSTP), where some of the best scientific research and development companies are working with local partners to find solutions to pressing needs, thereby boosting Qatar's knowledge economy. Again, representatives from the Qatar Foundation are amongst the experts interviewed for this research study.

3.9 Future and Vision of Qatar

Countries such as Qatar, which have a vast wealth of natural resources, have found it necessary to create a vision for the future that will provide for continued growth and economic development once natural resources may no longer be viable. Since 2008, the Qatar National Vision 2030 (QNV) has been in operation. This has presented Qatar with a further understanding of current and future trends with the goal of creating a more developed and sophisticated country by the year 2030. This is to be accomplished through balancing the present generations' needs against future demands and working to strengthen the country's ability to enhance the future wealth and quality of life of all Qataris.

His Highness Sheikh Tamim bin Hamad Al-Thani, Emir of Qatar demonstrated this by stating that, "Wise political leaders know the direction in which they would like their societies to develop, balancing the interests of present and future generations.... Qatar National Vision 2030 builds a bridge between the present and the future...The welfare of our children, and of our children yet to be born, demands that we use our resource-wealth wisely" (Qatar General Secretariat for Development Planning, 2008, p. 4). In other words, Qatar's strategy and framework is not just to address current issues, but also to seek to outline and achieve long-term outcome goals (Luomi, 2012 and Qatar General Secretariat for Development Planning, 2008).

To meet these aims, QNV 2030 is based on four pillars: Economic, Social, Human, and Environmental Development needs. The two which are of most relevance to this study are the Human Development and Economic Development, so these are described below.

The Human Development pillar focuses on the current level of societal improvement. This is to be accomplished by developing various educational programmes through different

methods, promoting the Islamic religion, and encouraging Qatari ethical and cultural traditions. It is hoped that through the advancement of the educational system, the population will be encouraged to engage with new ideas and new forms of critical thinking that can assist the nation in its developmental needs.

The Economic Development pillar is concerned with protecting the future generation's rights to quality of life and the need to address the overall unsustainability of current levels of resources. This is to be accomplished by providing worthy investments which could be utilised as a means of creating a dynamic future of prosperity and sustainability throughout the nation (Qatar General Secretariat for Development Planning, 2008).

This has to be taken into account with respect to the future as Qatar must find the strategy that is best suited to balance natural wealth with Qatari environmental and ecological needs. In other words, this is the very definition of 'natural sustainability' (Luomi, 2012).

3.10 Energy Consumption and Generation in Qatar

As research has shown, there is currently massive consumption of generated electricity in Qatar, 80% of which is derived from the burning of natural gas and petroleum (Marafia and Ashour, 2003). According to the Global Investment Center (2000) the nation's oil reserves stand at 3.7 billion barrels and produce around 806,000 barrels per day (bbl/d), whilst the consumption is 45,000 bbl/d. Although the gas reserves are 300 trillion cubic feet (TCF) and petroleum products are roughly 690 billion cubic feet (BCF), even a consumption rate of around 522 BCF is unsustainable. Thus, it is expected that within 40 years, the oil resources will begin to be depleted creating a situation in which current levels of exploitation and consumption is untenable (Alnaser and Almohanadi, 1990). In terms of its 'ecological footprint', a concept created in the 1990s to help explain the influence and limitation of human demands on natural resources, Qatar has been defined as having a very high ecological footprint, or, in other words, as a country in which consumption and pollution are 6.5 times that of the earth's carrying capacity (Luomi, 2012).

3.11 Renewable Energy and Sustainability in Qatar

Finding the right renewable energy and sustainability projects has become the most obvious solution to avoid the issues discussed above. Marafia and Ashour (2003) consider wind power to be one of the fastest and potentially the best energy solution for Qatar, capable of producing many millions of MWs of energy annually. Although it is true that this form of

generation is environmentally friendly, turbine costs, maintenance, and the cost of installation are some of the main reasons why nations have not been quick to embrace this technology. Equally, not all regions are suited for the use of wind power, with some receiving only a small amount of wind on a daily or yearly basis. However, wind power installation has still been growing globally over the years as shown in Figure 3-1. Certain regions within Qatar are more favourable than others, and wind could be a possible energy source in the country, particularly in Halul. In Qatar, small to medium sized wind turbines would be suitable where wind speeds of 20m or above measure in the middle of 5.1m/s on-shore and 6.0 m/s off-shore. Moreover, the generation cost for every unit of energy from wind production could be less than 0.0289ECU/KWh, while it is 0.0342 ECU/KWh from a typical gas production (See Figure 3-2).

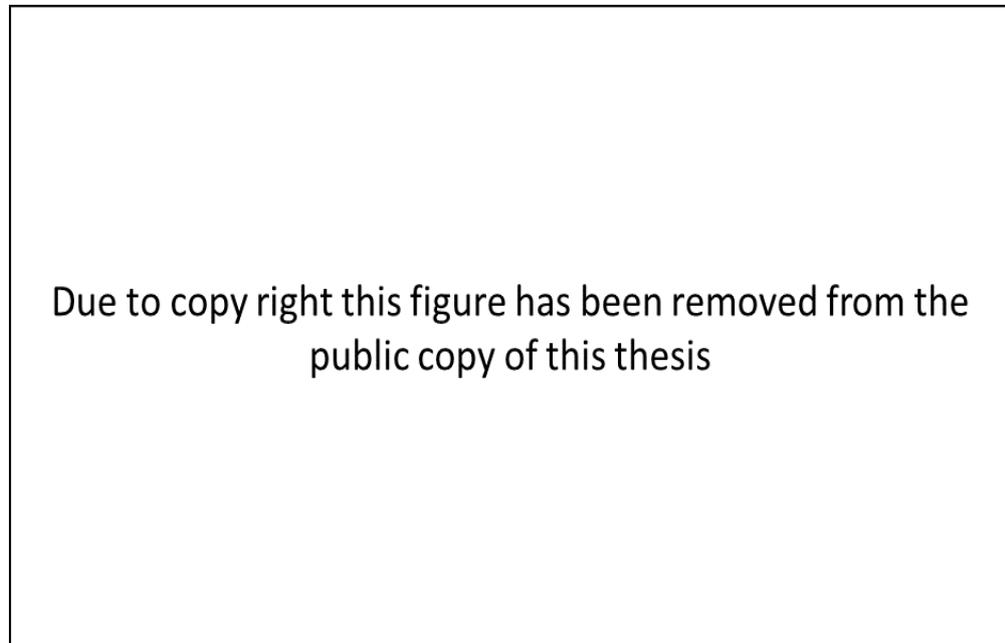


Figure 3-1: Growth in Wind Power Installations Worldwide (Marafia and Ashour, 2003).

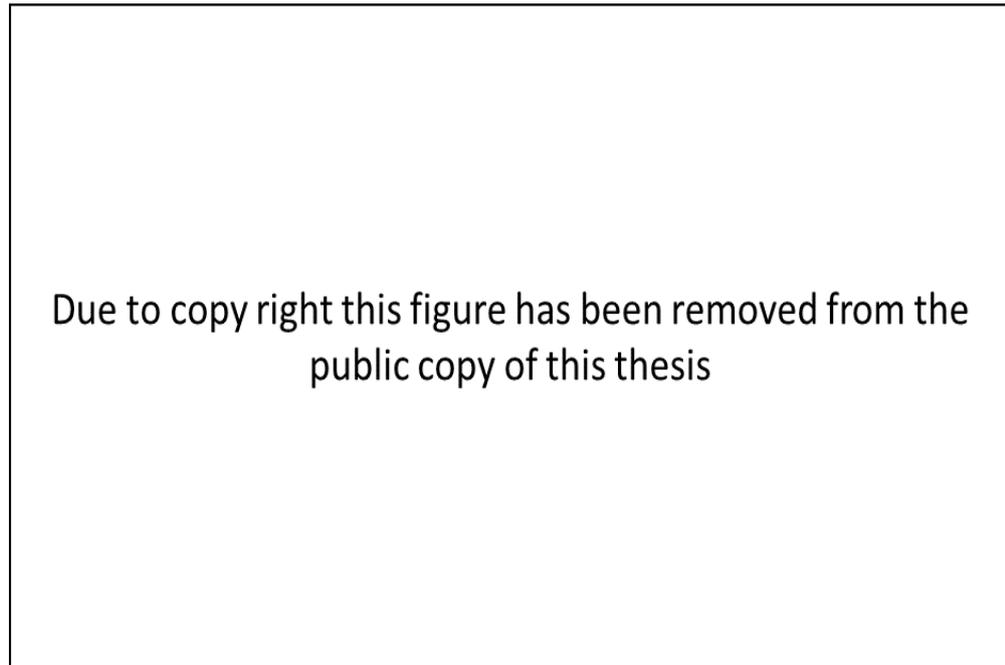


Figure 3-2: Effect of Capital Cost and Interest Rate on Wind Energy Generation Cost for a Wind Turbine Installed at Halul (Marafia and Ashour, 2003).

By 2020, Qatar aims to create about 2% renewable energy from solar generation, with 640MW of solar PV, and the hope is that around 1 MW of solar energy production capacity will have been installed by then (Al-watan, 2013). Moreover, Qatar is one of the countries that is financially supporting renewable research with solar taking a prominent place in the National Priorities Research Program (REN21, 2013 and ALraya, 2012). This was supported by the announcement of Her Highness Sheikha Moza bint Nasser, at the 2013 Qatar Foundation annual research conference, that energy security is one of the basic challenges that will have to be addressed by Qatar.

3.12 The Cities of Renewable Energy

3.12.1 A Starting Point

Where other nations and indeed other cities have struggled with the means by which they can implement green energy technology/renewable energy, Qatar is in a unique position with respect to this dilemma. The underlying reason for this is that the nation itself is developing in a unique manner. Due to the overall level of wealth that Qatar has accrued over the past several decades, the nation is expanding at a rapid rate (Hashem, 2015). Further, rather than merely adding to the existing infrastructure within many of Qatar's main cities, the nation itself has chosen to build new cities and form entirely new residential

and commercial areas where none existed previously. This growth plan is optimistic but presents unique opportunities for the development and consideration of green/renewable energy alternatives that society can leverage. Due to the fact that these cities are truly being born from nothing, the potential for developing a renewable and green infrastructure base is perhaps higher when compared to other regions of the world. Yet, opportunity alone does not create a guarantee that green and renewable energy will be the locus of interest for the developers of these cities. Instead, the remainder of this chapter will consider the ways in which the approach adopted determines whether or not the renewable/green infrastructure and energy provision that Qatar will implement in its new and developing cities will ultimately be successful or not (Koch, 2014; Alzubaidi, 2013).

3.12.2 Short Term Outlook

Whereas it may be tempting to utilise Qatar's massive financial reserves as a means of purchasing the most advanced green and renewable energy systems currently available, this particular temptation must be resisted, at least partially. The underlying reason for this is the fact that Qatar is a unique nation within a unique latitude that exhibits a litany of unique environmental challenges. First and foremost, among these is the fact that Qatar is a relatively hot climate that has very little rainfall and must therefore be considerate of the overall resources that are involved in any means of energy production. One of the most effective processes that can be pursued is to ensure that Qatar utilises targeted metrics and goals with respect to what it envisions as the future of sustainable and green energy within the nation. As such, rather than merely leveraging the state treasury as a means of purchasing the most efficient systems, a thorough and complete list of metrics and targeted goals must first be outlined (Attallah et al., 2013). For instance, nations that have not engaged in a thorough level of analysis with respect to targeted goals and metrics have found themselves with extraordinarily costly green and renewable energy sources that do not readily lend themselves to further development or changes that the future might bring. Likewise, such short-sightedness creates a dynamic in which growing cities and changing demands can override the positive benefits that might otherwise have been realised.

3.12.3 Projections

Another necessary aspect of green and renewable energy implementation within the nation of Qatar and its rapidly growing cities is an appreciation of the importance of projections. Whereas it is ultimately impossible to determine how the global marketplace might change

in the coming years and demographics shift in future decades, it is possible and necessary to at least engage with a consideration of these dynamics. For instance, if it is projected that certain cities in Qatar, or indeed entire regions, may grow at a disproportionate rate and thus experience an increase in overall energy needs, decision-makers need to be keenly aware of these projections in order to determine the renewable energy strategy that Qatar should pursue. Rather than merely dismissing this particular process as nothing more than guesswork, it is necessary for stakeholders within planning and decision-making to ensure that as many factors as possible are considered and the future development of Qatar and its regions are well understood. In effect, not only can massive amounts of money be saved through such projection analysis, it is also possible to engage any further level of economic development and planning at the same time. As such, stakeholders within the economic sectors of Qatar will benefit from the way in which the future economy of the nation develops and how individuals within key sectors are affected (Al-Khalifa and Aspinwall, 2000).

The current population of Qatar is likely to double in the coming few decades. According to the preliminary results of a recent census, there are now believed to be “1.69 million people living in Qatar compared to 774,000 when the last census was taken in 2004” (Hyslop, 2010, n.p.). One of the main contingent factors of this prospectus for population growth is the fact that direct change must be engaged within Qatar based upon this demographic shift and growth, due in part to the fact that changes in energy needs and the growth and renewability of energy demands immediate planning and construction as a means of targeting and meeting these metrics even with traditional forms of power provision, licensing and other requirements. This makes the study of renewable and alternative energy resources highly significant because when the population grows at such a rapid speed, the current sources of energy are likely to be in short supply. Therefore, greater efforts must be made to come up with alternate sources of energy for Qatar.

Another reason why the nation of Qatar must be focused on future goals and the means by which demographics are predicted can be evidenced within the future turnaround time that exists between decision-making with regard to energy strategy and actual implementation. For instance, within developed regions such as Western Europe or the United States, it takes a significant amount of time to shift from one source of energy to another. This is natural because finding alternate energy sources and developing policies regarding the use of new energy sources takes time. Various factors are considered while developing and

implementing new energy policies, including population growth estimates, financial resources, and availability of land and required resources for policy implementation. “Combined with rising population levels, climate change will aggravate existing challenges regarding water scarcity and food security and raise new challenges through adverse impacts on human health, economic development and the environment” (Meltzer, Hultman and Langley, 2014, p.1). Now, if a sudden fluctuation or drop in the cost of existing fossil fuel resources were to arise, the nation of Qatar would experience significant shortfalls with respect to its budget and planning that might contribute towards seeking an alternative energy strategy in the future.

3.12.4 Education of the Populace

In order for definitive and lasting change to take place, it will be necessary to integrate a level of change with regard to educating the Qatari populace. Regardless of the alternative energy approach that is promoted or the green energy strategy that is developed, the degree and extent to which the populace supports and is engaged in such a dynamic shift is an essential component in whether or not it can eventually be successful. For example, if solar energy is deemed to be necessary for meeting future energy needs, rather than merely foisting this change upon the general populace, it will be necessary to gain stakeholder buy in. This element can be accomplished in a number of ways, however, education of the populace is the most effective (Lindsey, 2013).

3.13 Alternative Forms of Energy and the Decision of Which to Pursue

Another noted difficulty with regard to the future prospects for energy policy and renewability within Qatar is that there are many alternatives that can be pursued, none of which have been determined to speak definitively to the needs of the population. With this in mind, the first stage of any renewable energy strategy will be to narrow and determine what approach is most effective for the nation. The second stage should then be the selection of appropriate energy forms, and the allocation of finances towards them in a decreasing manner. The underlying reason for this is the need to introduce several different forms of renewable energy into the energy strategy. Planning and implementation will all be contingent on the fact that technology is continually changing and shifting (Global Data, 2012), and, given this, Qatar could find itself at a disadvantage if it were to pursue a solitary energy policy within the next few decades. For example, if solar were to be selected, changes in technology could create a situation by which tens of billions of pounds of

potential early investment were effectively wasted should there be a breakthrough in technology and the feasibility of solar power generation. However, by seeking to hedge renewable energy bets by leveraging alternative forms of energy generation at the same time, Qatar is inevitably increasing the overall level of investment that might otherwise be directed towards creating a network or grid of renewable energy. This is likely to decrease the potential efforts that could be made towards achieving this end and might, therefore, prove ineffective in the long term.

3.14 Business Relations and Energy Policy

The role and impact that industry and business will have with respect to the move towards different sources of energy is vital for understanding the way in which this entire process will take place. Ultimately, the success or failure of renewable energy implementation plans and the degree and extent to which they are adopted is contingent on a number of factors, not simply the issue of education explored above. As with any new practice, or technology, first adopters play a pivotal role with respect to the way in which consumers and other stakeholders within the economy come to renewable energy as a complementary function of the way in which life within Qatar is defined. Thus, state-owned industries and businesses in the country can play a pivotal role in seeking to shift public opinion towards renewable energy and its overall potential within the nation long before the wide scale implementation of renewable energy plan is in operation (Hosseini, Yazdan and Ehsan, 2012).

At this stage, it is helpful to look at examples of government action to shift public opinion beyond Qatar's borders. One is the European Union's Remourban project which is aimed at reducing dependence on traditional energy and the reduction of carbon emissions through the construction of smart cities (European Commission, 2014). Nottingham (UK), Tepebaşı (Turkey) and Valladolid (Spain) have all benefitted from this project which has seen over 190 electric vehicles together with charging locations introduced and over 900 accommodation units fitted with energy efficiency systems. The project is based on providing high value to the energy services and is intended to encourage energy consumers to change their choices and actions (Ibid.).

In addition, for the development of renewable energy and attempts to make a nation-wide strategy, the private sector can also be engaged with respect to accomplishing this particular goal. As an illustration, one can consider the way in which the government of Qatar has

provided powerful incentives to encourage private industry to become a primary motivating force with respect to renewable energy and the means by which this particular facet of energy production will come to be a mainstay of the Qatari state within the coming years. Direct incentives and other fiduciary tactics can be used as a means of creating a dynamic system in which the overall requirements of the energy sector can be decreased and the overall efficiency of industry and business increased. Additionally, the benefit of this particular approach is that the Qatari utilities face a situation in which extending the grid to each and every entity is not nearly as costly as it might otherwise be had those entities made no attempt at energy independence in the past (Berrebi, Martorell and Tanner, 2009).

As a means of learning from this example, it is necessary for policymakers and decision-makers within the government to ensure that significant fiduciary incentives exist for business and the private sector/industry as a means of encouraging the development of renewable forms of energy and moving the dynamic of the nation in this direction. This has several potential benefits. The first of these relates to the situation that has been defined above with respect to the case of Qatar. The second relates to the way in which stakeholders within these businesses will come to understand the tactical benefits that renewable energy will provide to the economy and to Qatari spirits. With first-hand understandings of this dynamic, individuals will be much more likely to create a positive understanding of the means by which renewable energy can directly benefit both the environment as well as the bottom line of industry and business. This would create a favourable situation in which the best practices of energy conservation and renewable energy technology could be diffused within society and allow for a gradual osmosis of the technology prior to any government mandated changes that might otherwise meet a certain degree of resistance.

3.15 Targeted Goals and Metrics

In terms of targeted goals and metrics, it is necessary for the government and the energy sector of Qatar to set these in the very near future, due in part to the fact that any changes will take years to accomplish, and as such should be thoroughly planned in order to maximize efficiency. As discussed above, it will be necessary for the nation of Qatar to encourage private sector engagement prior to any level of infrastructural investment in renewable energy or educational programmes seeking to shift the ways in which individual consumers consider this particular facet of energy generation. The underlying reason

behind this is to allow the level of endogenous adaptation without the spectre of requirements that might otherwise discourage individuals from adopting technology that could facilitate lower costs and decrease negative impact upon the environment. This particular phase should be expected to last throughout the entire adaptation process; however, the first few years are perhaps most important as they have a profound impact on the way in which the culture of a country comes to view the issue of renewable energy and how business and industry conducts its own micro energy policy (Marafia and Ashour, 2003). The three main streams of energy resources that should be analysed include the economic stream, financial stream, and energy analysis (Menegaki, 2008). Accompanying this process, an educational focus should be presented that also stays the course of the entire process, however long it might take. After these two stages have been conducted, leveraging the investment fund that has been indicated above will be required as a means of providing necessary equipment, research and development, and knowledge with respect to renewable energy generation. Many different avenues will need to be pursued. However, it is the expectation of this analysis that solar energy will most likely be the means by which the majority of this renewable energy is produced. This particular stage will begin approximately 10 years after the project itself has been determined and relevant research and development has been conducted in order to determine the most efficient means of renewable energy generation within the region.

3.16 Summary

As the discussion above indicates, it is clear that the issue of renewable energy generation within the nation of Qatar is more complex than merely specifying a particular direction that the government should pursue and allocate funding to. As such, the broader requirement is to fundamentally analyse and then reconfigure the system so that it is able to promote the needs of all individuals, to educate them accordingly, and provide exemplars for the way in which renewable energy can efficiently and productively meet the needs of industry and business, and thereby the needs of the broader populace. Simultaneously, it is also necessary to provide adequate funding with respect to research and development and to seek to diversify the energy programme so that it is not overly reliant upon one particular form of renewable energy generation.

Furthermore, it is also necessary to reference the fact that unique dynamics in the global economy will likely create another situation in which hardship is evidenced within the

coming years. As a result, the fact that this is a multi-decade project that will require continuous and varying levels of sponsorship, the need to create a sub fund within the project as a function of countering these economic stresses is an essential component in seeking to promote its overall success. Ensuring that the project is able to remain relevant, irrespective of any economic hardship that might be faced is a vital part of developing a renewable energy policy that is robust and capable of withstanding both internal and external pressures. However, these difficulties in and of themselves provide unique opportunities with respect to the way in which Qatar can seek to address them. Ultimately, implementing effective renewable energy policies will provide an example which the rest of the world can follow in seeking to generate a higher percentage of renewable energy and discontinue traditional forms that are harmful to the environment.

The next chapter sets out the methodology employed to conduct this study and describes the study location, the study design, the methods used for the collection and analysis of the data, and the ethical issues which had to be addressed.

4 Methodology

4.1 Introduction

In this chapter, the methodology used in the research is presented. The geographical location where the study was conducted, the study design and the samples are described. The instrument which was used to collect the data and the encompassing methods executed to maintain the reliability and validity of that instrument are also described.

4.2 Research Philosophy and Approach

The research philosophy used in this research is interpretivism. Interpretivism assumes that objective reality is not always discoverable and that subjective realities can be used to accumulate subjective evidence of what amounts to a close approximation of reality. This is because social actors are subjective in their thinking, interpretations and reactions so that multiple realities exist. In this regard, interpretivism proceeds on the basis that meaning and understanding from multiple individuals can aid in arriving at a close approximation of reality and truth (Willis & Jost, 2007).

Following the research philosophy, the collection and analysis of data in this research is conducted with a qualitative approach by using inductive reasoning (See Figure 4.1). Inductive reasoning starts out with specifics and moves toward generalisations and theorising. Inductive reasoning does not seek to confirm or disprove theories but attempts instead to identify subjective truths or to end with a theory.

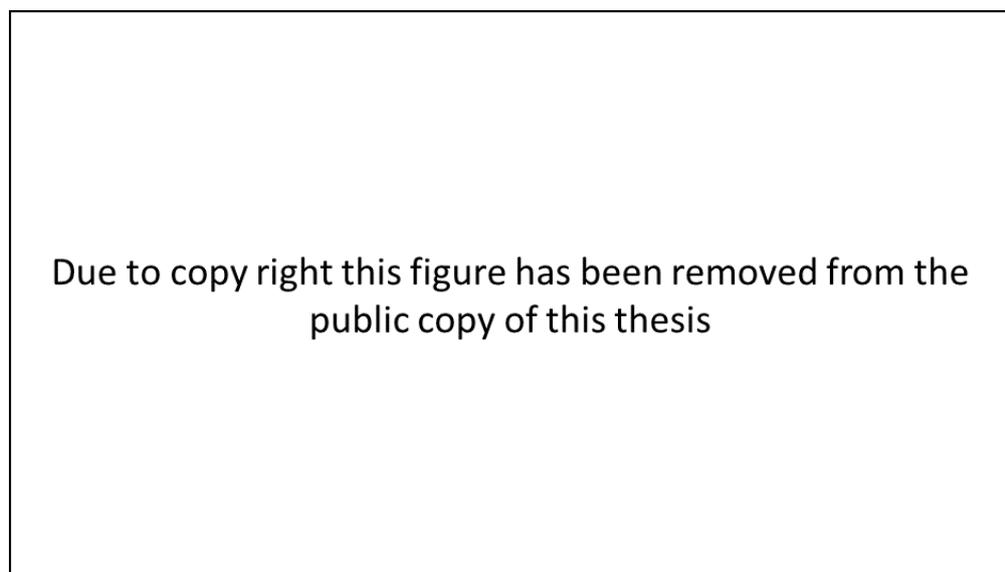


Figure 4-1: Inductive Reasoning (Image produced by author from Roulston, 2010)

4.3 Research Methods

This research study can best be described as an exploratory and descriptive study, which seeks to identify attributes for and obstacles to sustaining and implementing successful and efficient renewable energy policies. The research method also involves a mixed method so that the weakness in one method can be compensated for by the strengths in another method. In this regard, both qualitative and quantitative methods are used in the collection and analysis of data (Johnson, Onwuegbuzie and Turner, 2007). The collection and analysis of qualitative and quantitative data carries on “in many phases in the research process” and, through taking this approach, the researcher gains and shares a more dynamic understanding of the “research problems than either approach alone” can produce (Creswell and Clark, 2011, p. 5).

According to Creswell and Clark (2011), the researcher is mindful to merge and converge the qualitative and quantitative data. The idea is to ensure that the quantitative and qualitative data are supportive and complimentary of one another. They further emphasise that it is inadequate for a researcher to simply collect and analyse quantitative and qualitative data, but rather the researcher is required to mix the data so as to form a more complete image of the problem (Creswell and Clark, 2011).

For the purposes of this research, a triangulation method was used in the mixed methods research. A triangulation mixed methods research requires that in addition to collecting qualitative and quantitative data, the researcher merges the two data sources and relies on the results in forming a better understanding of the “research problem” (Tashakkori and Teddlie, 1998, p. 5). In taking the triangulation mixed method, the researcher compares the two data results and observes and thinks about consistency in the results (Camerino, Castaner and Anguera, 2012). The author will not be influenced by the conceptual framework but will use the conceptual framework as a means of analysing and interpreting the results.

A triangulation mixed method approach aims at complimenting effects. The strengths and weaknesses of the quantitative data are complimented by the strengths and weaknesses of the qualitative data. For example, quantitative data usually involves large sample sizes while qualitative data involves smaller sample sizes. Therefore, the weaknesses in the small sample size under qualitative data are complimented by the larger sample size in the quantitative data. However, since qualitative data involves small sample sizes, the data

obtained is far more robust and detailed than the data obtained from larger sample sizes under quantitative data. Therefore, the quantity of quantitative data and the quality of qualitative data combine to improve research results (Camerino, Castaner and Anguera, 2012).

4.4 Data Collection: Design of the Research Instruments and the Research Targets

4.4.1 Primary Data Collection

Both purposive and random sampling methods were used in this research for the recruitment and participation of a population of experts in renewable energy in Qatar. Random sampling was used for the recruitment of and participation of a population of energy users in Qatar and of Qataris in the UK. The random sampling participants took part in the surveys while the purposive sampling participants took part in the semi-structured interviews.

Purposive sampling is best understood as a non-random sample which is aimed at the collection of data from a population that is expected to have the requisite knowledge and experience to provide the information that the research study is aimed at obtaining (Tashakkori and Teddlie, 2010). In order to obtain a purposive sample population, the researcher identified and recruited experts who have experience in managing efficient energy and promoting or advising on renewable energy and who have been exposed to renewable energy policies and practices in Qatar.

The purposive population sample were asked to participate in a semi-structured interview designed to identify their knowledge and experience with renewable energy strategies and their experiences and perceptions of the reality of Qatar's renewable energy policies and practices.

Semi-structured interviews were used to provide the researcher with the flexibility to ask questions for clarification or for following up with additional questions in the event that new information was offered, or it became clear that the interview subject wanted to offer information that was not included in the question. Semi-structured interviews involve a pre-prepared list of questions that permit the researcher to go off-script in appropriate circumstances (Wengraf, 2001). Thus the researcher prepared a list of questions that were

merely preparatory in nature with the understanding that the researcher would go off-script when necessary.

The random sampling technique was used to recruit both Qatari citizens in the UK and residents of Qatar. Also known as “accidental” or “haphazard” sampling, random sampling is among the most popular, yet also the weakest and least reliable sampling technique used in the behavioural sciences (Gravetter and Forzano, 2015, p. 598). In the interest of time, money and resources, random sampling involves the recruitment of individuals who are easy to reach. As Gravetter and Forzano (2015) explain, random sampling is best understood as a sampling technique in which individual participants “are selected on the basis of their availability and willingness to respond” (p. 147).

In this study, the first questionnaire was distributed among Qataris in the UK by The Culture Attaché’s Office, Embassy of The State of Qatar in the UK, through e-mails; meanwhile, for the second survey the residents of Qatar were approached and recruited electronically from social media networks and other online locations where relatively large populations gather. The random sampling was preceded by plans to deliberately target individuals who live in Qatar’s larger cities and Qataris in the UK who are experiencing energy bills for the first time, and who are over the age of 18. The individuals who fitted these criteria and were readily available were recruited for participation in the study. The age is important because it means participants had the legal ability to consent to participation in the study.

Random sampling was used to complete a survey designed to measure variables associated with attitudes toward renewable energy policies and practices and the participant’s own energy efficiency practices and knowledge. The surveys were presented in two languages English and Arabic, as Arabic is the official language in Qatar and English is widely spoken. The survey structure was multi-dimensional in that one part was designed as a blind item in which statements containing the variables were rated pursuant to a Likert scale, but it also contained matrix and open-ended questions. Each statement in the survey was accompanied by a Likert scale and participants were asked to select the appropriate rating for each statement. The open-ended questions permitted the participant to freely express themselves (Creswell, 2013).

In order to properly recruit participants for the semi-structured interviews all potential participants were provided with a consent form. This informed the potential participants of

the purpose of the research and the research topic and explained that they were under no obligation to participate. They were asked to sign the form if they agreed to participate in the study. The interviews and consent forms were presented almost simultaneously in that once a consent form was signed, the interview commenced. The semi-structured interviews were arranged in person with the potential participant. The interviews were conducted face to face and online (via Skype) at a time that was convenient to both the researcher and the participant. Semi-structured interviews were slated for 30 minutes to 1 hour and all the interviews were well documented in writing.

Altogether the target for the first questionnaire was 200 and the second survey was 500 as this number is substantial enough to satisfy the ends of quantitative data in terms of observable and measurable data. The target for interviewing was 10. Saturation point is met when all possible explanations regarding the results of the data have been exhausted.

4.4.2 Secondary Data Collection

Secondary data is archived data or data collected for a specific research or academic purpose other than the research conducted by the person who is collecting it. Secondary data can be found in a number of sources and is primarily located in physical libraries, on-line libraries or scholarly sites such as JSTOR, Springer, Wiley, Google Scholar and so on (Stewart & Kamins 1993). Thus secondary data is distinguished from primary data as the latter involves field collection specifically for the research conducted (McNabb 2010). A number of useful and available secondary data sources outside of scholarly journal articles and textbooks were used in this study; these include governmental, organizational, and scholarly data sets compiled for the purpose of information or for the purpose of aiding in further research (Schutt 2006).

4.5 Data Analysis

4.5.1 Qualitative Data Analysis

Qualitative data analysis involves looking at results and exploring, observing and reporting what the data reveals. The researcher takes an approach in which the data is observed and all possible explanations are exhausted with the result such that the most logical and reasonable explanation is left unchallenged. The researcher identifies commonalties and discrepancies in the data and attempts to determine whether or not the commonalties and discrepancies are linked (Caudle, 2004).

In analysing the qualitative data, the researcher used a coding process for distinguishing commonalities, categories and discrepancies. In this context “coding refers to the sorting observations into a limited number of categories” (Monette, Sullivan and DeJong, 2014, p. 429). Categories were created and coded for each of the variables. For example, interviewees from the Qatar Foundation were coded as (A1, A2...etc.) and interviewees from Qatar Petroleum such as (B1, B2...etc.).

4.5.2 Quantitative Data Analysis

Quantitative data analysis permits the collection of quantified data, which is statistically measurable (Wetcher-Hendricks, 2011). The results of the surveys were calculated using Excel software and are reported statistically.

4.5.3 Reliability

Reliability refers to the degree to which the research reports and results are believable. To this end, a research report and its results are reliable when anyone who reads the report is confident that the results can be relied upon (Creswell, 2013). In order to ensure that anyone reading this report can rely on or have confidence in the research results, a number of measures were adopted by the researcher, and the survey was further tested among the researcher’s colleagues.

To begin with, the researcher created an audit trail documenting the collection, categorizing, coding and safekeeping of the data and its results. In other words, the researcher kept ‘track’ of interviews and surveys and in doing so, ensured that they were in the sole possession of the researcher and unavailable to anyone else (Gast and Ledford, 2010, p. 1937). Interviews and contemporaneous notes taken at the time of the interviews were coded, annotated, and kept by the researcher to safeguard against loss, destruction and modification of the data. Field notes and contemporaneous notes were also necessary to ensure that the researcher did not have to rely on memory. Similarly, the surveys were kept in the sole custody of the researcher to ensure that the researcher did not have to rely on memory.

In conducting the interviews, the researcher used a technique referred to as ‘member checking’ to eliminate the risk of unreliable responses to a question. Member checking is a technique in which the researcher reads back or repeats a response to an interview question where the participant’s response is ambiguous or potentially misunderstood. After

reading the participant's response, the researcher asks the participant if that was what he or she meant to say (Harper and Cole, 2012).

With regards to the surveys, a pilot sample was conducted among the researcher's colleagues. The purpose of a pilot sample is to test the usability and validity of the research instrument. A copy of the survey is distributed among colleagues and after completion the participants are asked a number of questions. Questions asked relate to the ability to understand the questions, the questions relevant to the research topic, and so on. By using a pilot test, the researcher has the opportunity to improve the survey instrument before distributing it for the purposes of the research (Panter and Sterba, 2011).

Further, in ensuring that the results of the surveys and interviews were reliable, the researcher selected only questions that are relevant to the research objectives and questions. This was a necessary strategy for eliminating the risk of obtaining information that was not relevant and therefore not usable. Moreover, the questions were kept as simple and clear as possible to reduce, if not eliminate, the risk of confusion and therefore unreliable responses. In order to safeguard against boredom and rushed responses, the surveys and interviews were designed to take the shortest time possible.

Replicability refers to the possibility of the research results being replicable by other researchers using the same or very similar research. In other words, if the study can be applied to or conducted on the same population or a different population and produce similar or the same results, the research study and its results are replicable (Whitley and Kite, 2013). It is very important that research can be replicated, because it means that other researchers can test the findings of the research. Replicability keeps researchers honest and can give readers confidence in research. The replicability of the study also contributes to the reliability of the study. This research study was applied to a population of residents in Qatar and Qataris in the UK and did not require special adjustments for the specific needs of the population, thus it is therefore highly replicable.

In order to ensure further reliability, the interviews and surveys were administered in Arabic and English. The interview results as well as the survey results were then translated into English by a bilingual expert who verified that the results were duly and appropriately interpreted. After being translated, another expert counter checked all the translated materials to ensure that there were no mismatched information or wrong interpretation. Therefore, with regard to the measures adapted in this study, this research is reliable.

4.6 Ethics in the Research

Pursuant to ethical standards of research applicable to studies involving human subjects, the researcher took the measures necessary to ensure that all participants were both competent and voluntarily participating in the study. As Creswell (2013) cautioned, ensuring that participants are legally competent to participate in a study is necessary although, in certain circumstances, consent may be obtained by someone who can give consent on the participants' behalf. With regards to competence, all individuals were at least 18 years old and were therefore competent to consent to and to participate in the study. Therefore, age was not an ethical factor in this research.

Another ethical issue that had to be dealt with in this research study was the voluntary participation in the study. As demonstrated by the consent form, the participants were informed of the research topic and its purpose and this gave them an opportunity to determine whether or not the topic and purpose was one that they felt comfortable with. The participants were also informed that they were at liberty to withdraw from the study at any time after they gave their consent. To further ensure that the participants were voluntarily participating in the study, the researcher did not offer rewards nor did the researcher in any way make the participants feel coerced to participate in the study.

The participants were not exposed to the risk of harm in any way. There may have been some form of discomfort with having to answer survey questions or to participate in face-to-face interviews. However, this discomfort was minimized as far as possible by keeping the interviews light and friendly. The surveys were simplified and short so that participants were not tied to a long and complicated process. Moreover, the surveys and interviews were conducted at the convenience of the participants.

In respecting and protecting the human rights of the participants, their privacy and confidentiality were not invaded. The surveys and interviews were blind items in that the identities of the participants were protected so that they are not identified by name or otherwise in the research report. In other words, no indications or identifiers are used in the research report. Moreover, the raw data is kept in the sole custody of the researcher and this data will be destroyed within a year of the publication of this research report.

4.7 Summary

This chapter has set out the research methodology used in this thesis and provided an explanation and justification for the collection and analysis of the data. The data described here is primary and secondary data. The research philosophy, sampling, validity and reliability of the study are also described. This chapter has also considered the significance of this study.

The next chapter presents the results of the two surveys and the interviews conducted for this study and provides analysis of the data collected.

5 Results and Analysis

5.1 Introduction

This chapter presents the results and analysis of the two surveys and the interview data collected in this study. The first survey was conducted on a sample of Qatari citizens, whom were studying in the UK and the remaining respondents were either working in the UK, or in the UK for reasons other than work or study. The second survey was conducted on a sample of Qatari residents in Qatar. As previously explained, the purpose of the surveys was to measure the respondents' perceptions and awareness of renewable energy use in Qatar and whether or to what extent these had been influenced by the Qatari government's energy efficient/renewable energy practices and policies. The interviews, on the other hand, were conducted with a sample of energy experts in Qatar. The purpose of the interviews was to obtain expert perceptions of what constitutes good energy efficient/renewable energy policy and practice and how and where the Qatari government's current practices and policies stand in relation to a hypothetically ideal energy efficient policy and practice. This chapter is therefore divided into three parts. The first part presents the results and analysis of the first survey, the second part presents the results and analysis of the second survey and the third presents the results and analysis of the interviews.

5.2 First Survey of Qatari Citizens in the UK

The participants in this survey were UK-based students from Qatar whose preferences and attitudes towards energy use are highly influenced by the subsidisation programme experienced in their home country. In Qatar, the students are used to low-cost electricity due to the government policy on energy subsidisation; but when they reach the UK, they find they spend a significant amount of their money on electricity bills. This study examines how these changes in energy costs influence the consumption attitudes and preferences of Qatari students as the current research indicates that several factors affect the consumer behaviour of Qatari citizens in relation to energy – education, individual lifestyles, cultural values, and costs of energy.

5.2.1 Results/Responses of Qatari Citizens in the UK

Among the target of 200 Qatari citizens who have lived or are living in the UK, 150 successfully returned the survey. Of the 150 respondents, 87 were males compared to 63

females. In other words, 58.4% of this sample of respondents were male and 41.6% were female, with one undisclosed gender (See Figure 5-1). The survey results revealed that gender did not play a statistically significant role in the results.

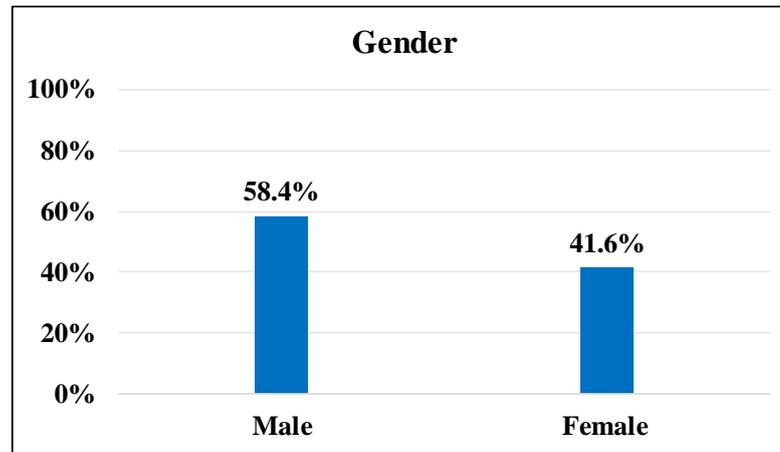


Figure 5-1: Survey 1 Respondents by Gender

Only one of the respondents was under the age of 18 (and therefore not included in the final population sample) and one respondent was between the ages of 45-54. 99 respondents (66%) were between the ages of 18 and 24, and 39 (26%) were between the ages of 25 and 34. Finally 10 respondents (6.7%) were between the ages of 35 and 44 (See Figure 5-2). The ages of the respondents did not appear to play a role in the results of this study.

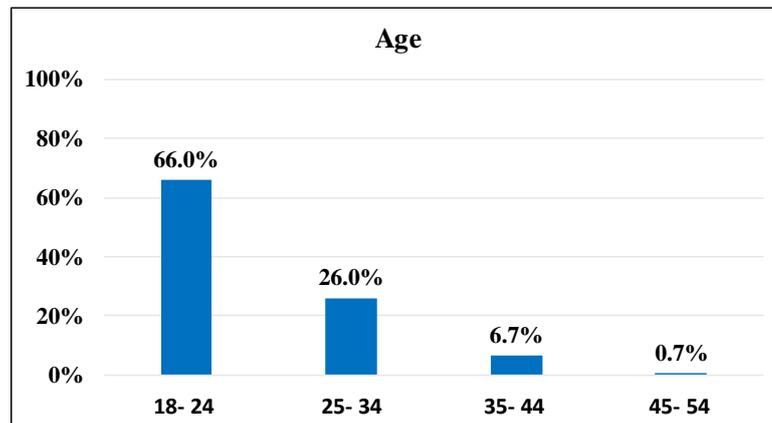


Figure 5-2: Ages of Respondents Completing Survey 1

The results of the first survey revealed that 95.9% of the respondents were students in the UK. A further 2% were employed in the UK and 2% were in the UK for reasons other than work or study (See Figure 5-3). The purpose of residence in the UK did not appear to have a statistical significance. 63 respondents (42%) have been in UK for between one and two

years, while only 30.7% (46) have been in the UK for between two and four years. 20% (30) of the respondents have been in the UK for less than a year, with only 11 (7.3%) residing in the UK for over four years (See Figure 5-4). Length of time in the UK did not show a statistically significant value in the results of the survey.

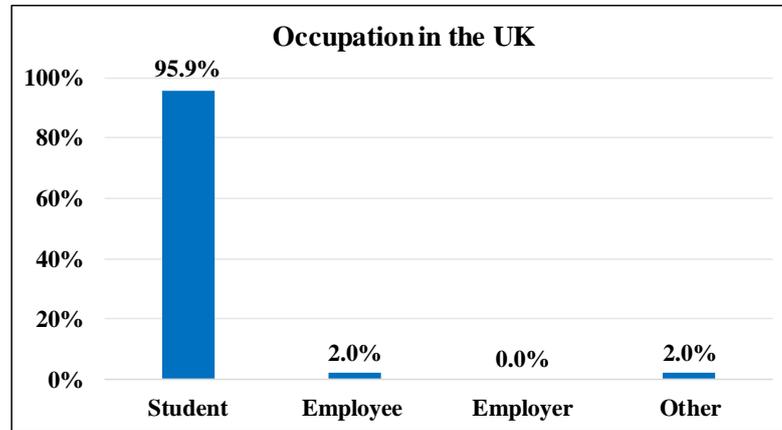


Figure 5-3: Respondents' Occupation in the UK

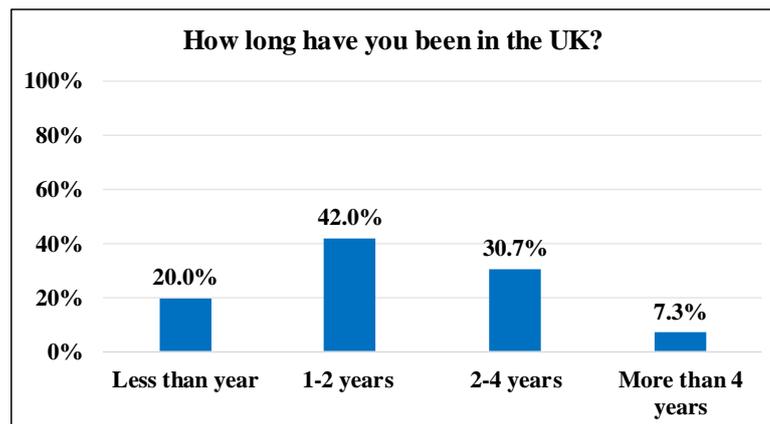


Figure 5-4: Respondents' Duration in the UK

The first part of the survey indicates that the vast majority of the Qatari citizens in the UK who participated in the first survey are pursuing an education, with a very small minority employed. Just one respondent is neither a student nor employed. Moreover, an overwhelming majority of the respondents were over the age of 18. It can therefore be concluded that this group of respondents have some ability to recognize and analyse energy efficiency/renewable energy policies and form reasonable perspectives on their practices. Moreover, as the majority of these participants have been in the UK for at least a year, they are in a position to be able to compare energy efficiency/renewable energy policies and practices in the UK with those in Qatar.

With respect to questions dealing with the variables, awareness and perceptions of energy efficiency/renewable energy, question five inquired as to each respondent's interest in renewable energy. Only 143 responses were returned to this question. Of these, 119 (83.2%) indicated that they were interested in the subject of renewable energy while 24 (16.8%) said they were not (See Figure 5-5). For each of the awareness and perception questions, the respondents were given an opportunity through a response option to provide their own detailed response to the question. In this regard, 16 respondents shared their interests in renewable energy.

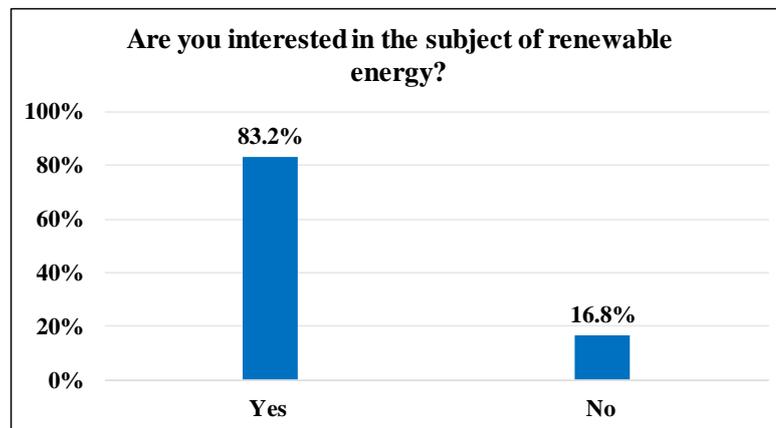


Figure 5-5: Interest in the Subject of Renewable Energy

Only one of the respondents who wrote out their own answer to this question acknowledged having no knowledge or awareness of renewable energy. The remaining respondents who provided additional responses expressed both an interest in and an awareness of renewable energy and the need for renewable energy. One respondent indicated that during his/her UK studies, s/he had a module titled Environmental Engineering. Another respondent's interest was related to a desire to invest in Doha. One respondent noted that 'I'm interested in the shifting of energy production away from natural gas at a time of, arguably, peak oil.'

Another respondent expressed an interest in renewable energy as follows:

'Renewable energy generates electricity with no pollution or carbon such as wind and solar power with little or no pollution'.

Another respondent stated that his or her interest in renewable energy related to an interest in 'no pollution or carbon' and sources that created energy without those damaging side effects. Such renewable energy sources would be wind and solar.

One respondent noted that renewable energy was important for sustainability in Qatar while another stated that ‘our mission is to build the life in earth not to demolish it and damage its environment’. Another respondent stated that he or she was interested in how renewable energy ‘could improve the quality of life for humans and the ecosystem.’ The same respondent went further to state that:

‘I am also interested in how it can be a substitute to non-renewable energy, which many countries depend on as their mainstream source of revenue (e.g. Qatar)’.

Another respondent expressed their interest in renewable energy in terms of it being a problem in all Gulf countries ‘on the road to creating a sustainable and stable community.’ Others spoke in terms of concerns with reducing CO₂ emissions, climate change, global warming, and reducing pollution. One respondent also added that they were interested in renewable energy ending the energy crisis, and another hoped to see renewable energy helping the world for ‘100s of years.’ Another respondent was interested in how non-renewable energy harmed the environment and how much safer renewable energy was. The interest and knowledge expressed by these respondents indicate that Qatari citizens studying, working or otherwise living in the UK are well-informed about renewable energy and the environment.

92 respondents (61.7%) indicated that they had some idea about the environmental damage caused by hydro and fuel-based power plants, while 57 respondents (38.3%) indicated that they had no idea about his type of environmental damage (See Figure 5-6).

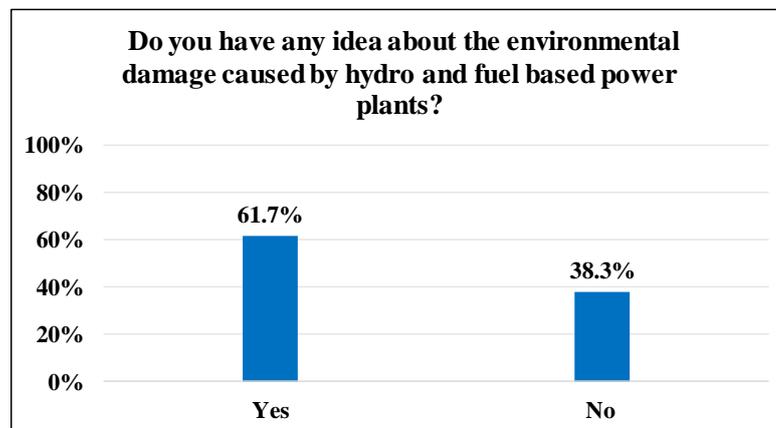


Figure 5-6: Respondents' Awareness of the Environmental Damage Caused by Hydro and Fuel-Based Power Plants

12 respondents provided further written details in their responses to the question of whether or not they had an idea of the environmental damage caused by hydro and fuel-based power plants. One respondent stated that these plants emitted ‘harmful waste into the environment’ and another respondent said that s/he had ‘general knowledge of greenhouse gases and how they affect the ozone layer and cause global warming.’ Another respondent pointed toward the production of ‘brine waste’ from desalination plants and its disposal into the sea ‘which increases the salt concentration and affects the aquatic lives’.

Many of the responses were similar in that there was a shared awareness of the damage caused by hydro and fuel-based power plants to marine, plant and animal life. One respondent showed an awareness of how this all combines to impact human life by stating that ‘poison is being consumed by plants that we essentially need to live.’ While one respondent admitted to having just a general or basic idea of the damages caused by hydro and fuel-based power plants, the other respondents combined covered all effects from CO₂ emissions/air pollution to global warming and climate change.

Out of 149 responses to the question on payment of UK electricity and gas bills, 136 respondents (91.3%) indicated that they paid those bills themselves. Just 13 respondents (8.7%) indicated that they did not pay these bills themselves (See Figure 5-7). When asked if they thought energy prices in the UK were suitable, 92 out of 145 respondents (63.4%) did not think they were suitable while 53 respondents (36.6%) thought they were. (See Figure 5-8).

In 19 detailed responses to this question, 10 respondents referred to the UK rates charged for electricity and gas as excessive. Others stated that the amount charged either depended on the utility company or the city in which the rates applied. Only one respondent thought that the rates were reasonable and one stated that they were not sure. One respondent however, provided an interesting input in stating that:

‘I think it is suitable for residents in the UK, because it helps to save energy and people can learn how to use limited energy’.

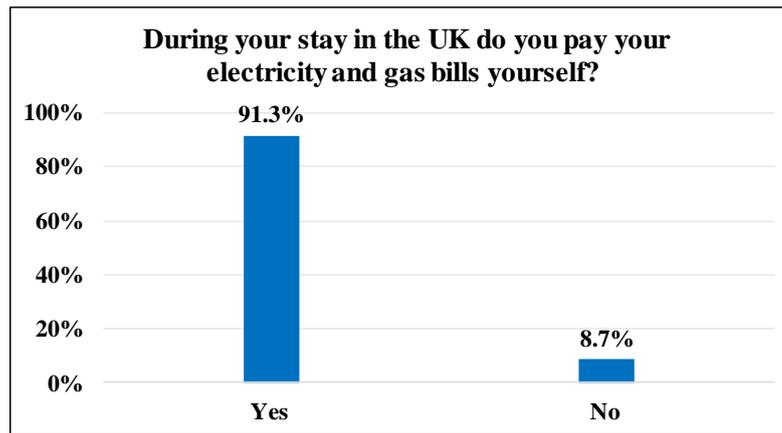


Figure 5-7: Respondents Paying UK Electricity and Gas Bills

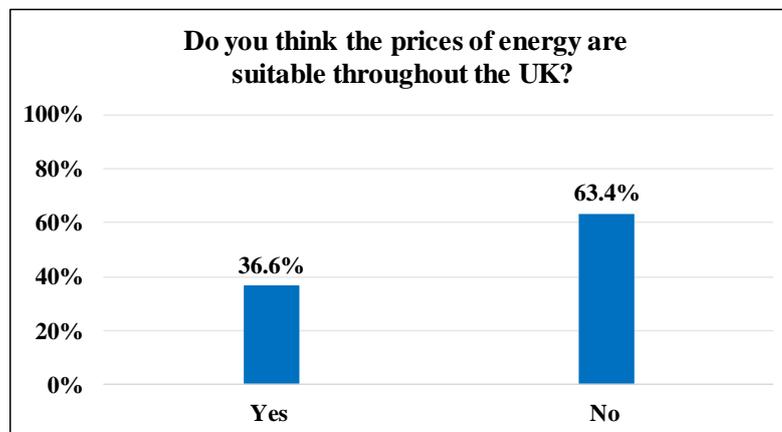


Figure 5-8: Respondents' Perspectives on the Suitability of Energy Prices in the UK

When asked about their energy consumption behaviour in the UK, 137 out of 149 respondents (91.9%) indicated that they switched off energy appliances when leaving their home. Only 12 (8.1%) respondents revealed that they did not do this (See Figure 5-9). Three respondents offered further details about this behaviour in the UK. The common theme was that it was either a waste to leave energy appliances on while not in use, or that it was an unnecessary cost and turning them off while not in use reduced energy bills.

However, when asked if the same behaviours were practised while living in Qatar, the responses were virtually reversed. Only 67 of 147 respondents (45.6%) agreed that they turned off energy appliances before going out while living in Qatar while 80 (54.4%) indicated that they did not do this in Qatar (See Figure 5-10). Nine of the respondents provided detailed answers to this question. Most of these acknowledged that they are not as conscious of this practice while in Qatar. Two respondents mentioned that electricity is free in Qatar, indicating that they were not concerned about energy efficiency but were guided purely by the cost of energy. Others simply admitted that they are not as diligent

back home, or that they were but only occasionally. One respondent said that, prior to living in the UK they did switch off energy appliances not in use, but after one year in the UK, they developed and maintained the practice. Another respondent said that they did in fact turn appliances off while living in Qatar because they were conscious of energy waste impacts on their own lives and the community as a whole. Meanwhile another respondent stated that he/she always tried to save energy because ‘every little helps the environment’.

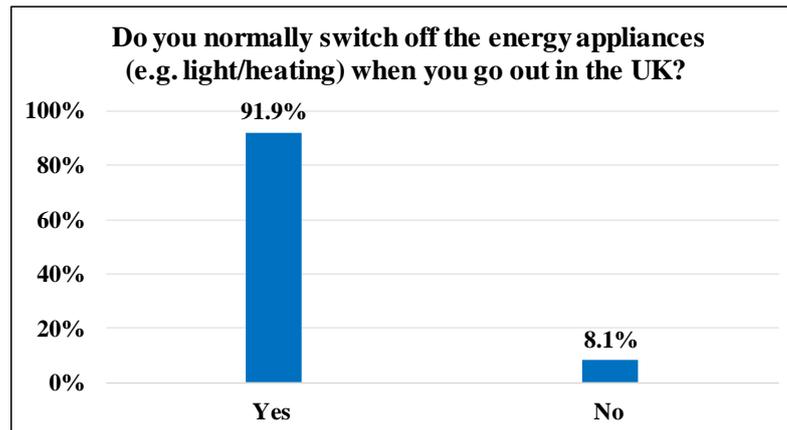


Figure 5-9: Energy Efficient Behaviour While Living in the UK

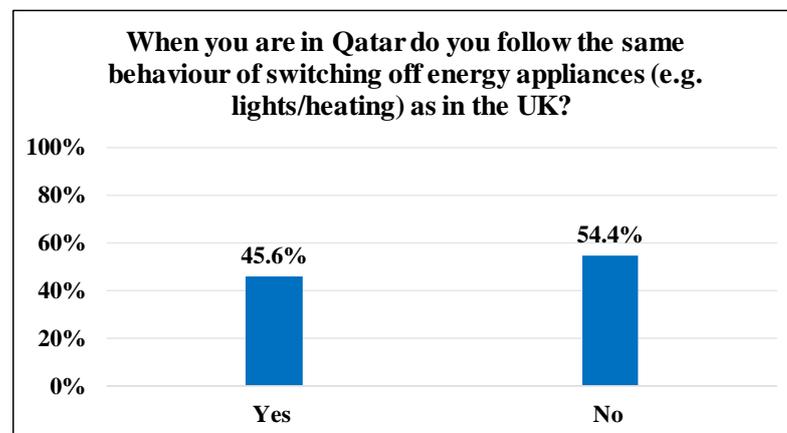


Figure 5-10: Energy Efficient Behaviour While Living in Qatar

Out of 150 responses, 109 respondents (72.7%) agreed that they were more careful about energy consumption in the UK than in Qatar. Less than one third (41), representing only 27.3% of the respondents, did not agree that they were more careful (See Figure 5-11). 10 respondents provided detailed replies. Two common themes emerged. One that prevailed over the other was that the fact that energy was not free in the UK meant the respondents were more conscious of their energy use as a means of controlling costs. The second theme to emerge indicated that the respondents in the UK generally lived alone and as such were able to control their household energy use. While living in Qatar, there were other people

in the household and there was no control. Moreover, since electricity is free, they were less conscious of its usage. As one respondent noted, when you have to pay for energy consumption, the cost guides your behaviour. One respondent said that s/he became more conservative about energy consumption due to a course on greenhouse gases and climate change. Another respondent stated that it did not matter that electricity was free in Qatar: s/he simply cared about Qatar and that guided his/her energy consumption behaviour in the country.

66 of 148 respondents (44.6%) thought that the UK government played an important role in raising awareness about the significance of energy use. However, 82 of the respondents (55.4%) did not think this was the case (See Figure 5-12).

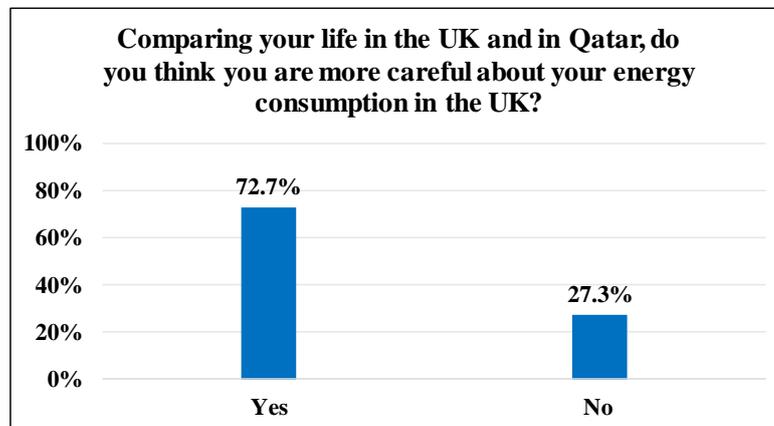


Figure 5-11: Respondents' Energy Consumption in the UK vs Qatar

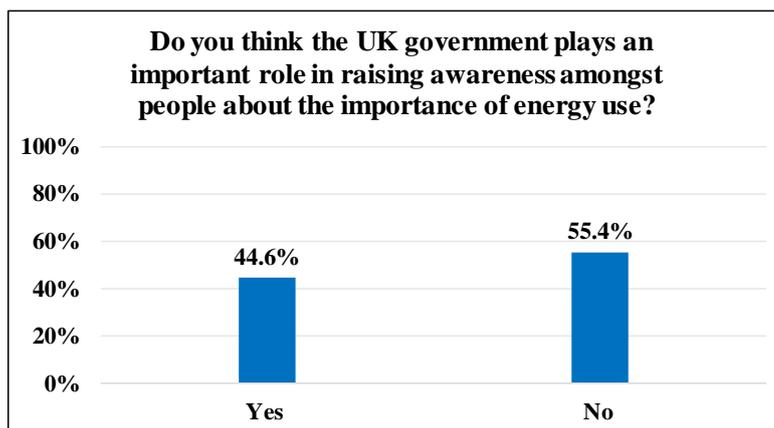


Figure 5-12: Respondents' Perceptions of UK Government's Role in Raising Energy Use Awareness

Respondents were also asked what methods the UK government has used to heighten awareness of effective energy use. Only 138 responses to this question were completed. All 138 respondents (100%) indicated that their bill's detailed annex booklet rationalised usage and was a method through which the government raised awareness about effective

energy use. In addition, 47 respondents (34.1%) selected television adverts as another method of raising awareness of effective energy use. Written declarations were selected by 39 respondents (28.3%); 31 respondents (22.5%) selected newspapers and magazines; 27 (19.6%) selected specialized websites; 14 (10.1%) selected ‘Other’ and 100 (72.5%) selected bills (See Figure 5-13).

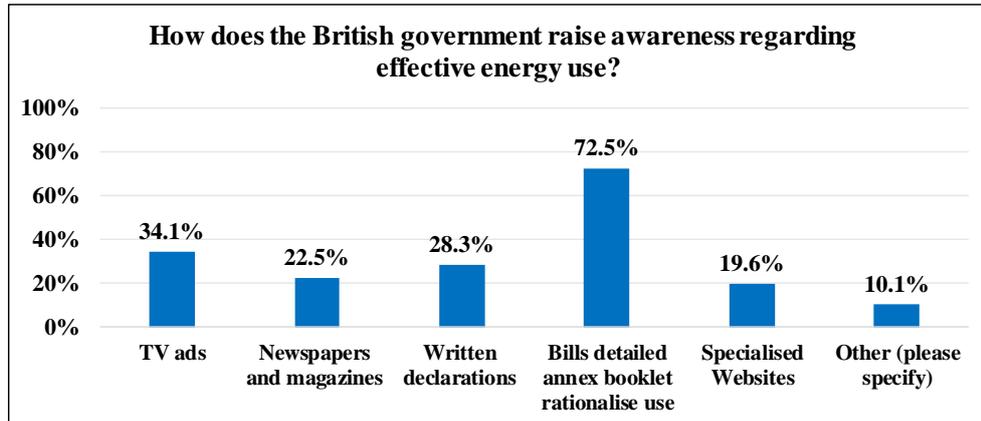


Figure 5-13: UK Government’s Methods for Raising Awareness of Effective Energy Use

When asked if their homes in Qatar had loft insulation, wall insulation or double-glazing, 118 out of 148 respondents (79.7%) said this was the case. Only 30 (20.3%) said that their homes in Qatar had neither loft insulation, wall insulation nor double-glazing (See Figure 5-14). Furthermore, 122 respondents out of 145 (84.1%) stated that they would like to use renewable energy such as solar panels in their homes in Qatar. Only 23 respondents (15.9%) said they would not like to do this (See Figure 5-15).

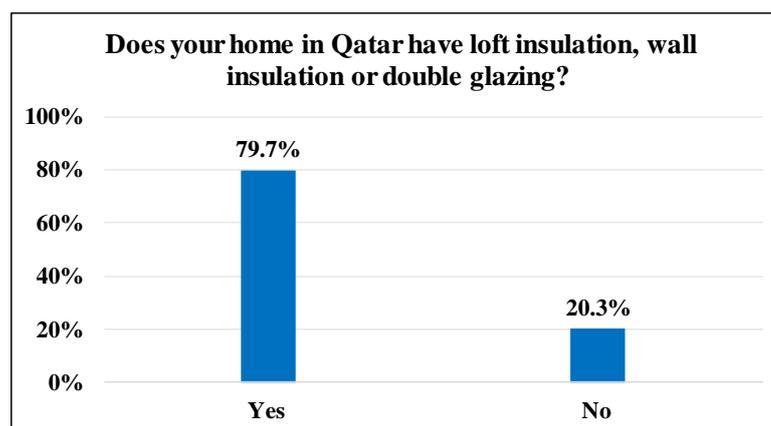


Figure 5-14: Qatari Homes with Loft Insulation, Wall Insulation or Double Glazing

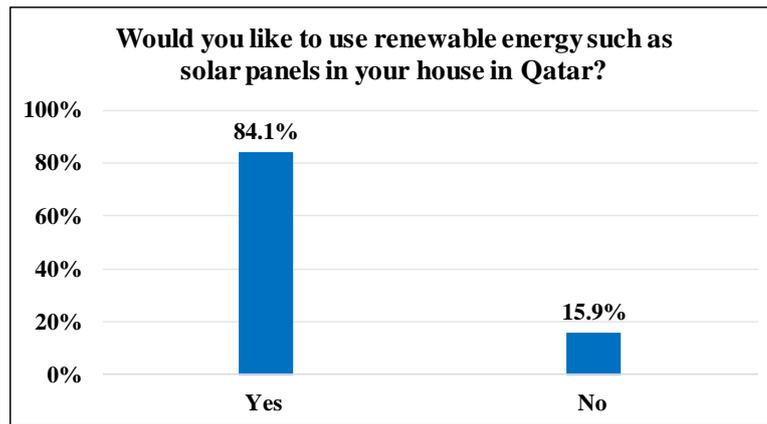


Figure 5-15: Respondents Amenable to Using Renewable Energy in their Qatari Homes

When asked about the prospects of using renewable energy in their homes, 23 respondents offered detailed responses to this question. Two of the main concerns expressed were the efficiency and cost of renewable energy. Some respondents were amenable to solar energy given its rich resource in Qatar, but this interest was usually coupled with concerns for its cost, its reliability or its efficiency. As one respondent stated:

'Yes. However, it is not an efficient source as the energy obtained will only last for so long and one might face some delays (as in, running out of power.) It has a limited storage of energy. Qatar is perfect for using solar panels, because usually every day is a sunny day'.

One respondent simply agreed with the prospect of renewable energy and stated that s/he already uses it on a farm. One respondent pointed out that while renewable energy is a great idea, it is impractical as there is not a market for it given that electricity is freely available in Qatar. Therefore, although one respondent stated that renewable energy will save energy and money, others, for the most part, worried about its ability to service their needs as efficiently as traditional energy sources.

5.2.2 Analysis of Responses of Qatari Citizens in the UK

The results of this survey are consistent with the theory of self-determination (See Section 2.1) where individuals are influenced or motivated to behave in ways that are based on punishment and rewards. For example, while living in Qatar, where electricity is free, a majority of the respondents were less mindful of their energy consumption habits. However, once in the UK, where electricity was much more expensive, the punishment of paying for electricity used even when wasted, motivated behaviour that was different from that motivated by the reward of free energy. When confronted with electricity bills, the

respondents found themselves more conscious of their energy usage and adopted habits that they previously did not have. These included turning off appliances that were not in use and when leaving their residence.

This is also demonstrative of economic theory (See Section 2.5) in that individuals who have had the opportunity to experience the economic results of energy consumption were now in a position to determine future returns/rewards differently. Essentially, pursuant to economic theory, the respondents came to the conclusion that if they did not want to incur the expenses associated with excessive use of energy, they had to take actions to prevent those future outcomes, and, at the same time, safeguard their own rewards of lower energy expenses.

Some of the respondents, however, were always conscious of energy consumption although they were more profoundly conscious after moving to the UK and being confronted by utility bills for the first time. Here hierarchy theory offers some insight (See Section 2.2). According to hierarchy theory, people tend to create primary and secondary needs and attend to those needs accordingly. For these Qataris respondents, conservation of energy for the purpose of contributing to the health of the environment was a secondary need until they found themselves having to pay to consume electricity. Once this happened the idea of saving energy became a primary rather than a secondary need. This is also consistent with economic theory in which future rewards and improving the future are strong influences on current behaviour. While high energy usage might provide comfort for the moment, it can provide future discomfort in the form of financial losses.

The findings of this survey are consistent with findings in the literature. The survey results are consistent with the hierarchy of needs theory, which suggests that people change their behaviour based on changes in circumstances. A majority of the respondents in the UK reported a willingness to consider using renewable energy, notably solar energy, and have admitted to altering their consumption habits. Therefore, heightening awareness of the environmental damages accruing to high energy consumption can and will change behaviour, perspectives and attitudes. The results of this survey are also consistent with self-determination theory in which the respondents were exposed to both the punishment and rewards of energy consumption trends and were motivated to alter their use of energy to reduce cost (reward) or pay excessive prices for wasted energy consumption

(punishment). This is also consistent with economic theory in which future rewards and improving the future are influences on current behaviour.

The experience of these respondents also suggest that perceptions and awareness of energy consumption habits are altered by the fact that energy is free in Qatar. This has desensitised the population to awareness of the negative environmental impact of wasted energy. The Qatari respondents living in the UK recall experiences back home where whole households showed a lack of awareness of saving energy. However, when placed in a situation in the UK where energy consumption is subject to fees, Qatar citizens were impacted by the cost of energy consumption and altered their behaviour.

It can therefore be assumed that if the real costs of traditional energy consumption in terms of environmental costs are more widely understood, Qatar residents will be more inclined to alter their consumption trends. This is supported by the findings of this survey that Qatari citizens living in the UK altered their consumption behaviour when they were exposed to knowledge of the environmental costs of such consumption. Likewise, should the government of Qatar engage in a campaign to educate the public about the environmental costs of energy consumption and provide some form of incentive for conservation of energy and conversion to renewable energy use, consumption habits could, and will likely, change for the better.

5.3 Second Survey of Qatari Residents in Qatar

The purpose of this research is to establish the current behaviours and awareness of Qatari citizens regarding the use of energy with the aim of recommending alternative methods of improving energy use and efficiency. Out of the targeted 500 survey participants, 410 surveys were completed correctly and returned and thus were usable. For a sample of $n = 410$ for an infinity population this indicates a margin of error in the sampling process to be $\pm 5\%$ with confidence interval of higher than 95%. Confidence interval is the probability that the sample accurately reflects the attitude of the population while margin of error is the range in percentage that the population's response may deviate from the response of the sample. The participants were questioned on how they use energy, the costs they incur, and their attitudes towards energy consumption. The sampling technique used to identify participants of the study is the random sampling approach in which the sample items are included in the research by equal chance. The results of this survey suggest that education,

increased awareness, and greater knowledge of the sustainability and renewable energy effects influence Qatari consumers' consumption.

5.3.1 Results/Responses of Qatari Residents in Qatar

Out of 410 Qatari residents participating in the second survey only 408 gave their age range with two declining. A majority of the respondents indicated that they were between the ages of 25 and 34. Altogether this age group of respondents numbered 153 (37.5%), with 129 (31.6%) representing the second largest age group between the ages of 18 and 24. 67 of the Qatari residents participating in the survey were between the ages of 35 and 44, 47 were between the ages of 45 and 54 with 12 aged between 55 and 64. None of the respondents were over the age of 65 (See Figure 5-16). Again, age did not have a statistical significance in the survey results.

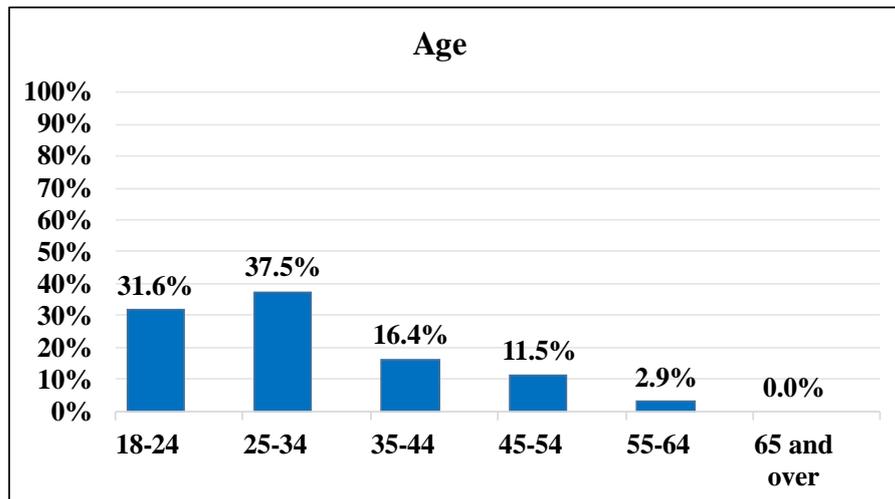


Figure 5-16: Ages of Qatari Residents Participating in Survey 2

On the question of nationality, three respondents declined to identify their nationalities while 308 claimed to be nationals of Qatar, representing 75.7% of the respondents. 99 claimed to be other nationalities and this represented 24.3% of the respondents (see Figure 5-17). Nationality did not play a significant role in the survey results except where non-Qatari residents had energy bills to pay (The payment of energy bills by non-nationals is discussed in more detail below).

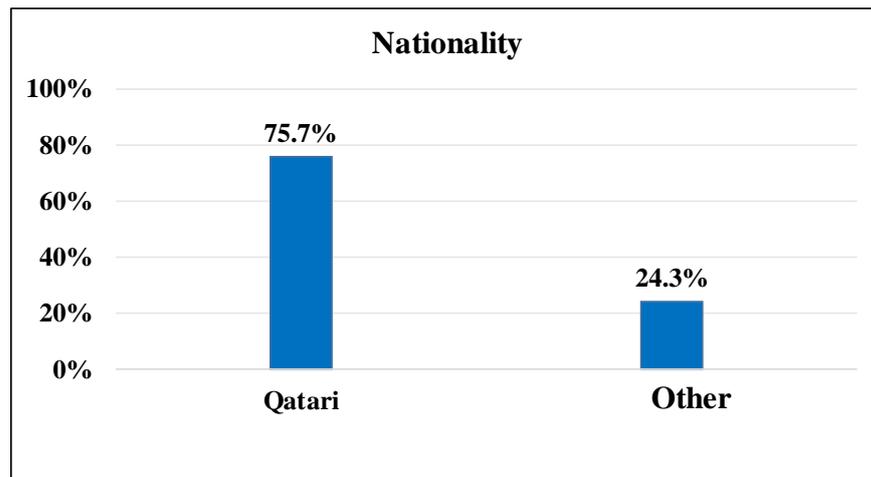


Figure 5-17: Respondents' Nationality

Out of 410 respondents, four declined to reveal whether or not they paid for their electricity use in Qatar. However, a majority of the respondents (331) representing 81.5% claimed they did not pay for electricity and 75 respondents representing only 18.5% said that they did pay for electricity consumption in Qatar (See Figure 5-18). However, from the seven detailed responses to this question, it appears that people who are not Qatari but who reside in Qatar do not typically pay for electricity directly. A majority of the detailed responses indicate that electricity is either included in the rent or the employer pays the electricity bill. Only one non-Qatari national stated that his/her electricity bill was 300 QAR per month. Another respondent noted that part of the electricity is included in his/her rent and s/he pays any excess cost, but that cost is reimbursed by the respondent's employer.

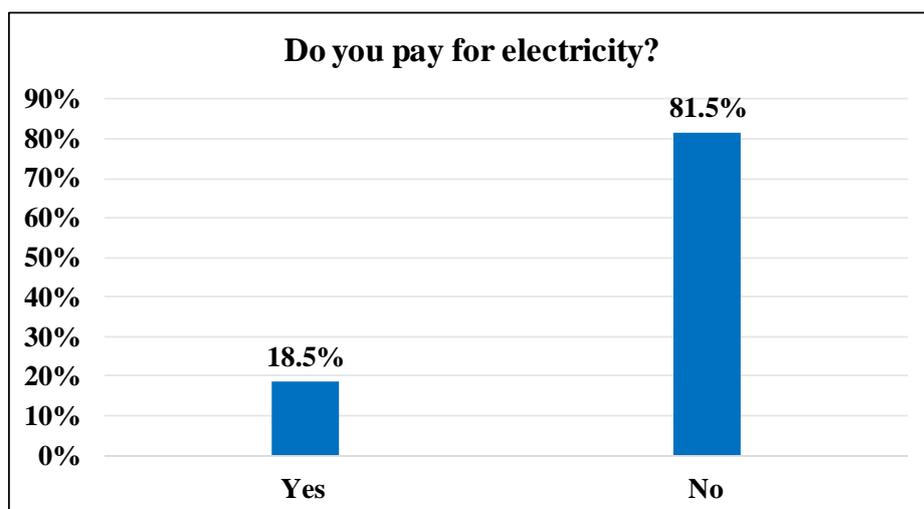


Figure 5-18: Respondents Paying for Electricity Consumption in Qatar

Respondents were asked to identify which energy source they thought produced the largest amount of CO₂ emissions from a list of possible answers. Out of 405 responses, 194 selected coal, 149 selected oil, 125 selected gas, 29 selected solar, 12 selected wind and 17 acknowledged that they did not know (See Figure 5-19). They were also asked to select the main source of electricity generation in Qatar. Of 398 respondents, 240 thought that gas was the main source of electricity, followed by oil, which was selected by 199 respondents. 35 respondents selected solar energy, with 16 selecting coal, five selecting wind and 24 stating they did not know (See Figure 5-20).

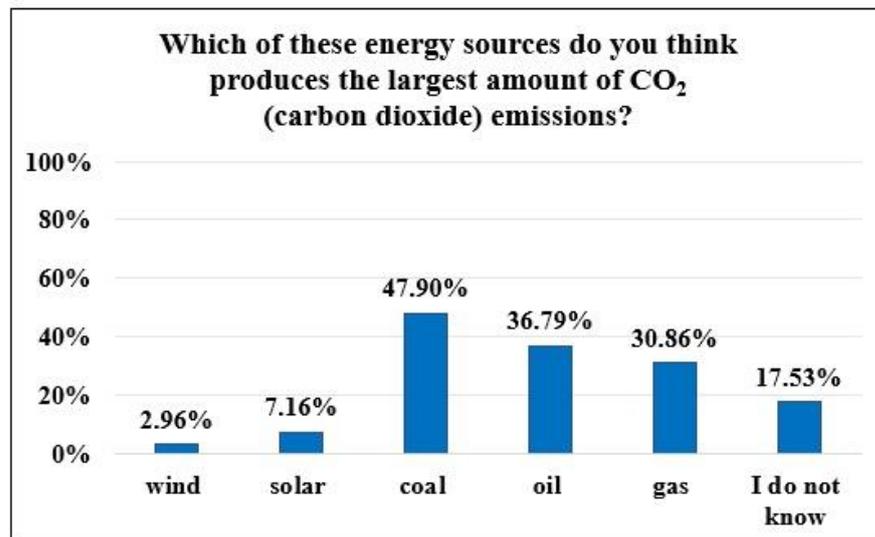


Figure 5-19: Respondents' Perceptions of the Largest CO₂ Emitting Energy Sources

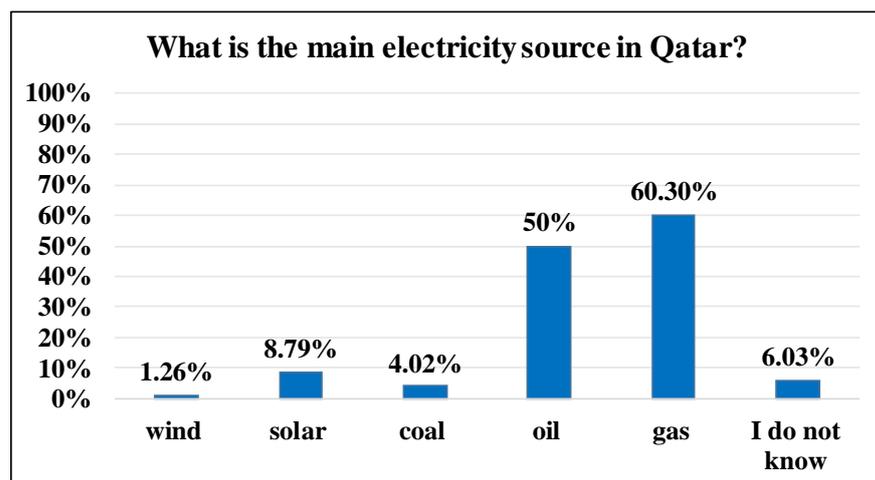


Figure 5-20: Respondents' Awareness of the Main Electricity Source in Qatar

The respondents were then asked a series of questions specifically designed to test their understanding of and interest in renewable energy. The first of these was 'Do you have any idea what renewable energies are?' Only 43% (fewer than half of the respondents) said

they knew what renewable energies were. 35% said they did not know what renewable energies are, 18.50% did not know if they knew, and 3.50% did not care. (See Figure 5-21 **Error! Reference source not found.**).

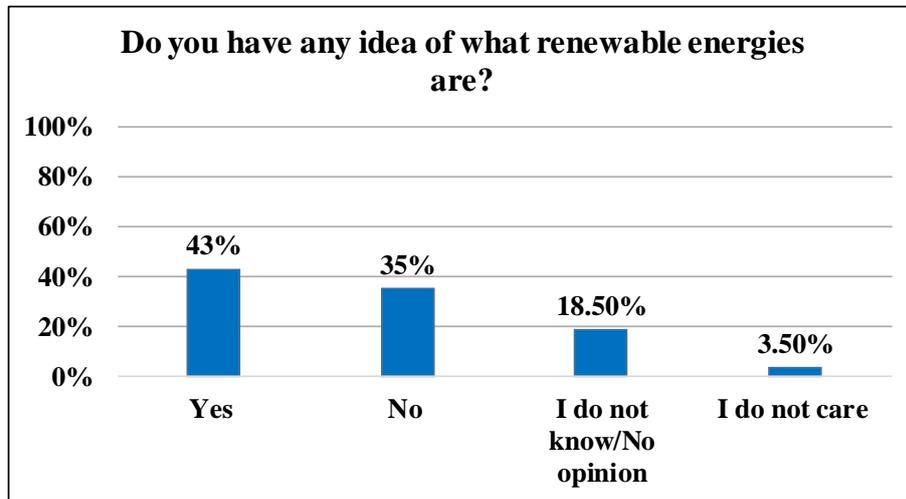


Figure 5-21: Respondents' Knowledge of Renewable Energy

There were 13 detailed responses to this question. Each of these responses suggest that the respondents do have a better than average understanding of what renewable energy is. While three respondents identified renewable energy as wind, solar, waves, or rain, others provided broader details. For example, one respondent stated that renewable energy is a source that is capable of being reused. Another stated that renewable energy was energy that can be recycled and does not deplete 'much natural reserves'. This was the most common explanation for what renewable energy was among this group of respondents. One respondent however thought that renewable energy was a source that did not cause any damage to the earth as opposed to traditional energy sources for example. This particular respondent stated:

'...renewables or those type of energies which are abundantly available on earth and if used not harming/damaging the earth through its use by humans. When used by humans, it does not generate waste'.

This was a little different from the general tone of the detailed responses where the respondents accepted that renewable energies are not necessarily harmless, but can be replenished, and some were of the opinion that they can emit harmful gases.

58% of the respondents noted that they were interested in information that would help them save energy. However, 19.10% were not interested in such information, 14.57% did not know if they were interested, and 8.04% did not care (See Figure 5-22). 26 respondents provided further details in response to the question of whether or not they were interested in information that would help them save energy. These answers were varied although a common theme was identified. There was a recognition that knowledge was the key to conserving energy for the future of Qatar and the community. One respondent acknowledged that ‘because its free for us so we should know how to control and save it’. Another respondent stated that ‘we are part of the climate change issue; we have to participate in a good way to help this world’.

There was a genuine interest in learning how to contribute to the conservation of resources and the environment in general. One respondent stated; ‘I would like to know how we can be more environment friendly in our day to day life’. While others showed concerns about lowering their electricity bills, for the most part, there was a concern about conservation. One respondent replied by quoting a native American saying ‘we do not inherit the earth from our ancestors, we borrow it from our children.’

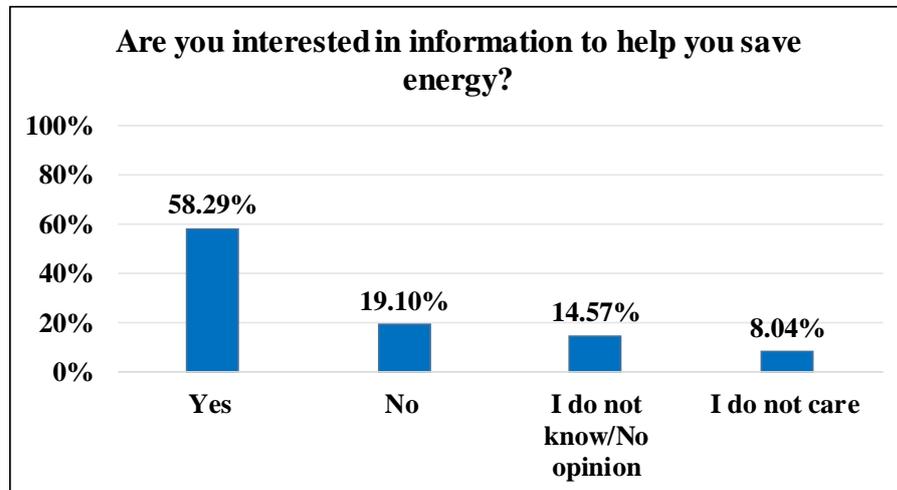


Figure 5-22: Respondents Interested in Information about Saving Energy

The respondents were also asked if they had any idea of the damages caused to the environment by hydro and fuel-based power plants. Fewer than half of the respondents said Yes (48.74%), while 31.66% said No, 17.59% did not know and 2.01% did not care (See Figure 5-23). There were 16 detailed responses to this question. In all 16 detailed responses there was agreement that hydro and fuel-based power plants degrade the environment and expose human, marine, plant and animal life to significant harm. While some respondents

pointed to the general damage to the environment and pollution, others pointed to the health of individuals and the damage to resources needed to sustain human, plant, animal and marine life.

One respondent went so far as to state that:

'...it is harm on human life and health as there are a lot of people who have some afflictions such as asthma, cancer and skin allergies'.

Yet another respondent provided impressive details stating that:

'Hydro power plants usually require the building of a dam which destroys the environment. Fuel-based power plants generally burn coal to produce electricity. The mining of coal destroys the environment and puts the miners' lives at risk. The burning of coal emits CO₂ into the atmosphere, which also destroys the environment'.

Although a majority of the detailed responses did not exhibit as much knowledge as the above respondent did, it was clear that this group of respondents had, at the very least, an adequate understanding of the environmental damage caused by hydro and fuel-based power plants.

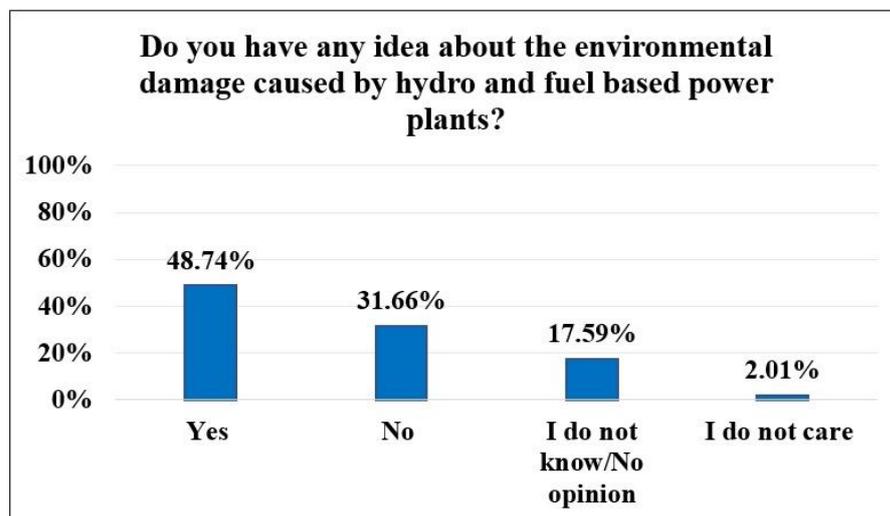


Figure 5-23: Respondents' Knowledge of the Environmental Damage Caused by Hydro and Fuel Based Power Plants

In a group of knowledge and understanding based questions, the respondents were asked if they believed that renewable energy would help Qatar to minimize over-dependence on fossil fuel and thus save oil/gas for the long-term. Barely more than half of the respondents

agreed (51%) with 18.25% disagreeing, while 26.25% did not know and 4.50% did not care (See Figure 5-24).

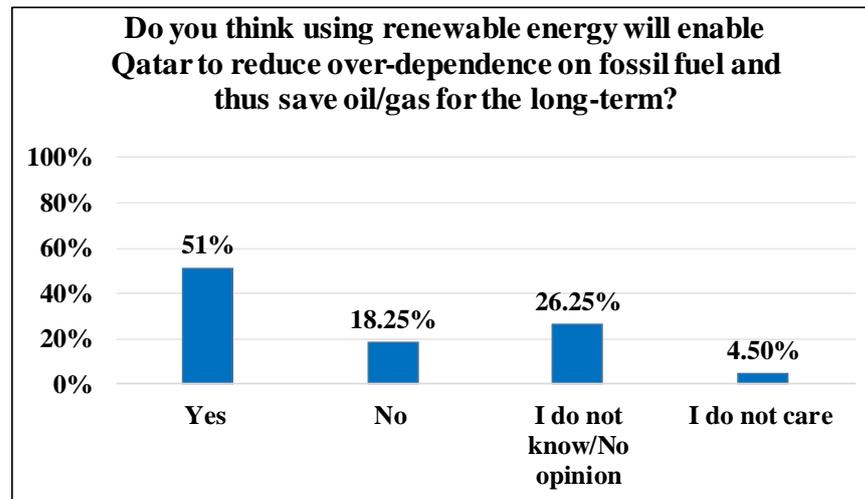


Figure 5-24: Respondents' Beliefs that Renewable Energy Will Help Qatar Minimize Over-dependence on Fossil Fuel and Save Oil/Gas for the Long-term.

There were 24 detailed responses to this question. The general consensus was that renewable energy will not only minimize Qatar's over-dependence on fossil fuels, but it will also help the country in the long term because fossil fuels will not last forever. For example, one respondent noted:

'Using renewable resources can be helpful because we will not know how long Qatar can maintain and cultivate its oil and gas in the country.'

However, there is one poignant response that needs to be repeated here. One respondent noted that:

'There are currently no drivers in Qatar to switch from non-renewable to renewable energy sources as non-renewable sources are available in large quantities and are cheap. Qatar has potential to use solar energy and wind energy; however Qatar has, per head, a high carbon footprint. This is due to low energy costs, high income and thus no financial encouragement to save energy. Other factors are the high temperatures which require use of air conditioners all year round.'

Another respondent made a similar observation, and in doing so, highlighted the role that free access to abundant resources plays in complicating efforts to change patterns of behaviour towards an acceptance of renewable energy as a solution to dependence on fossil fuels. Human behaviour contributes to this dependence.

When asked if renewable energy could decrease dependence on fossil fuels, the respondent stated:

'Possibly but I don't think renewable energy will be able to make much of a dent in the dependence on fossil fuel due to the lifestyle habits of most Qatar residents. They drive gigantic cars and leave the lights/AC/television on in their homes, even when no one is using them. Renewable energy along with behavioural changes would be much more effective'.

One thing that a lot of the respondents pointed out is that Qatar has the means to decrease dependence on fossil fuels as a source of energy. Just as Qatar has ample supplies of fossil fuels, it also has more than enough renewable energy sources. The difference for the respondents is that, in their view, fossil fuels come at a great cost to both human life and the environment, whereas renewable energy sources do not have any cost to human life and the environment. As one respondent noted:

'There is plenty of sunshine in the region which appears to be an untapped resource at the moment, which could help in the long run'.

Yet another respondent stated:

'...fossil based fuel may be plentiful, but it will be completely exploited someday, using energy from sun and wind is basically unlimited and free'.

Moving on in the survey, the respondents were asked to select from four possible answers how they would describe renewable energy. The four possible answers were: a) harmful, b) not harmful, c) profitable or d) not profitable. Out of 398 responses, only 6 (1.5%) thought renewable energy was harmful compared to 100 who thought it was not (25.1%). Meanwhile, 329 (82.7%) thought renewable energy was profitable compared to 7 (1.8%) who thought it was not (See Figure 5-25).

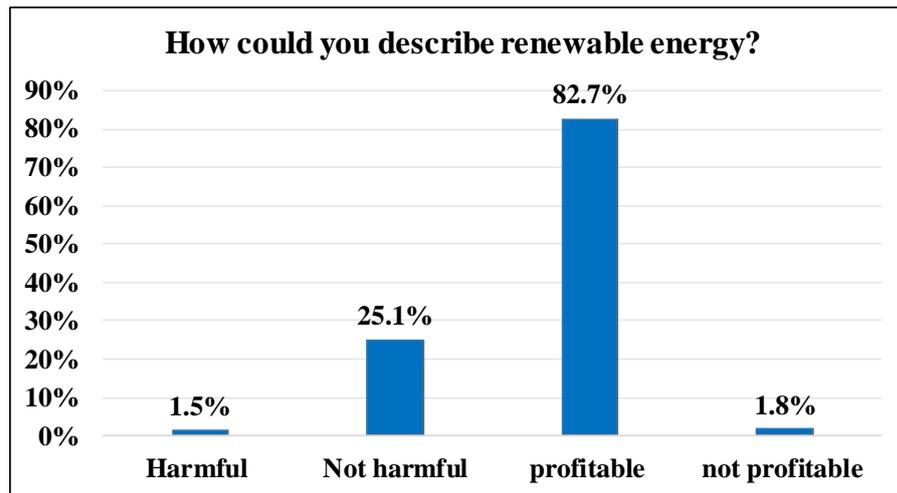


Figure 5-25: Respondents' Descriptions of Renewable Energy

397 respondents answered the question asking how they would prefer to be informed about renewable energy. 125 respondents (31.5%) indicated that they would like to be informed via on-line information. 123 (31%) opted to be informed via TV or radio advertising. 53 respondents (13.4%) opted for telephone information, 33 (8.3%) for communication from a friend, 12 (3.0%) for postal letters and 21 (5.3%) preferred other sources of information (See Figure 5-26). In the 'Other' responses, five other channels were specified: newspaper, social media and TV, documentary movies and education through school, lectures and seminars.

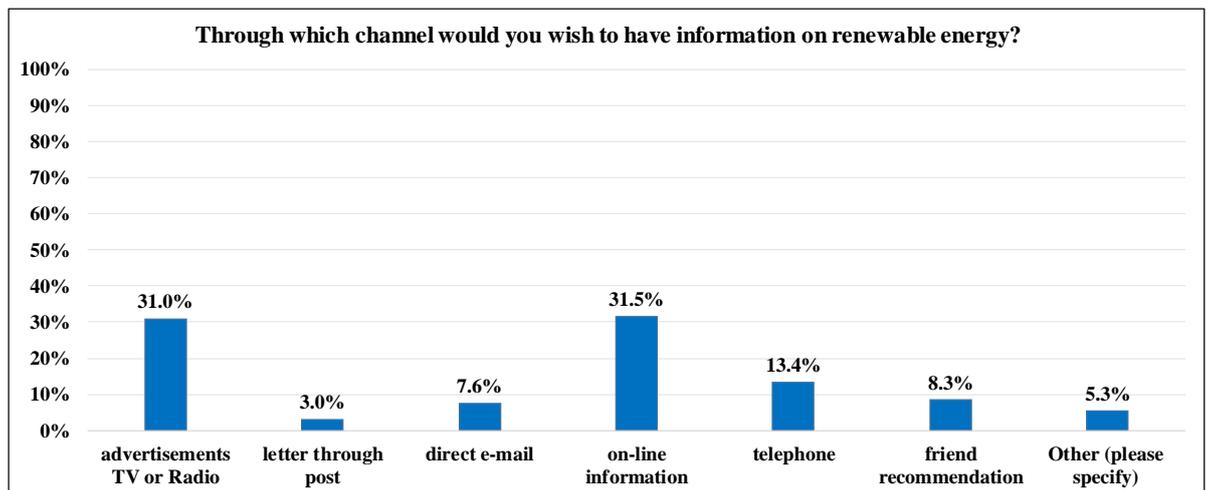


Figure 5-26: How Respondents Would Like to Be Informed of Renewable Energy

The respondents were asked to select the extent to which they expected Qatar to use renewable energy in the next 20 years. The options for answers were presented in percentages. 399 responses were usable with a majority, 137 (34.3%), stating that Qatar would be using over 30% of renewable energy over the next 20 years. 74 of the respondents

selected 20% renewable energy use while 36 (9.0%) indicated that Qatar would be using more than 10% renewable energy over this period. Only 13 (3.3%) thought Qatar would be using less than 10% renewable energy over the next 20 years and 115 (28.8%) did not know (See Figure 5-27).

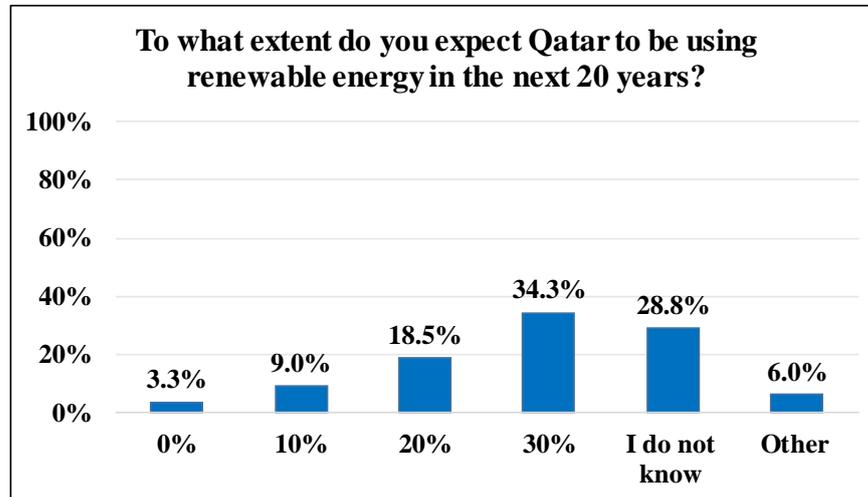


Figure 5-27: Respondents' Perceptions of the Extent to Which Qatar Will Use Renewable Energy over the Next 20 Years

Altogether two respondents provided additional details to this question and several more simply stated their own projections in terms of percentages. One respondent was quite pessimistic predicting that only 3% of Qatar's energy would be renewable energy within the next 20 years. Another respondent predicted that it would be surpass the range of 15-20% with another predicting that renewable energy use over the next 20 years would be 45%. However, a majority of the comments predicted between 50%, 70%, and 80%. One respondent did not predict a percentage, but merely stated that Qatar had the potential to make renewable energy a large percentage of its energy sources within 20 years. This particular respondent stated that:

'Qatar has the regular supply of the sun and enough capital to invest in transferring the current fossil power supply to solar (they should go for at least 70 to 80%)'.

Another respondent also spoke of Qatar's potential, but expressed doubt about its ability to cash in on that potential. This respondent stated that:

'The next 20 years would take us to 2035. By that time Qatar's ambition is to become an industrial national similar to European

nations. Today's predictions are that the gas and even oil reserves of Qatar will stretch beyond this date. I would not expect that Qatar will undertake a fundamental switch from non-renewable to renewable energy sources in the next years. This means that Qatar's dependency on non-renewable energy resources will remain. Qatar may not achieve 10% by 2030, whilst it could achieve 50%, if a switch would be initiated soon'.

The respondents' energy consumption habits were measured by asking four questions about their behaviour in specific circumstances. The first question in this series of four asked the respondents if they left the lights on during the day with the curtains open. 397 respondents (44.33%) stated that they did at times, 47.36% stated that they never did this and 8.31% stated that they always did. (See Figure 5-28).

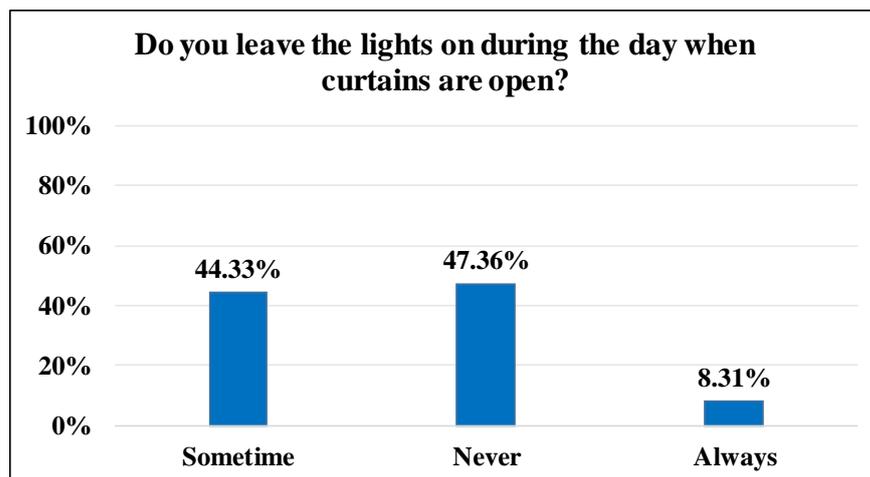


Figure 5-28: Respondents' Consumption Habits: Pattern of Leaving Lights On During the Day with Curtains Open

In the second question, respondents were asked if they opened a window for fresh air when the air conditioning was running. 396 respondents answered this question with 69.19% stating that they never opened a window for fresh air while the air conditioning was running. However, 25.25% stated that they sometimes did, while 5.56% admitted that they always opened the window for fresh air while the air conditioning was running. (See Figure 5-29).

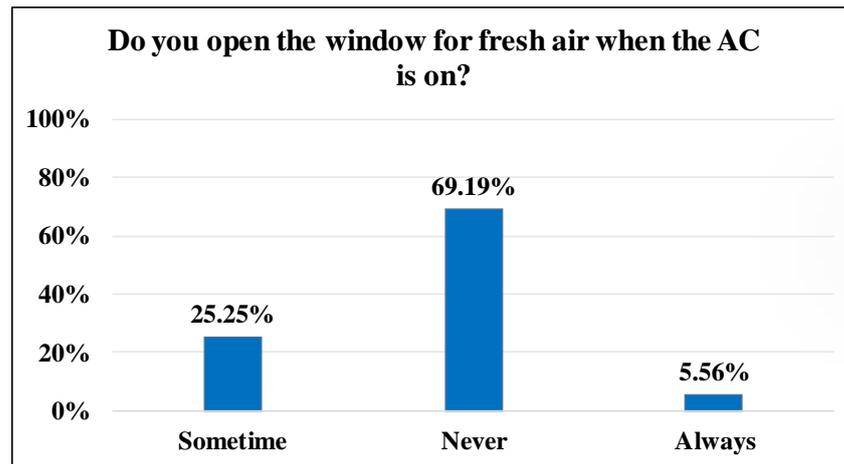


Figure 5-29: Respondents' Consumption Habits: Opening a Window to Let Fresh Air in While AC is On?

The third question in this series inquired as to whether or not the respondents turned the power off when the computer/TV/electronic device was not in use. There were 399 responses to this question with 41.85% stating that they always turned the power off in these circumstances compared to 35.34% who said they sometimes turned the power off and 22.81% who said they never turned the power off. (See Figure 5-30).

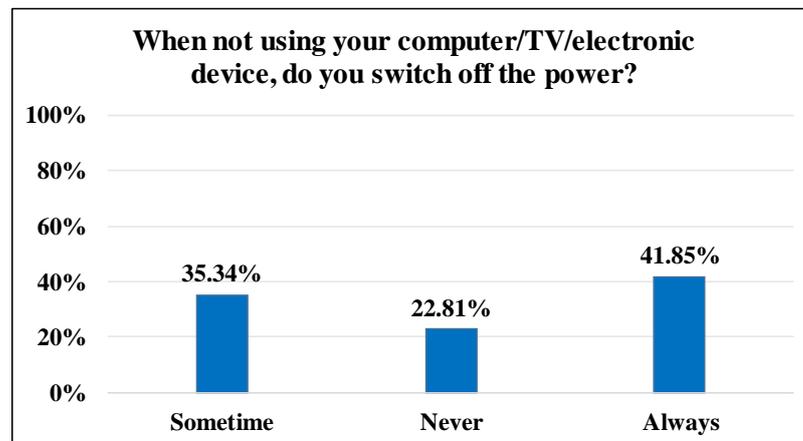


Figure 5-30: Respondents' Consumption Habits: Turning Computer/TV/Other Electronic Device Off When Not in Use

The final question exploring consumption habits asked respondents if they turned the lights off if they were the last to leave a room. 400 respondents answered this question with 60.25% stating that they always turned the lights off in these circumstances. However, 28.50% said that they only turned the lights off when leaving a room last sometimes, while 11.25% said that they never turned the lights off when exiting a room last. (See Figure 5-31).

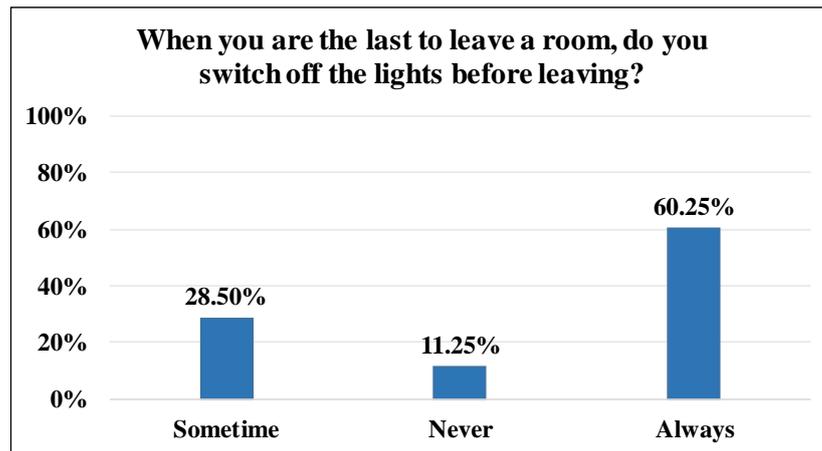


Figure 5-31: Respondents' Consumption Habits: Turning Off the Lights When the Last to Leave a Room

The respondents were also asked a series of five questions designed to measure their energy efficiency habits. The first of these asked if the respondents used energy saving light bulbs. This question was answered by 401 respondents. Just over half of the respondents (50.37%) admitted that they did not use energy saving light bulbs. Only 32.42% said they used energy saving light bulbs and 17.2% did not know if they used such light bulbs. (See Figure 5-32).

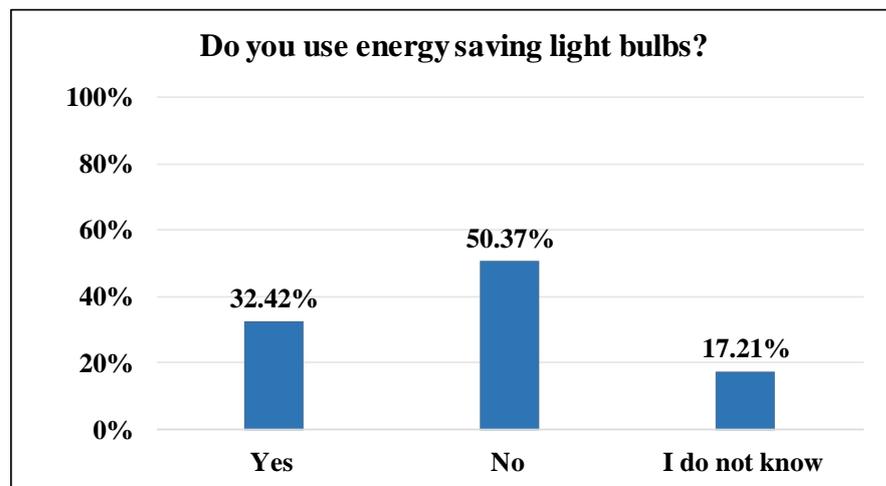


Figure 5-32: Respondents' Energy Efficiency Habits: Using Energy Saving Lightbulbs

There were 14 detailed responses to this question. For the most part, these respondents admitted to using energy saving lightbulbs and some described the energy saving lightbulbs that they used. Two respondents described LED lights and two described florescent lights, with one stating that these lights are brighter and use up less energy. Only two respondents stated that they relied on the landlord's lightbulbs which were not energy saving lightbulbs. One stated that s/he didn't think s/he could fit energy saving lightbulbs into the landlord's fixtures. Another respondent only stated that s/he was renting and wasn't sure if the

'landlord' used energy saving lightbulbs. However, another respondent was far more proactive in that s/he said that they were renting and while the landlord had installed non-energy saving lightbulbs, s/he had removed them all and replaced them with energy saving light bulbs.

In the second question in this series, the respondents were asked if they had electricity controller/programmers in their homes. 398 respondents replied to this question with 56.28% stating that they did not have an electricity controller or programmer in their homes. Another 23.37% said that they did have such devices in their homes while 20.35% did not know (See Figure 5-33).

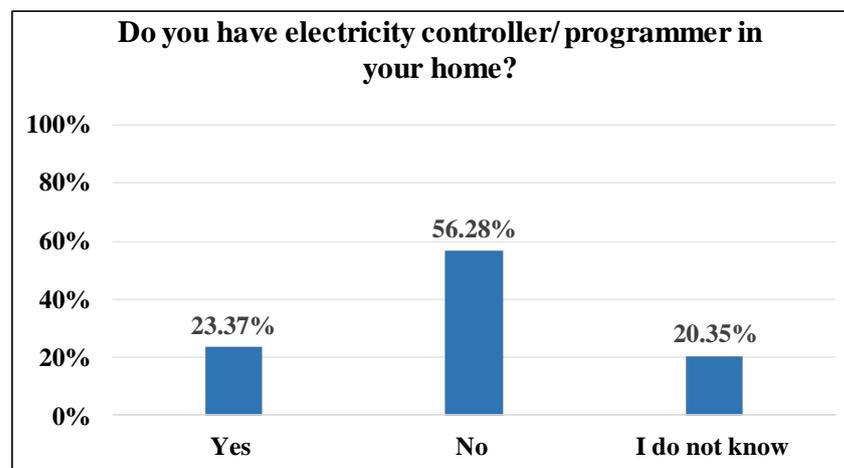


Figure 5-33: Respondents' Energy Efficiency Habits: Electricity Controller/Programmer in the Home

There were 11 detailed responses to this question and from these it appears that electricity controllers/programmers are not very well known to the respondents. The first of the 11 responses questioned what these devices were. In fact, the response was 'have no idea what you are talking about.' One respondent stated that 'we are using solar energy for geyser and building corridor lights' and thus believes that s/he is using electricity controller/programmer devices. Another respondent stated that s/he plans to 'install one' and one wondered if a timer was one and if so, s/he did have a timer for wall lights. Another respondent also stated that s/he had a timer. Another respondent, much like the first respondent, was confused saying 'I do not have any idea'. Another did not know where one could be found. One respondent simply stated 'NO'. One respondent said that his/her rental 'is not equipped with such devices', while another said that the 'tenancy agreement will not allow retrofitting my home's electrical system.'

The third question in the energy efficiency habits series asked the respondents if their homes were fitted with insulation. 400 respondents successfully answered this question with the results nearly equally divided between Yes, No, and I don't know. In this regard, 38.75% representing the majority stated that they did have insulation in the home. Another 34.75% stated that they did not have insulation in the home and 26.50% did not know if their homes had insulation (See Figure 5-34).

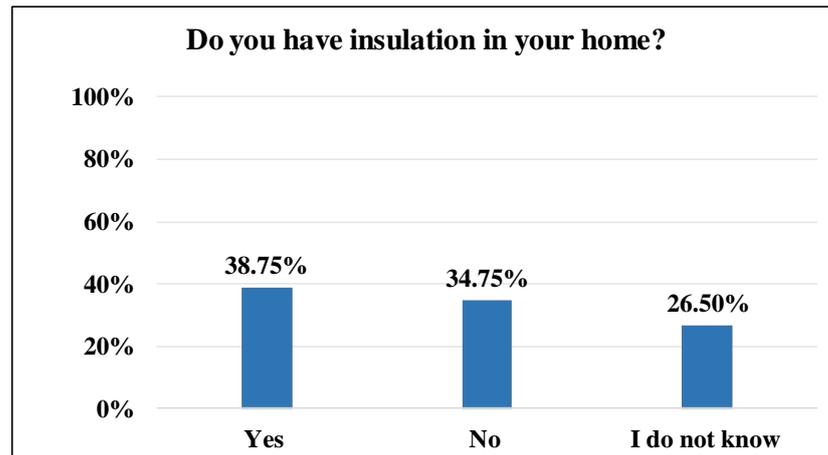


Figure 5-34: Respondents' Energy Efficient Habits: Insulation in the Home

There were 11 detailed responses to this question with mixed results. Approximately half of the respondents stated that they had double glazing/ insulation. One respondent did not know. Another stated that his/her apartment was;

'...mostly concrete so it keeps my apartment cool even when its hot out. I don't need to use AC that much, even when it's 40 degrees outside. The only time I use the AC on a regular basis is to sleep at night'.

One respondent said that these energy-saving materials will be installed in the 'future'. One stated that there was no 'provisions for installation' in the 'building design and construction.' Another respondent stated that 'standards for construction in Qatar are not followed.' One respondent merely replied that the house 'was old' indicating that no installations for energy saving were a part of the home.

400 respondents answered the fourth question which inquired about whether or not the respondents checked how much electricity and gas they used. An overwhelming majority of respondents (71.75%) admitted that they did not check how much electricity and gas

they consumed. Only 17.50% of the respondents checked this with 10.75% saying they did not know if they checked how much electricity and gas they used (See Figure 5-35).

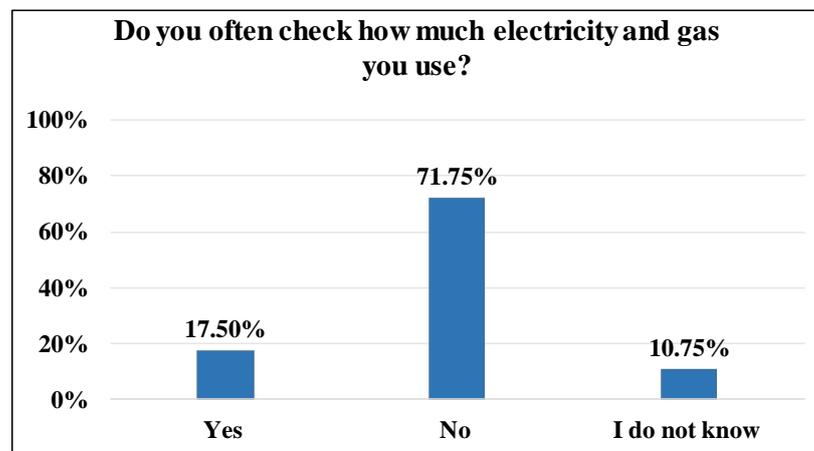


Figure 5-35: Respondents' Energy Efficiency Habits: Checking Electricity and Gas Consumption

There were eight detailed responses to this question. The responses were mixed in that some of the respondents admitted to checking electricity and gas bills on occasions, some always, and some admitted that they do not pay those bills so never check them. One respondent, however, said that 'since I do not receive the bills, we are controlling the use of lights and other devices carefully.' It is clear, however, that for those who pay the bill, they are very careful about those consumption habits. Where electricity is paid, but not gas, the only concern is the usage of electricity. One respondent admitted to being careless in that s/he only checked the electricity usage when 'I am about to pay the electricity bill.'

In the final question on the energy efficiency habits of the respondents, they were asked if they thought it was necessary to save energy. 392 respondents answered this question and an overwhelming majority (83.42%) agreed it was necessary to save energy. Only 5.36% said no compared to 11.22% who did not know (See Figure 5-36).

There were 21 detailed answers to this question. Although the responses varied in terms of content, the results were unanimous. All of the respondents believed that it was necessary to save energy. Most of the respondents gave different opinions as to why it was necessary to save energy or why energy was being wasted in Qatar. One of the primary reasons given was conservation of the planet for future generations. For example, one respondent said:

'Not only for our sake but also for the sake of the future generations to continue living life with sufficient energy'.

Another respondent also said, ‘Definitely YES, if we want to let our children live in a better environment.’ One respondent was more explicit and stated:

‘For the sake of economy, sustainability and environment safety we need to find out an appropriate quality of life and improve energy saving technologies’.

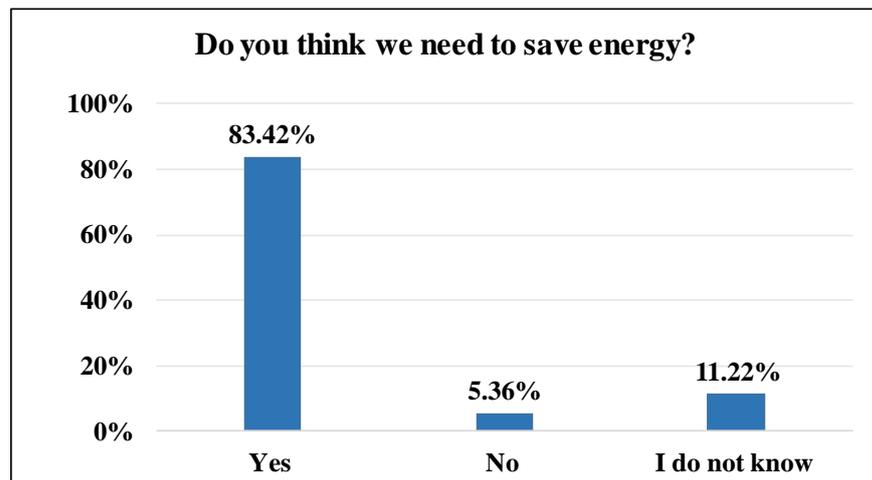


Figure 5-36: Respondents’ Energy Efficiency Habits: The Need to Save Energy

The respondents were then asked to select from a number of options which form of renewable energy they would like to use and to explain why. The choices were a) nuclear, b) wind, c) solar, d) wave, e) biomass, and f) I do not know. Out of 398 usable responses, 277 or 69.6% of the respondents selected solar energy as the preferred renewable energy source. 84 (21.1%) of the respondents did not know, while 14 (3.5%) selected nuclear; 13 (3.3%) selected wind; three (0.8%) selected wave and seven (1.8%) selected biomass (See Figure 5-37).

There were 16 detailed responses to this question. The most common choice was solar energy, principally because of its abundant availability in Qatar. One respondent said of solar energy:

‘Available everywhere (compared to others), Totally Free, Low to Zero Impact, Easy Maintenance’.

This was reflective of the majority of comments. While other options were selected, numbers were very much lower. For example, one respondent thought nuclear power was the best option since it provides more energy than any other energy generation source.

Another respondent selected wind energy since wind ‘power provides continuous generation day and night.’

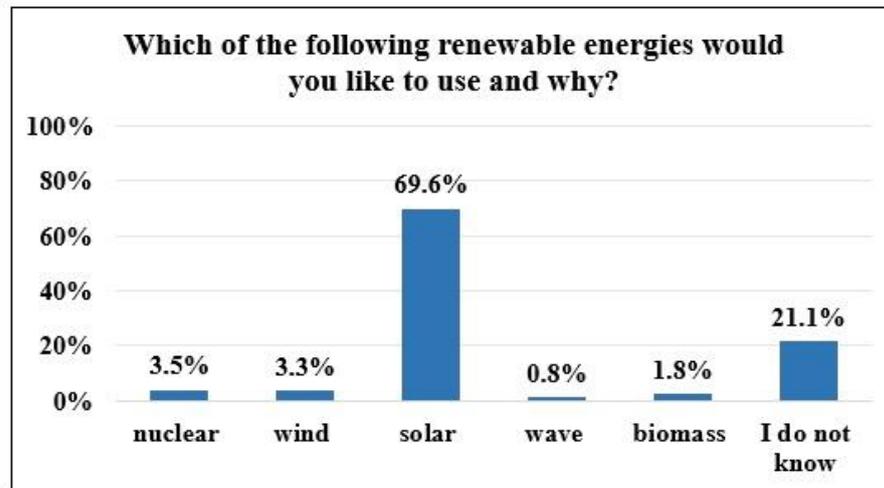


Figure 5-37: Respondents' Preferred Source of Renewable Energy

The respondents were also asked to select the reason they would choose renewable energy sources from a number of possible answers. The options for responses were: a) cost; b) efficiency, c) environmental responsibility, d) for selling excess energy generated, e) patriotism and energy security, f) policy, g) to reduce electricity consumption, h) society reputation, i) lack of information on how it works, j) I do not know; or k) Other (please specify). 394 respondents answered this question with the majority selecting environmental responsibility. Overall 199 respondents (50.5%) selected environmental responsibility as the reason for renewable energy, 126 (32.0%) selected patriotism and energy security; 113 (28.7%) selected cost; 97 (24.6%) selected efficiency, 90 (22.8%) selected to reduce electricity consumption; 60 (15.2%) selected society reputation; 48 (12.2%) selected lack of information on how it works; 46 (11.7%) did not know; 45 (11.4%) selected policy and 10 (2.5%) selected Other (See Figure 5-38).

It is also interesting to note that, when asked, of 394 respondents, only 37 (9.4%) were aware of any renewable energy firms in Qatar while 357 (90.6%) of respondents were not aware of any such firms (See Figure 5-39). However, in the detailed responses to this question, two renewable companies were identified: Qatar Solar Technologies (QSTec) and Al Emadi Solar.

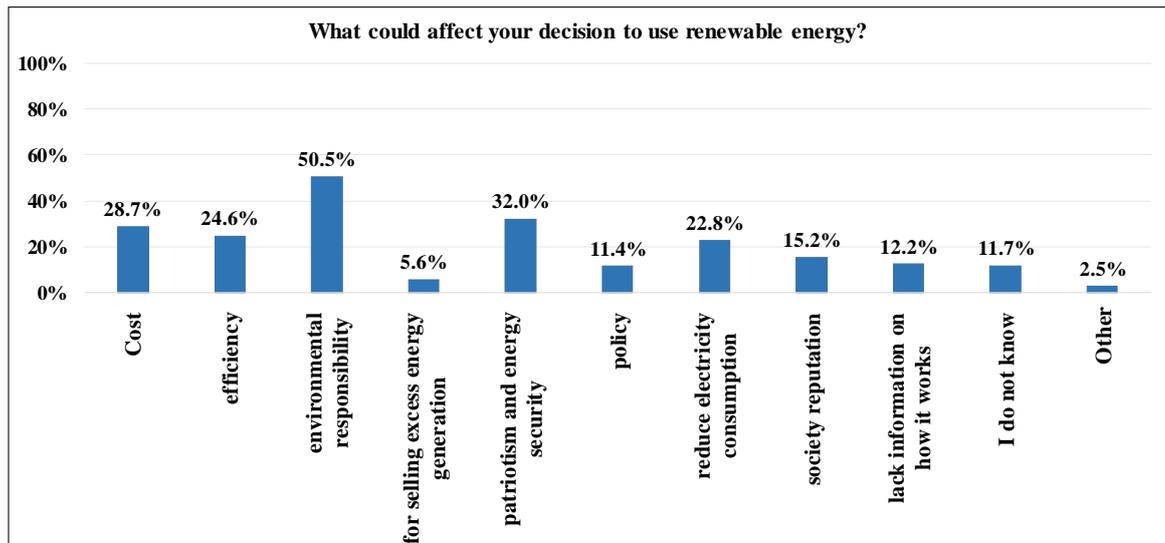


Figure 5-38: Respondents' Reasons for Choosing Renewable Energy

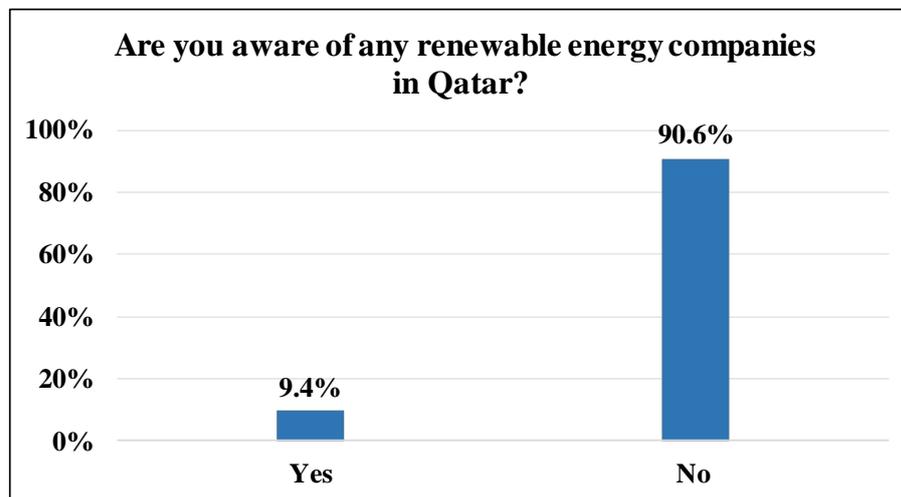


Figure 5-39: Respondents' Awareness of Renewable Energy Companies in Qatar

In the final segment of the second survey, the respondents were asked questions designed to determine their perspectives on the government of Qatar's renewable energy policies and the role of education in influencing their perspectives on renewable energy in general. The first question asked the respondents if the Qatar government's energy efficiency policy is clearly understood. Only 10.91% of the respondents strongly agreed with this while 27.41% agreed. However, 39.09% were neutral, with 18.27% disagreeing, and 4.31% strongly disagreeing with this question (See Figure 5-40).

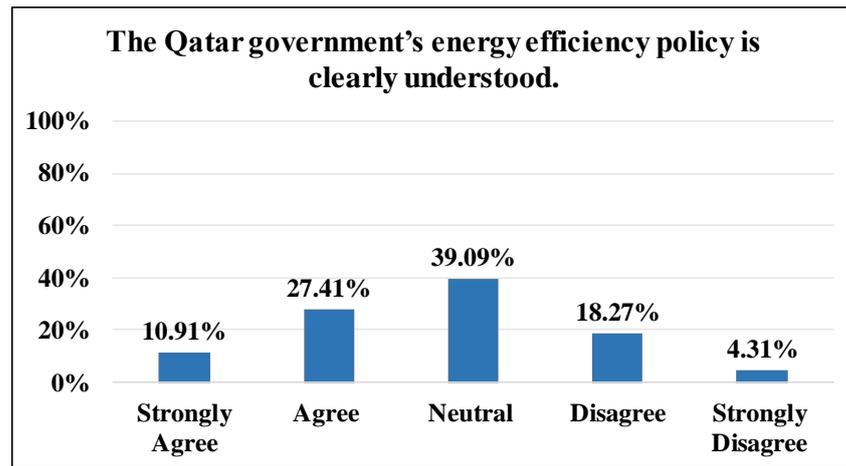


Figure 5-40: Respondents' Perceptions of Clarity of Government Renewable Energy Policies

When asked whether or not the Qatar government's energy efficiency policy contains clear objectives, 33.16% agreed and 11.83% strongly agreed, 38.82% were neutral, while 13.37% disagreed and only 2.83% strongly disagreed (See Figure 5-41).

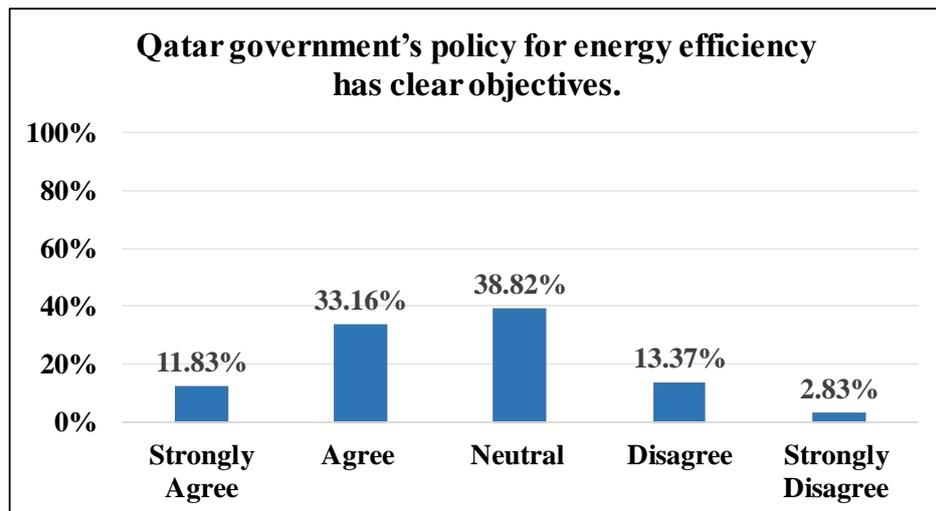


Figure 5-41: Respondents' Perceptions of Government's Renewable Energy Policy Objectives

On the question of how well the Qatar government is putting its energy efficiency policies together in practice, a majority of the respondents (44.87%) were neutral, with 10.51% strongly agreeing, 27.95% agreeing, 12.82% disagreeing and 3.85% strongly disagreeing (See Figure 5-42).

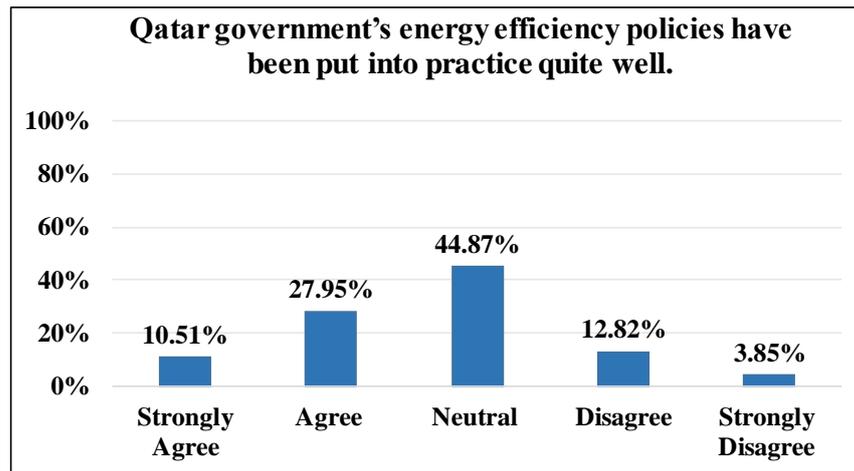


Figure 5-42: Respondents' Perceptions of Government's Renewable Energy Policies: Policies into Practice

The respondents were also asked if people are showing greater caution in their energy use as a result of the Qatar government's renewable energy policy and practices. Only 9.25% of the respondents strongly agreed, with 24.94% agreeing. However, 41.65% were neutral, 18.25% disagreed, and 5.91% strongly disagreed (See Figure 5-43).

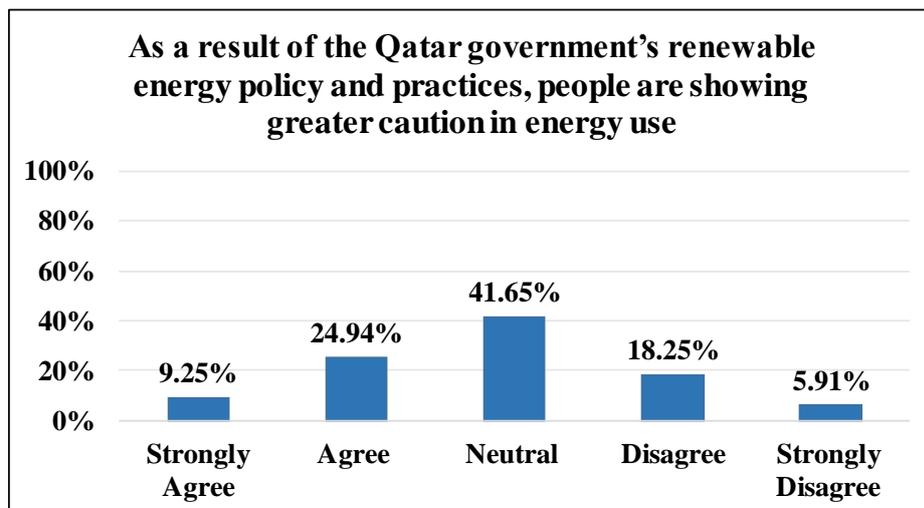


Figure 5-43: Respondents' Perceptions of Government's Renewable Energy Policies: People Showing Greater Caution in Energy Use

The respondents were also asked if they themselves were more responsible with regards to energy use than before because of the Qatar government's energy efficiency policy. 10% of the respondents strongly agreed, while 30.26% agreed. However, 37.44% were neutral, while 16.41% disagreed and 5.90% strongly disagreed (See Figure 5-44).

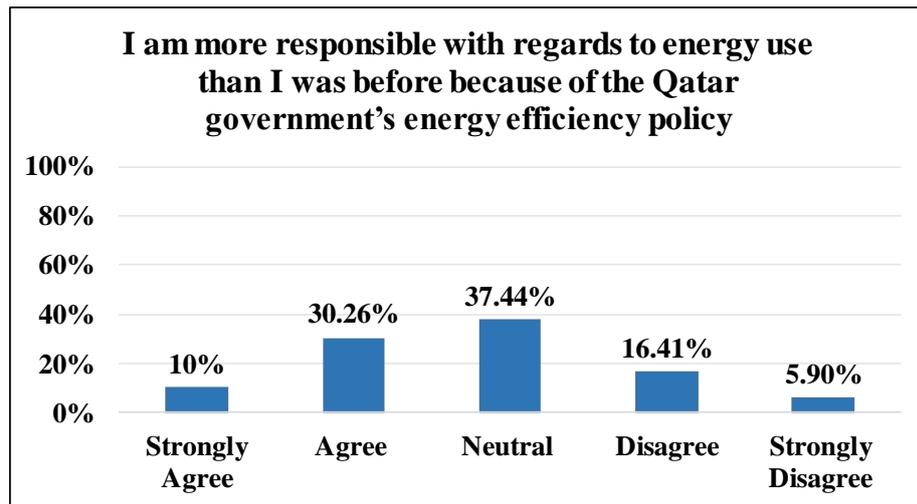


Figure 5-44: Respondents' Perceptions of Government's Renewable Energy Policies: Impact on Energy Usage

Two further questions in this last segment of questions referenced the impact and role of education in energy efficiency and awareness of renewable energy. The respondents were asked if education contributed to their knowledge and practice of saving energy. Results indicated that 35.75% strongly agreed with 32.64% agreeing. While 18.39% were neutral only 10.10% disagreed and even fewer (3.11%) strongly disagreed. (See Figure 5-45).

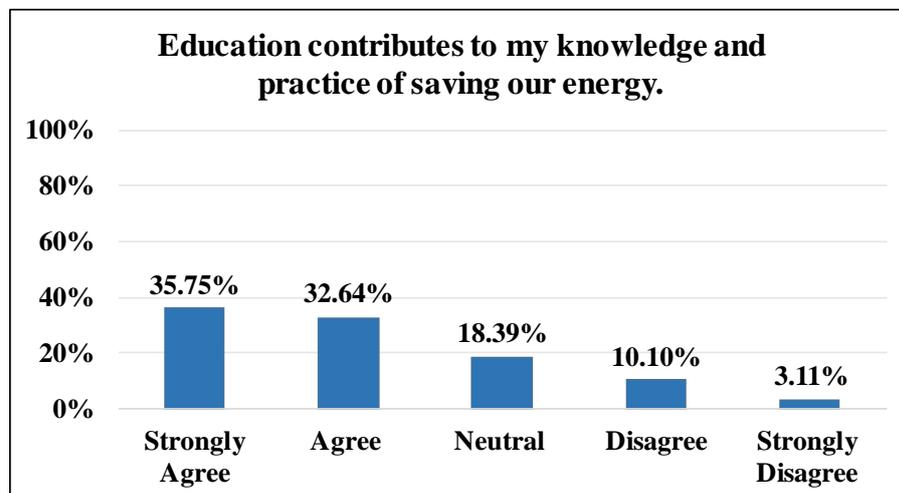


Figure 5-45: Education: Contribution to Knowledge and Awareness of Renewable Energy

As for the final question on education, and in the survey, respondents were asked if education played a role in their awareness of renewable energy. The results indicated that 47.94% strongly agreed with this and 30.15% agreed. Only 12.63% were neutral, with 6.19% disagreeing and 3.09% strongly disagreeing (See Figure 5-46).

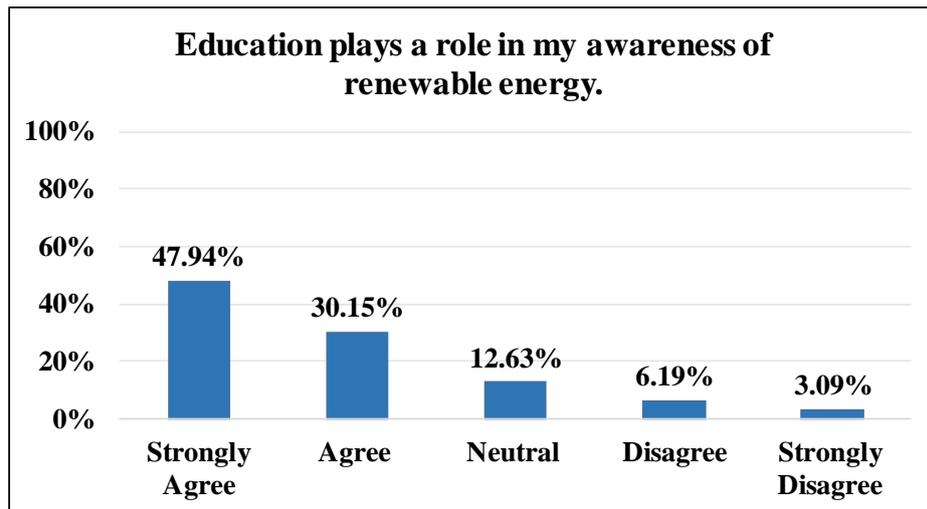


Figure 5-46: Education: Role in Respondents' Awareness of Renewable Energy

As an added note, the respondents were asked to identify what they thought would be the most suitable source of renewable energy in Qatar and to give an explanation for their choice. There were 13 detailed responses and, although some respondents selected wind, the general consensus was solar energy. One respondent selected both wind and solar energy but doubted those would be able to be put to effective use. According to this respondent, humidity and dust would make solar energy very difficult and expensive to sustain. Moreover, the respondent doubted that the wind was strong enough to provide an efficient source of renewable energy.

However, other respondents were far more optimistic about the use of solar energy in Qatar.

As one respondent put it:

'Solar: A lot of sunshine hours during the year, large uninhabited areas in the state's centre provide space for solar panels'.

Another respondent stated that solar energy was the first priority and that wind would be an excellent back-up plan. Specifically, this respondent noted that:

'Qatar would be ideally suited to use solar energy. The country must have one of the highest number of sun hours per year of any country in the world. There are vast areas of unused desert, which would be ideally suited for that. Wind would be an alternative, the winds are never particularly strong but fairly consistent - again there are large unused areas, which would be suitable'.

Another respondent made a very similar observation:

'With the abundant availability of solar energy during most of the year, it is very obvious that the primary source of renewable energy generation will be via solar power. However, wind power could also play a vital role in power generation along with solar'.

Three respondents who selected solar energy as the main likely source of renewable energy in Qatar registered reservations about its maintenance due to dust and humidity. However, another stated that, despite maintenance issues, solar energy was definitely the most viable source because the alternative, wind, is not freely available throughout Qatar.

Respondents were also asked to express their opinion about what the benefits of using renewable energy were. This question called for a detailed response and 47 were provided. These were quite similar for the most part with only slight variations. The overall theme in the responses was that renewable energy saved the earth's resources/helped to cut down on the cost of energy. One respondent simply noted that renewable energy was 'easy to use and cheap'. Another respondent stated that:

'It's part of a sustainable development that guarantees that future generations can live without any harm on earth by not depleting its resources'.

In understanding how renewable energy would help with costs in Qatar, where citizens/nationals have access to electricity without cost, one respondent clarified by stating:

'...clean air to breathe, good health for humans and animals, good health reflects also on the economy by allocating less budget for health and medical etc'.

Moreover, another respondent stated that using renewable energy will also create savings as less money will be spent on the production of oil and gas.

Finally, the respondents were asked if they had any comments or questions and, if they did, to provide a brief explanation. The following statements were submitted in reply:

- *I had no clue about energy efficiency policy*
- *I haven't heard much about renewable energy in Qatar*

- *I can still see a lot of villas surrounded by lights around the fence walls and some of them are never switched off, not even during the day*
- *If the government makes people pay for their electricity, they will use less of it*
- *Every one of us can help to craft a green legacy*
- *I hope Qatar can be greener to save our health and environment. And I think people need more awareness regarding the energy systems in Qatar. It's not impossible*
- *Renewable energy should be taught in schools and universities*
- *We need a lot of awareness*
- *Qatar is gifted and has a lot of gas reserves, but we should use other methods in saving our resources*
- *I hope we start it soon*

5.3.2 Analysis of Responses from Qatari Residents in Qatar

Due to the larger sample size, this group appears to be far more knowledgeable about renewable energy than the respondents in the UK, yet their patterns of behaviour toward the conservation of energy appear to be similar. However, the responses of the Qatari residents suggest that they have very different motivations for these behaviours. Those not paying for electricity are generally divided between those who do not concern themselves with energy saving behaviour at all, those who care sometimes, and those who care all the time. Therefore, the hierarchy of needs theory applies here, but for different reasons.

The hierarchy of needs theory applies where the respondents are aware of the energy security risks that they face and the importance of fossil fuels for the country's future and for future generations. Qatari residents mindful of the energy security risks and the future of their country, their communities and the health risks posed by environmental damages, should have elevated energy conservation to a primary need over a secondary need. However, as the results of this survey reveal, a majority of these respondents have not yet made this leap. While many claim to be aware of renewable energy and the need for it, some seem to exhibit carelessness in regard to energy consumption. For example, there are respondents who open windows to let in fresh air while running the air conditioning and others who use traditional light bulbs when energy saving light bulbs are both efficient and

widely available. Such cases display a lack of consciousness of the environmental impact of wasting energy and act as an obstacle to the Qatari government's plan to reduce reliance on traditional energy by placing greater emphasis on renewable energy sources. Therefore, in order to effectively implement renewable energy, it is first necessary to educate Qataris to alter their behaviour and encourage them to transition to renewable energy sources. Economic theory also applies here because this involves thinking towards the future and the need to be mindful of future generations. In this regard, the respondents are indicating a need to adjust their current behaviours relative to energy usage with a view to safeguarding against a future where the quality of life will deteriorate, with little, if any, prospects of reversing that decline.

Pursuant to the theory of self-determination, some respondents are more concerned with the need for comfort and this includes the right to have their air conditioning operating by whatever means are available. If this means using energy generated by fossil fuels, they simply do not care. Any alternative energy source is unthinkable unless it is guaranteed to be as reliable as the energy generated by fossil fuels. At the end of the day, the respondents are only interested in the reward and are not concerned about how this might punish the environment or future generations. Other respondents, however, are able to balance their personal reward against such future punishment, and, in doing so, are unable to reconcile the comfort acquired from the use of non-renewable energy with the comfort of future generations and the conservation of the environment. The fact that electricity is free in Qatar also resonated with this population sample. As in the UK sample, this group confirmed the theory of self-determination when some respondents stated that there was no need to conserve energy because it is free to Qatari residents. In other words, free electricity is a reward that some of the respondents prefer to have. These particular respondents are motivated to act in ways that are satisfying to the self as opposed to acting in ways that benefit others (Tanaka, 2013).

Like the UK respondents, members of this group recognize and accept that some form of renewable energy is necessary. What is striking is their eagerness to utilise solar energy. Although a few respondents appear to appreciate that solar energy, although abundant in Qatar, is a high maintenance exercise and not as easily implemented as one might think, the remaining respondents seem to think that solar energy will be an easy option for Qatar and are anxiously awaiting the transition from traditional energy to solar energy. This perspective is consistent with findings in the literature which show that solar energy has

become an appealing alternative to conventional energy. In general, it has been suggested by those in favour of solar energy, that this renewable energy source is inexpensive, easy and relatively cheap to maintain and is efficient (Abbasi and Abbasi, 2012).

Again, economic theory can be applied here as it demonstrates a propensity for maximising future opportunities, and adjustments to ensure those outcomes in a changing environment. However, a majority of the respondents' awareness and perceptions with regards to solar energy are unrealistic. This is because, as the literature indicates, at this particular point in time, converting to and maintaining solar energy is expensive (Lewis, 2007). While it is expected that market forces will drive costs down over time, respondents expecting instant results are likely to be disappointed. When this transition does not take place as quickly and as efficiently as anticipated, the outcomes may be undesirable for the respondents. Nevertheless, as reported in the literature, the respondents' amenability to solar energy is an indication of how society can change in terms of the ability to accept and adapt through technological advances (Kenisarin and Mahkamov, 2007).

The difficulty for the respondents that are eager to see the Qatar government's solar energy conversion come to fruition is that their expectations are inconsistent with the realities on the ground. While the respondents are willing to convert to solar energy, their understanding of the conversion process is skewed by the expectation that conversion will be a simpler and less expensive process than it actually is. Another concern that makes their expectations unrealistic is the installation process. Findings in the literature indicate that installation of solar energy requires a significant amount of space and that, in order to generate sufficient solar energy to power a single residential building, solar panels would have to cover the building's entire roof and some of the yard as well (Wagner, Twesme and Hidalgo, 1992). It is quite possible that the respondents' eagerness to convert to solar energy would abate somewhat if the installation process was better understood. Even so, a majority of the respondents' positive attitudes toward converting to solar is a good start to Qatar's renewable energy ambitions.

Although a promising technology, solar energy is in need of further development and research (Goh et al., 2014; Liu, Li and Liu, 2014). As some respondents pointed out, it is not yet known how this energy can be stored and used efficiently. Therefore, while solar energy might turn out to be a huge success, it could also turn out to be a complete failure. The government of Qatar is right to invest in research and development prior to fully

implementing its renewable energy policies. However, in order to prevent the population's disenchantment with the seemingly slow implementation of the solar energy policy, the government should take steps to heighten awareness of solar energy prospects and integrate renewable energy education into education policies and the broader social environment.

In order for the renewable energy policies and plans to work, the population will have to accept them and adapt their behaviour accordingly: as Lindsey (2013) notes, education precedes acceptance. Although the results of this survey indicate that more of the respondents are aware of or knowledgeable about renewable energy, there is still a significant number who are not. This suggests that, as a whole, the people of Qatar are not yet sufficiently aware of the potential of renewable energy. Taken together, the two surveys indicate that there is a growing need to integrate environmental and renewable energy into the education systems. As the results of this survey demonstrate, a lack of adequate education leads to inaccurate perceptions and misguided expectations. In this case, where the population is unaware of the intricacies of renewable energy sources, they have expectations that the government can implement a renewable energy source that is efficient and low cost. With greater education, the population's expectations would be more realistic.

The Qatar government is aware of the urgency of seeking and using alternative energy sources and has fixed conversion processes with hallmark accomplishments by the year 2020 (Power Qatar, 2015). However, as the results of this survey suggest, the government needs to identify additional measures to improve public awareness of why this strategy for renewable energy is important. A large number of the respondents are still unaware of renewable energy and the environmental costs of using traditional energy sources, and many of those who support the transition to renewables have high expectations which are unlikely to be satisfied.

5.4 Interviews with Energy Experts and Policy Makers

In addition to the surveys discussed above, the researcher surveyed 11 Qatari experts in the energy sector using semi-structured interviews. The purposive sampling technique was used to identify relevant professionals to provide qualitative data for the research. This approach involves selecting individuals with appropriate knowledge and expertise on a specific field of study. The energy professionals selected included energy policy makers, academicians, and managers of energy companies.

5.4.1 Results of the Interviews with Energy Experts and Policy Makers

11 interviews were conducted with representatives from the following organizations:

Qatar Foundation, Qatar Petroleum, Qatar General Electricity & Water Corporation (Kahramaa), Qatar University and Al Emadi Solar. Al Emadi Solar is a private company while all of the others are energy policy makers or contributors to energy policy making (See Table 5-1).

Table 5-1: Classification of Interviews (Author's Creation)

Classification	Organisations of Interviewees list	Code of Interviewee	Duration
Energy Policy Makers	Qatar Foundation	A1	60 minutes
		A2	54 minutes
		A3	53 minutes
	Qatar Petroleum	B1	45 minutes
		B2	60 minutes
	Qatar Kahrama	C1	55 minutes
		C2	57 minutes
	Qatar University	D1	36 minutes
D2		45 minutes	
Private Companies	Alemadi Solar	E1	34 minutes
		E2	39 minutes

Each of the interviewees were asked what kind of renewable energy they believed was most suitable for Qatar and why. All 11 interviewees recommended solar energy as the most suitable form for use in Qatar. Only one interviewee thought both solar and wind energy were preferable (B2). One interviewee specifically said that wind was not feasible as it was only available in the North while solar energy was available throughout all of Qatar (D2). Another interviewee, in selecting solar energy, stated that the 'speed of wind is limited' (D1).

Each of the 11 interviewees stated that one reason for selecting solar energy as the most suitable renewable energy source for Qatar was its availability and abundance. Interviewee A3 did point out, however, that there are 'some negatives' and these include 'the high temperature which affects the 'efficiency', because some solar panels could not accept temperatures over 25-30°C, and 'humidity' and 'dust', which mean that solar panels require regular cleaning and maintenance.

Even so, B1 stated that solar energy would still be a cheaper option in Qatar than other sources of renewable energy, going on to point out that:

'Timing, during day time is actually when most energy is needed. And solar offers peak demand saving opportunity. Secondly, waste to energy. This energy is both landfill problem solving and a source of reliable energy.'

Interviewee B2 selected solar energy (PV) and wind energy. Solar energy 'benefits from high natural resource (Global Horizontal Irradiance or GHI) and low capital costs.' However, although solar energy is a rich resource in Qatar and it has a 'potential role in industrial processes,' it is 'negatively impacted by all the dust in the air and may not be economical.' As for wind energy, Interviewee B2 stated that it 'has an average low natural resource and benefits from new technology (tall towers) that could' be 'economical'; however, it requires more research to determine how well it might work as an option for renewable energy in Qatar.

Interviewee C1 simply said that solar energy is the best option because 'Qatar has good sun light radiation' and 'it is the most feasible economically compared to other sources of renewable energies.' Interviewee C2 stated that there is currently no 'inventory and assessment of renewable energy sources in Qatar,' but that:

'...assessment satellites [have] confirmed Qatar enjoys high levels of solar radiation which qualifies for all solar energy applications, whether photovoltaic or thermal, as well as wind power playing a role, especially in the northern regions.'

Further insight was also provided by Interviewee E1 who added that solar energy and increasing 'the efficiency of buildings' through design, usage, electricity generation and mechanical means can create and promote 'green' construction.

The interviewees were asked if they thought this kind of renewable energy would meet the energy demands of citizens and why. The results were mixed with some interviewees thinking that solar energy could meet the needs of citizens fully, or partially, or not at all. Interviewee A1 stated that the sun has more radian at the 'peak load and therefore saving the peak is affordable'. However, A2 said solar energy would not 'fully' meet the energy demands of citizens in Qatar, 'because of the intense energy demand, especially air

conditioning.’ A3 did not think that solar energy or renewable energy would meet the energy needs of citizens in Qatar for two reasons:

‘...energy prices are supported in Gulf countries and investing in renewable energy will not be profitable. There is no motivation to use renewable energy. For example, in Europe tax incentives are motivational but here we do not have taxes’.

Interviewee B1 felt that solar energy or renewable energy could ‘partially’ meet the energy demands of Qatari citizens, but that ‘the better answer’ is to have different types of energy and to ‘create a balance or mix of energy’. Interviewee B2, however, was convinced that solar energy or renewable energy would ‘absolutely’ meet the energy demands of Qatari citizens and offered the following insight:

‘The solar resource is sufficient to meet 100% of energy demand (when combined with storage). More importantly, renewable energy will displace natural gas use in power generation and allow that gas to be exported. The revenue earned in international markets is much higher than the revenue earned in domestic markets. The difference is significant (tens of billions of dollars over the life of the solar plant). This additional revenue could fund schools, hospitals, and other public infrastructure’.

Interviewee C1 essentially echoed the thoughts expressed by Interviewee B1. According to Interviewee C1:

‘Based on current technology and economic circumstances renewable energy is necessary but we do not believe it will substitute the fossil-based energy source at least until the end of this century; however, it is considered to be a very important complementary source of energy. It can meet the demand in remote areas, and as a complement as mentioned above, and for limited uses’.

Interviewee C2 also shared a similar opinion about renewable energy sources and took the position that renewable energy can be a supportive or complimentary source of energy, but

it will not work as the only source of energy. Interviewee C2 specifically stated that it was not possible to:

'...rely entirely on renewable energy sources to meet the needs of all citizens of energy and that the diversity of applications and the different time periods to take advantage of them, but this must work to take advantage of what is available from the sources and work on integration. The solar power of renewable energies can best be made use of during the day time as the energy can be generated and stored to take advantage of at night to meet the needs of citizens.'

However, Interviewees D1, D2, E1 and E2 were all of the opinion that renewable energy, specifically solar energy, could meet the energy demands of Qatari citizens. Interviewee D2 stated that renewable energy could meet 100% of the energy demands in homes but would probably not be sufficient for factories and malls. Interviewee E2, however, was of the opinion that renewable energy could meet the energy demands of all citizens 'as well as the private and public sector as a sustainable energy source.'

The interviewees were asked if they thought it was necessary to use renewable energy in Qatar and, if so, why. One interviewee thought it was not necessary at all (B2) and another thought it was not necessary for now (B1). According to B1:

'For the time being, the answer is not really important. However, in the future, the balance of energy may change, and we may face missed opportunities of gas sales. Taking into account that the power generated by solar is supplementing gas generation.'

In other words, Interviewee B1 is more concerned about the conservation of gas for economic reasons and thinks that renewable energy will help to preserve gas resources in the future if it becomes obvious that gas resources are becoming depleted.

Interviewee B2 shared a similar opinion but was far less hesitant than Interviewee B1. Interviewee B2 stated that:

'Renewable energy is not necessary. Natural gas and nuclear energy can also meet domestic power needs. Nuclear energy can also displace natural gas demand and improve national revenue, just like renewable energy. Defining priorities is a function of priorities. If

people say the environment and limiting climate change is a national priority, then renewable energy may become necessary’.

Interviewees A1, A2 and A3 thought that renewable energy for Qatar was necessary, but, interestingly for the very same reasons that B1 and B2 thought it was not necessary. The difference is that while Interviewees B1 and B2 did not think that looking into the future was necessary as traditional energy sources were not currently in danger of depletion, Interviewees A1, A2 and A3 were concerned about the future of these resources. For example, Interviewee A1 stated that:

‘It is paramount to start our long-term sustainability plan to stop burning our precious fossil fuel for electrical power and keep it all for our GDP capitalization’.

Interviewee A2 said that renewable energy is necessary to use in Qatar because it will aid in the reduction of GHG emission and ‘save energy (gas) which can be exported.’ In the meantime, Interviewee A3 thought about the future generation and stated:

‘yes we have oil and gas now, but it is wise to save it for new generations to live as we did, for example, if the oil and gas lasts for 200 years and we save 50%, that will save it for 400 years. Even if we do not need save it, the awareness is necessary to reduce consumption’.

Interviewees C1 and C2 took the position that it was necessary for Qatar to use renewable energy sources for the simple reason that it was impractical to rely on a single energy source. Depending on a single source of energy is risky and can lead to blackouts. Therefore it is necessary to minimize this risk by relying on different energy sources (C1). Interviewee C2 added that:

‘Each State should take advantage of their natural resources, especially in the field of energy; we should not rely on one source of energy because of the effects of this on the market. The diversity of sources will ensure the continuity and sustainability in its use for production. In the case of Qatar, which has enormous sources of natural gas, the addition of other sources works to maintain it for

longer periods for future generations as well as to take advantage of export potential in larger quantities’.

Interviewee D1 stated that reliance on renewable energy in Qatar was necessary for protecting the environment. Interviewee E1 simply stated that it was necessary and did not provide an explanation for this perspective. Meanwhile, Interviewee E2 said that Qatar should look for ‘alternative energy to maintain development and progress.’

The interviewees were asked: ‘Have there been, or will there be, any projects geared towards renewable energy development? Any names? Are there any practical experiences?’ According to Interviewee A1, QSTP has been ‘operating a solar test facility’ for at least two years. Interviewee A2 pointed out that in 2013 Qatar General Electricity and Water Corporation (Kahramaa) announced it was developing a ‘major solar power plant’ with the aim of being fully operational within eight years. Interviewee A3 stated that Qatar ‘committed at the COP conference in 2012 to establish 200GW’ and that ‘this is a good point to start.’ There is also Lusail City (Qatar’s ‘City of the future’) which ‘focuses on’ reducing energy consumption by up to 30% ‘and this is the first city to do it around the world.’

Interviewee B1 identified five renewable energy projects or initiatives. The first of these is the Ministry of the Environment’s ‘waste-to-energy’ plant in Mesaieed. The second is the solar ‘test facility’ established by Chevron, Green Gulf and QSTP. The third is Qatar Environment and Energy Research Institute (QEERI) which is developing a cell production ‘technique’ and solar ‘resource assessment.’ The fourth is Al Emadi Solar, and the fifth comprises Qatar Solar Energy and Green Gulf, all three private sector initiatives. Finally, there are ‘other applications for off-grid’ that are now being established in ‘QP for stand-alone well-head monitoring stations.’

Interviewee B2 provided details of a number of projects as follows:

‘Green Gulf has many small solar projects for QF (2MW). Kahramaa is approved to build 200 MW and has begun project work for about 20 MW. QP in partnership with Qatar Electricity and Water will jointly pursue solar project development, but those efforts are very immature. Finally, there are many very small examples of the use of solar for lighting, power electronics, winter tents set up in the desert, etc. However, these small applications are not true projects’.

Interviewee C1 offered information that a number of studies have confirmed that solar energy is the most feasible solution, but it also depends on the type of technology that will be utilised. Interviewee C2 mentioned Kahramaa and stated that it adopted a ‘proposal’ to establish ‘solar power plants’ with capacities ‘up to 200 megawatts by the year 2020’. A study assessing its potential for ‘benefitting from the surfaces of water tanks for the establishment of these stations and connected by an electrical unified network’ has been conducted. There are also ‘some with small capacity and diverse projects’ throughout Qatar and a ‘total capacity of up to about 4 megawatts.’ However, everything ‘is connected to the unified electric grid.’

Interviewees D1, D2, E1 and E2 offered less insight. D1 said that ‘I think there is but one small example, QF.’ D2 stated ‘yes, at international research strategy [level] there is renewable energy direction.’ Interviewee E1 said that there are ‘a lot of projects currently in Qatar, the Qatar Vision 2030 is the installation of 200 MW of solar energy’ and there is also the ‘subject of green building.’ Interviewee E2 also said that Qatar was ‘seeking to establish a photovoltaic power plant of 200 MW capacity by 2017.’ In addition, a number of projects have been implemented in Qatar ‘in this area.’

Asked if there were any local industries for renewable energy in Qatar, the interviewees identified a few, notably the Qatar Solar Company and Qatar Solar Technology (QSTec). According to Interviewee B2:

‘Qatar Solar Energy and Qatar Solar Technology (QSTec) both manufacture solar modules. Qatar Solar Energy appears to have a more practical and successful business model with a factory up and running. QSTec also has a factory under construction but may have encountered problems in the design of their assembly line’.

Interviewee C1 mentioned a joint venture between QF and SolarWorld for raw materials ‘which is silicon but till now not produced and the factory is still under construction.’

The interviewees were asked if there were any foreign investors in renewable energy in Qatar. The respondents identified SolarWorld as a German company with a 29% interest in QSTec. Qatar Solar was also named as a partner with a foreign investor. According to Interviewee B2:

'There are foreign companies that have partnered with Qatari companies to build solar projects, but those partnerships do not appear to be generating any significant project activity given that the Qatar power sector is not really an open market. I suspect that there may be some foreign investment in Qatar Solar Company and QSTec'.

However, Interviewees C1 and C2 were not aware of any foreign investors involved in Qatar's renewable energy projects. Interviewee D1 said he did not think there were any such foreign investors. Meanwhile Interviewee E2 said that there should be foreign investors but did not know if any were currently involved in renewable energy projects in Qatar.

The interviewees were asked if the Qatari government's renewable energy policies were clear. Out of the 11 interviewees, only one thought that the government had a clear renewable energy policy. According to Interviewee D2, there is a clear renewable energy policy by the Qatar government: the research strategy plan. The remaining interviewees were for the most part not in agreement with this. For example, Interviewee A1 said 'not yet', while Interviewee A2 stated simply 'No'. Interviewee A3 said 'not yet but there is a policy to reduce energy consumption' and a majority of the 'projects follow this to reduce consumption to 30%.'

Interviewee B1 said there was no clear renewable energy policy from the government of Qatar 'only targets, for example to produce 2% renewable energy by 2030.' In addition, there are 'voluntary initiatives, but none elevates to a clear policy.' According to Interviewee B2:

'There is no official policy from the Ministry of Energy or the Council of Ministers. The Emir has made some general public comments about future goals at the COP18 conference, but I don't see a well-coordinated policy framework'.

Interviewee C1 said that there was no clear renewable energy policy by the Qatari government, but they were 'working on it.' Interviewee C2 added:

'Even now, there is no policy or legal regulations with regard to renewable energy. But there are some trends and awareness of the importance of renewable energy use, so there are some experiences

of members/governmental institutions/private institutions using and benefitting from solar energy sources, but all of them individually’.

Interviewee D1 repeated the question and then added ‘I do not know.’ Interviewee E1 and E2 stated unequivocally that there was no clear renewable energy policy from the Qatari government.

The next question asked of the interviewees was: ‘Would you say that Qatar’s renewable energy policies are sufficient to increase or enhance renewable energy use? Explain.’ The interviewees gave pessimistic responses to this question. For example, Interviewee A1 stated that the Qatari government’s renewable energy policy was ‘not enough’ and that ‘more incentives and subsidisation are needed.’ Interviewee A2 did not know if the Qatari government’s renewable energy policy was sufficient to increase or enhance renewable energy use. Interviewee C1 thought the policies needed to be ‘modified to attract people to install PV, at least in remote areas.’ Moreover, ‘the power from the grid is classified as one of the cheapest in the world due to heavy subsidies.’ Interviewee E1 simply stated ‘No’ in response to this question.

When the interviewees were asked what they had to say about the strengths of the Qatar government’s renewable energy policies, they essentially said there were none. Interviewee A1 described the policies as ‘very weak’ and said that they needed ‘reinforcement’ and that they ‘do not exist in some cases.’ Similar responses were received to the follow-up question about the weaknesses of the government’s renewable energy policies. Interviewee C1 said that ‘we still do not have a full and permanent policy’.

When asked what the government could do to strengthen its renewable energy policy, the responses remained pessimistic. Interviewee A2 said it would help to ‘have a policy in the first place.’ Interviewee A3 offered more detailed advice as follows:

‘[find a] balance between implementation potential and encouraging people to take this idea of RE, and this is not just the government’s responsibility but also all of the public and private sectors, society and the education sector, [also] by speaking loudly at conferences, I believe it will be a good start (open conversation between all sectors in Qatar and discuss it)’.

However, Interviewee B2 offered yet more details, and focused in particular on the Qatar General Electricity and Water Corporation (Kahramaa):

Policy has not been formulated because of [certain] obstacles. I list the most important:

-Kahramaa manages the electric grid and is also responsible for power market regulation (in partnership with the Ministry of Energy). There is a conflict of interest in the structure, regulation and operation of the grid, they need to be clearly separated;

-Kahramaa has been slow to define the process to connect renewable energy projects to the electric grid. That process needs to be created to meet the needs of both the grid and the project developer. In an ideal world, developers would be protected by law that guarantees (a) open access to the grid if certain conditions are met and (b) a feed-in tariff or price that Kahramaa must pay when power is delivered onto the grid.

-Land access is very constrained. The market for land is also not liberated or free given the high percentage of government control. Government needs to set aside large blocks of land for future use in renewable energy.

-All forms of power generation cannot make a profit in Qatar. Power is sold to the public below the true production cost. Power generators still make a profit because they receive subsidies, either direct infusions of cash or low cost natural gas.

-The price of power sold to the public needs to be adjusted to reflect the true production cost. Qatari households receive power for free (on their first home only). There is no incentive under this framework for the public to explore the use of solar energy as an alternative to grid supplied power. There is also no incentive to limit consumption to reasonable levels or to protect the environment.

The interviewees were asked if they thought that renewable energy would be affordable. Interviewee A1 thought that it would only be affordable if it was coupled with incentives for using renewable energy. Interviewee A2 did not know. Interviewee A3 said that

‘initially, the prices could be higher, but it will be supported by the government and there are barriers such as the technical side and the economic side.’

Interviewee B1 thought that renewable energy would be affordable ‘if all costs are accounted for in producing power.’ In that case, renewable energy ‘could be an attractive proposal’. Interviewee B2 agreed that renewable energy would be affordable and added:

‘...it is possible to make a profit in Qatar through solar energy since the capital cost is low and additional revenue can be created when domestic demand for natural gas is reduced so the gas can be exported. A portion of the gas revenues needs to be allocated to the solar project to ensure profitability, but there is still a large block of cash left over from the gas sale that can go to the people of Qatar’.

Interviewee C1 offered more insight pointing toward the relative cost if renewable energy was not an option. In other words, given the threat to energy security, renewable energy is an opportunity people cannot afford to miss. In this regard it is affordable because it has to be. Interviewee C1 specifically stated:

‘The cost of renewable is more or less close to the traditional due to reduction in prices during the last 6 years; however we cannot compare it to the local power prices because it is heavily subsidized - therefore we cannot compare.

In Qatar we sell electricity for 0.07-0.08 Qatari Riyals, which is not more than \$0.3 cents (US\$); however I believe the promotion of solar does not depend on prices alone, but the concept of energy mixture is one of the drivers as well as energy security.

But I believe [the cost of] solar, especially photovoltaic technology prices, will decrease in future which will make it more attractive’.

Interviewee D2 said that renewable energy ‘will be cheap’. Interviewee E1 stated that it is ‘suitable compared to previous years.’ Interviewee E2 said that, at the onset, the cost of renewable energy projects ‘are high’; however, ‘in the long run’ the costs will be ‘economically viable.’

The interviewees were also asked: ‘Do you think that renewable energy production will be as efficient as current energy source production? If not, what is the difference - is it the cost of production? Why? Is it efficiency? Why?’ The following responses were received:

A1: This interviewee felt that due to technological advancements, economically effective alternative sources of energy can be achieved in the ‘coming years’.

A2: This interviewee did not feel that efficient renewable energy production was possible. According to A2: ‘solar energy depends on the sun which is available during the day only. This will require energy storage capabilities which will also fall short of demand.’

A3: According to this interviewee: ‘It should be considered. Efficiency and economics should be taken into account. In addition storage should be worked out as solar energy requires daylight and at night the energy will have to be stored.’

B1: This interviewee’s response was consistent with interviewee A3. B1 stated, ‘renewable energy is mostly an intermittent power; thus, power storage is needed to cover the gap. However, this is not cost competitive. The main difference in efficiencies comes from energy conversion. How energy is converted into usable power. So apple to apple comparison is not really the goal here, we should think about energy integration. Not replacement.’

B2: This interviewee was not comfortable comparing ‘the efficiency of renewable energy to conventional power generation... because the technology is so different and wind/solar energy are intermittent.’ B2 felt it was best to compare energy costs.

C1: C1 was also not optimistic about the efficient production of renewable energy. Much would depend on developments in ‘renewable technology’ such as ‘solar PV’ especially with the focus on this type of renewable energy. This interviewee added:

‘In traditional combined cycle gas-steam turbine power plants, efficiency varies from 40% to 67% depending on many factors. For PV, efficiency ranges from 9% to 17% as far as I know; therefore, to generate 1KW of electricity you need to cover an area that varies from 8 square meters to 12 square meters depending on technology and plant arrangement. Meaning you need a huge area to install a PV plant and land prices are not cheap, this is one of the main differences.’

Also, after sunset, you need to connect to the grid, or you need a battery system which is very expensive. And this adds more cost.'

C2: C2 felt that comparing renewable energy with traditional energy was problematic since traditional energy is 'continuous' and renewable energy is highly dependent on climate conditions which are changeable. Moreover, converting renewable energy is not as efficient as traditional energy conversion.

In terms of prices and the cost, the cost of energy production from renewable sources has seen a sharp decline in the last three years; it was almost better than conventional power, but with recent drops in oil and gas prices, that situation has changed.

D1: This interviewee said: 'We need to know that we should be adjusting to the new situation within RE and the changing social and economic situation.'

D2: 'The efficiency will be lower but RE will cover a big spot.'

E1: E1 felt that renewable energy would be a better option if it is diversified and able to meet current energy demands.

E2: This interviewee was more positive, saying that: 'Solar power plants perform the same purposes of diverse power plants ...and [have] the advantage of being economically viable in the long term and protecting the environment.'

The interviewees were then asked: 'Looking at a map of Qatar, what areas could be suitable for the installation of renewable energy technologies and what types of renewable energy technologies would be best suited to each geographical location?'

Interviewee A1 recommended that the entire country receive Photovoltaic. A2 suggested Qatar's centre, which is away from the 'possible humidity from the sea.' A3 thought that wind energy should be installed in the north and the northeast and solar energy should be installed through the country, 'but in the south' there should be greater availability.

B2, C2, D1, E1 and E2 thought that solar energy could be installed anywhere, but B1 offered a different opinion, stating that:

'Generally speaking, for solar power, the further you are from the sea the better. So central locations in the country are preferred. However, resource assessment is also needed to optimise site selection. The difference may not be significant, but weather data could provide

optimal site selection when considering micro climatic conditions such as fog, dust, wind, and temperature’.

When asked what the government’s role was in promoting renewable energy and establishing it, the interviewees reiterated the need for clear and convincing policies. However, Interviewee B2 offered the most insight:

‘Policy, land access, grid access, feed-in tariffs, project finance, [and] development of the local supply chain and skills. More importantly, government has to set priorities and manage expectations that another way of living is better than the current way of living’.

The interviewees were asked if they thought there were any challenges or barriers to implementing renewable energy in Qatar. Interviewee A2 stated that the greatest challenges or barriers were ‘technical, economic and social acceptance.’ Interviewee B2 echoed these sentiments. Interviewee C2 also felt that the main obstacles were individual acceptance and behavioural changes. Interviewee E2 added:

‘the most prominent is the low cost of fossil fuels, which leads to a lack of interest among institutions and individuals in renewable energy sources due to the relatively high initial cost’.

The interviewees were also asked: ‘What is your expectation of Qataris attitude/behaviour/opinion regarding renewable energy in Qatar? Why?’ In general, the interviewees thought that there was a general lack of trust and awareness of renewable energy among the Qatari population. However, B1 stated that:

‘I think people will be open to it if they see the benefits. However, currently, the conditions are not ripe for people to go for it in their homes. But definitely, stand-alone applications such as [for] camping [and] farming are getting attention’.

Interviewee B2 was less optimistic and stated that, ‘the attitude is simple: there is interest, but no incentives. If power is free, nobody will do anything.’ However, Interviewee C2 was more optimistic than his/her counterparts and said, ‘I think people now have sufficient awareness about renewable energy, as a clean source of energy and as sustainable energy as well.’ Interviewee D1 felt that since it is not against religion or society, it will be accepted ‘easily’.

The interviewees thought that the government of Qatar could do more to educate or increase Qataris' awareness of the feasibility of renewable energy. However, B1 stated that 'Qatar has already taken steps such as Kahramaa Awareness Park (an energy awareness 'edutainment' centre) to educate the public about energy and its sources.' C2 offered more insight into the government's role:

'Qatar has begun to develop renewable energy and seeks to raise public awareness of its importance in terms of preserving traditional sources on the one hand and, on the other hand, environmental (preservation).'

The interviewees were asked: 'Is there any education or training on using renewable energy in Qatar?' The responses were mixed in that A1 stated that the Qatar Foundation provides several courses, while A2 was aware of only one programme, namely Kahramaa's Tarsheed, and A3 did not know of any programmes or courses. B1 was vaguely aware of existing programmes and was sure there was a masters-level programme on energy. B2 was aware of a number of programmes for electrical engineering but not renewable energy.

C1 stated that:

'This section is relatively new. We compare it to other types of energy, but we here in Kahramaa have already started building capacity by educating our new engineers by exposing them to real life experiences, and by arranging special technical workshops. But on the level of schools, awareness has been increased using lectures that have been presented in schools as per schedule.'

C2 referred to Kahramaa's awareness park giving it high marks for improving knowledge and awareness of renewable energy capabilities. D1, however, was not very informative stating that there was no awareness programme and E1 simply stated 'No' in response to the question. E2 was more helpful stating that there are 'conferences and exhibitions and television programmes that encourage it.'

The interviewees were asked: 'What are the advantages of using renewable energy in Qatar?' Some helpful replies were recorded. A1 pointed out the benefits of not destroying fossil fuels and the resulting reduction in carbon footprint as well as the benefits for GDP. A2 also pointed out the benefits of reducing CO₂ emissions, noise pollution, and fossil fuel

depletion. B1 pointed out the benefits for the environment and the economy and the ‘flexibility and diversity of energy sources.’ B2 stated the benefits of ‘wealth and job creation’ and the improvement in the environment and quality of life and ‘the ability to produce water at lower cost’. C1 also mentioned the benefits of reducing carbon emissions and the improvement to the country’s image. C2 identified energy security, reduction of fossil fuel energy supplies, protection of the environment and the expansion of ‘fossil fuel exports’. D1 also reiterated the reduction of CO₂ emissions, while D2 emphasized saving oil and gas and improving the economy through investments outside of Qatar. E1 referred to mixed energies. E2 pointed out that:

‘The most prominent positive sustainable development, especially after the depletion of fossil fuel sources... Besides being a clean energy that protects the environment... and Qatar is characterized by high pollution compared to other countries.’

The interviewees were also asked: ‘Is there any new plan/strategy by the Qatar government to reduce CO₂ emissions generated by using oil/gas fuels?’ The responses were mixed in that some of the respondents stated yes while others were not as certain. For example, A1 said yes and went on to add that ‘We should reach 1 Giga of solar power by 2020 as per HH directions. Plus, the waste close loop recycling initiative by Qatar Petroleum.’ Whereas, A2 said there were only ‘modest measures’ in place. A3 however stated that ‘yes, there is a strategy to reduce CO₂ emissions in Qatar and all of the projects follow it.’ B1 referred to the ‘al-Shaheen project (Al-Shaheen Oil Field Gas Recovery and Utilization project) which is under the Kyoto Protocol for carbon reduction scheme,’ but added, ‘I do not think we have a specific target though. However, for more information you can check the sustainability report produced by QP or the Ministry of Energy in which you will find all the CO₂ reduction measures by industrial sector.’ B2 was not so certain and spoke of the ‘flaring of natural gas and control of air borne toxins’ and stated that ‘CO₂ policy controls are not yet mature or aligned with other countries.’ C1 stated that all of the power stations were governed by standards for environmental protection for minimizing CO₂ emissions and that no project was approved if it did not comply with these standards. D2 stated that they follow a specific strategy in Qatar University that ‘no project may harm the environment’.

The interviewees were also asked: ‘What do you think would happen to Qatar’s energy resources and environment should Qatar continue to manage energy as it is currently being managed?’ The interviewees gave varied responses. A1 referred to decreased GDP in the future and an increase in carbon footprint, while A2 stated that energy ‘resources will deplete faster with more negative effects on climate change’, and A3 noted that already high energy consumption rates will ‘be the highest in the world’ if they are not controlled. B1 was concerned with the way energy was wasted ‘at home’ as well as in commercial and industrial circles and stated that its continuation would be detrimental. B2 was not comfortable with his ability to provide an answer. C1 stated that improvements were needed. C2 noted that:

‘Qatar has pursued high development policies in recent years, along with it the demand for energy is increasing and therefore carbon emissions have increased too, so the role of renewable energy is in providing an important part of these requirements as well as reducing harmful emissions’.

E1 also expressed concern about the current energy consumption rates.

The interviewees were asked: ‘Is there any clear policy by Qatar’s government to protect the environment?’ The interviewees’ responses were very similar, with A1 agreeing that the government’s policy was clear and adding that the Kyoto Protocol, an international treaty that established compulsory ‘limits on greenhouse gas emissions’, was an example. A2 said that there were a few clear policies for protecting wildlife and the environment. B2 said yes, the government’s environmental protection policy via the Ministry of the Environment was clear and C1 also agreed; however, E1 and E2 were not sure.

Interviewees were asked: ‘Do you think that oil/gas companies or your own company/organization have measures to ensure the protection of the environment? What is your company’s ability to deal with environmental protection? (Laws regulating emissions and determining the size and type of waste).’ The interviewees’ responses were mixed with A1 citing ‘Ras Laffan’s Health, Safety and Environmental standards’ which were described as ‘extremely high and all industries obey it.’ A2, on the other hand described the laws as ‘modest measures’ which are ‘within the oil and gas industry like reducing flares’ and A3’s response mirrored that of A1. B1 deferred to the sustainability report and B2 thought that Qatar leads in ‘compliance activity with the Ministry of Environment’.

C1 expressed confidence as well by stating that:

'In Kahramaa, we buy electricity and water from IPPs (Independent Power Producers), so, waste from production, such as waste water from desalination plants, has been treated before they send it back to the sea and as per MOE regulations. Also gas from gas combustion in turbines is not released before mixing it with other chemicals that minimize CO₂ and other gases. More detail might be found with the IPPs themselves.'

E1 did not know and E2 stated that 'our company is a leading company in Qatar' for the promotion of products and 'solar projects' and has contributed to 'the future of building the future of Qatar.'

The interviewees were asked: 'What are the problems that could affect your company's process of production and distribution of electricity in Qatar? How do you deal with it?' According to A1 the question was not applicable to his company. C1 stated that from a commercial perspective, his company's problem is cost of utilities and from a technical perspective it is the 'technologies of transmission, distribution that can work efficiently'. E1 stated that his company's problem was its failure to motivate 'people' and a lack of 'clear policies on renewable energy use.' According to Interviewee E2 'all problems can be avoided by legislation in the interest of the trend towards alternative energy.'

The interviewees were asked: 'What percentage growth in renewable energy use should Qatar score over 5, 10, 15 and 20 years? What is it now?' The responses were mixed with A1 suggesting that growth for solar energy by the year 2020 will be '1 Giga' as well as for the 'waste close loop recycling initiative by Qatar Petroleum.' A2's response was confusing as he stated '5% now is 0' and A3 said he did not have a number but knows that it would 'move slowly.' B2 stated that the objective '20% of power demand' should be the target and C1 stated that within five years the growth rate is expected to be 2%. C2 stated that the rate at this point 'does not exceed 1%' but this should increase to 25% by the year 2030. D1 predicted a growth rate of 20% and D2 was more optimistic in predicting a growth rate of 30%. E1 and E2 were not as optimistic with E1 predicting a 10% growth rate and E2 predicting a 2% growth rate over two years followed by 20% in 15 years.

The interviewees were asked: 'When do you think renewable energy will be used in Qatar?' A1 reminded the interviewer that renewable energy had 'already started' in Qatar and

named projects such as ‘QF, Qatar Museum Authority, Msherib Properties etc.’ A2 predicted that renewable energy would be used in Qatar by 2016 and A3 stated that it ‘will be limited’. B2 added:

‘Some progress will be made over the next 5 years, but I am not optimistic that significant momentum will exist before 2020’.

C1 projected that renewable energy will be used in Qatar ‘within the next 3-5 years.’ C2 added that:

‘Qatar has already begun to use renewable energy sources, especially through solar energy, but what it lacks is the expansion of use as well as the diversity of techniques used’.

D1 was non-committal and simply said ‘one day’ while D2 stated ‘in 10 years.’ E1 predicted that renewable energy would begin in Qatar ‘this year’ (2015) and E2 stated that it had ‘already’ started.

At the end of the interviews, the interviewees were asked: ‘Do you have any additional comments or suggestion?’ A1, A2 and C1 had no comments. Meanwhile B1 offered the following:

‘In order to have a sound policy, a sound strategy for energy management and planning should be in place to support it’.

D1 stated that ‘we should accept renewable energy as part of our lives’.

5.4.2 Analysis of the Interviews with Energy Experts and Policy Makers

One of the most interesting points arising from the interviews is the experts’ perceptions of the social acceptability of renewable energy in Qatar. This is at odds with the results of both surveys which revealed that there are both Qataris and Qatar residents who are open to renewable energy and eagerly await its introduction and usage. The difficulty confronting those who are amenable to renewable energy is a lack of understanding of the time and resources that it takes to implement and sustain. This is indicated by the respondents’ eagerness to have solar energy delivered immediately. This is an indication that they expect renewable energy to be implemented in a way that fully replaces traditional energy sources. However, as revealed in the literature, this may or may not be possible as

further research and development is required in order to fully determine how far and how widely renewable energy can be implemented.

Based on the results of the surveys, there are both Qataris and residents who find renewable energy socially acceptable. However, a number respondents in both samples indicated that they were seldom or never conservative in their energy usage, for example by turning off lights or appliances when not in use, and Qatar-based respondents reported not purchasing or using energy saving light bulbs. A major obstacle to the wider social acceptance of renewable energy is the fact that energy is largely free in Qatar, a fact which prompted similar reactions from both survey participants and interviewees. As a free utility, both citizens and residents have a tendency towards uncontrolled energy usage, and this is consistent with the theory of self-determination: reaping the rewards without any concern for the punishment it inflicts on the environment. Thus, the experts' concerns about the Qatari populations' inability to find renewable energy programmes socially acceptable is genuine and well founded.

This is consistent with social cognitive theory in which human agency informs behaviour on both a personal and collective level. Individuals may be persuaded to take certain actions based on their own personal values, self-reactive, self-reflective and self-efficacy values. These values can be modified by external social influences and can be achieved through collective actions. Pursuant to social cognitive theory, we find further convergence; however, it is in relation to the collective attitudes toward education on renewable energy and the environmental reasons for the need for renewable energy. The interviewees and the survey participants for the most part all seem to think that there is an urgent need to educate the public about, and heighten awareness of, renewable energy. This is also tied to the fact that energy is free in Qatar. In applying the theory of self-determination, should Qataris become more aware of the costs of energy use to the environment, the economy and to their future, it is likely that they would be more motivated to conserve energy. Likewise, they would be more inclined to accept and adopt renewable energy programmes and might even take steps to implement these programmes on their own.

As might be expected given their expertise, the interviewees are more realistic about the practicalities of converting to renewable energy altogether. The experts indicate that they are more amenable to reducing traditional energy usage and increasing renewable energy usage to create a balance that simultaneously protects the environment and meets the

energy demands of the users. This is consistent with findings in the literature (Al-watan, 2013; Kolios and Read, 2013) where it has been established that solar energy, which is possible in Qatar as there is abundant sunshine, is in its infancy and whether or not it can be developed effectively is not known at this point. In other words, solar energy is an uncertain investment until such time as it has been thoroughly researched and developed.

However, the results of the interviews do not fully confirm all the findings in the literature. While the literature suggest that solar energy is difficult to install and harder to maintain, some interviewees were diametrically opposed to this idea and said that the opposite is true. Equally, while some interviewees thought that it would be impractical and costly to implement solar energy, others thought that converting to solar energy would be cost saving in the long term. Therefore, in a manner consistent with the two factors model, the experts advocate for a mixed energy programme with renewable energy supplementing traditional energy sources. Since findings in the literature suggest that solar energy has a promising, yet uncertain future, a two factor approach is the practical solution at this point. While solar energy might be the dominant form of energy in the future, until it has been fully researched and developed it is best to proceed with caution as it may prove to be unsuccessful.

Like the survey participants, the experts believe that there is little to no motivation or incentive for individuals to act conscientiously since electricity is free for most residents living in Qatar. The solution therefore appears to be greater education and a heightening of awareness of the depletion of the environment and the workings of renewable energy. Since both the survey participants and the experts tended to see this as the best way to change behaviour and promote the social acceptability of renewable energy, it can be argued that social acceptance of renewable energy has advanced to become a primary need which is consistent with hierarchy theory. Unfortunately, however, renewable energy has not yet been elevated to a primary need for all Qataris.

The theory of self-determination also informs the experts' emphasis on balancing traditional energy with renewable energy and is consistent with the idea that they may be motivated primarily by the need to conserve fossil fuels over the need to conserve the environment. The reward motivating the need to increase renewable energy usage and reduce fossil fuel consumption is economic in nature. In other words, the experts are more concerned about protecting and expanding the life of a resource with economic value as opposed to protecting the environment for future generations.

The experts' opinions, however, can be viewed as consistent with findings in the literature on the need to diversify energy programmes. As Kolios and Read (2013) point out, both analysts and researchers alike are promoting an understanding that diversified, renewable and sustainable energy approaches are the only way to provide a wider advantage to society. In other words, it is more effective if multiple sources of energy are used. Much depends on the geography and demographics of a specific area. For instance, wind energy may be available in some areas and should be used in those areas. The experts' opinions are also consistent with the hierarchy of needs theory which speaks to elevating secondary needs to primary needs. At this point, Qataris as a whole are not sufficiently concerned about the need to reduce traditional energy consumption and are therefore not yet ready to adopt renewable energy sources. Equally, despite the enthusiasm of many of the survey respondents, it is anticipated that if they were aware of the difficulties and disadvantages of installing and using renewable energy they would not be quite as enthusiastic.

A significant point of consensus between the interviewees and the survey respondents is the Qatar government's renewable energy policy. All indications are that the majority of them are not satisfied with the government's energy policy. The expert interviewees in particular suggested that the policy could be more robust. The policy in question is a part of QNV 2030 which states that 'the welfare of our children, and of our children yet to be born, demands that we use our resource-wealth wisely (Qatar General Secretariat for Development Planning, 2008, p. 4). However, the overall concern is that it is not currently clear how the government plans to reach its stated goals of sustainability in relation to renewable energy or energy efficiency by the year 2030.

Due to Qatar's abundant sunshine, it is expected that solar energy will be pursued and invested in more heavily than other sources of renewable energy such as wind, and Qatar plans to increase solar energy generation up to 2% by the year 2020 (Al-watan, 2013). As the results of the interviews and surveys suggest, this is consistent with the preferences of experts, Qataris and residents. However, the expert interviewees are not satisfied with the Qatari government focusing on only one energy source and would prefer that they look at other sources of renewable energy in the event that one does not work out.

Taken together, the survey and interview results indicate that there is a general level of impatience with the Qatari government's efforts in terms of clarifying and implementing its renewable energy policies. Expert interviewees believe that a renewable energy

programme can be implemented, but it needs to be supported by a clearer policy and an even clearer plan. Neither the government's policy nor plans are clear enough to satisfy many of the experts that the stated goals can be accomplished within the timeframe established by the government. Meanwhile only a minority of expert interviewees have confidence in the government's policy and plans for renewable energy programmes and have observed that some of these plans are underway. The expert interviewees' scepticism about the policy and plan has cast doubt on their perceptions of how well renewable energy can and will be implemented in Qatar.

Another factor that the expert interviewees have considered is the lack of current support for the government's renewable energy plans and policy among the Qatari population. It is believed that, at this stage, the availability of free energy and the lack of awareness of renewable energy, together with an unclear policy, presents significant challenges for the Qatar government's renewable energy programme. It therefore follows from the results of the interviews, that in order to move forward with their renewable energy policy and plans, the government will have to address issues with the population's willingness to accept and support renewable energy programmes. One method of achieving this is to present a more robust and clearer renewable energy policy and to educate the public about the need and plans for renewable energy.

When economic theory is factored into the equation, the need for a clearer renewable energy plan is obvious. It will provide the basis for citizens to consider how adapting to renewable energy can have a positive impact on the quality of their lives. Moreover, citizens can consider how not adjusting might impact the quality of their lives in the future. Therefore, economic theory indicates that this kind of thinking will spur residents to consider how adapting to renewable energy will shape their future rewards. However, without a clear renewable energy framework, individuals in Qatar will not have the requisite knowledge and information to make these evaluations.

5.5 Summary of Results and Analysis

Based on the results of this study it would appear that experts, citizens and residents have similar attitudes toward the Qatari government's commitment to renewable energy policies. Qataris in the UK and residents in Qatar together with the experts interviewed generally share the view that the government of Qatar has a plan, which needs commitment to promote and establish renewable energy alternatives to traditional energy generation.

Both Qatari citizens in the UK and residents in Qatar appear to have a greater appreciation of renewable energy than the experts are willing to accept. The experts tended to underestimate the wider population's ability to accept and adjust to renewable energy. However, as the results of the two surveys suggest, both Qatari residents and Qataris in the UK are open to renewable energy and have demonstrated an eagerness to begin renewable energy programmes. The main obstacle to this coming to fruition is the unrealistic expectation that renewable energy can be implemented seamlessly and immediately. As revealed in the literature, by the experts interviewees and by a few of the survey respondents, implementing renewable energy is not a simple exercise. There are high implementation and installation costs at the initial stages and a lot of uncertainty with regards to its maintenance and future success. At this juncture, further research and development together with visible results are necessary in order to plan for the future. As the government's current policies and plans do not reveal concrete steps to address the challenges ahead, nor has it adequately addressed how it plans to accomplish its objectives moving forward, some expert interviewees are somewhat sceptical about the future trajectory of renewable energy development in Qatar.

Based on the results of this study, it can be concluded that there is a profound awareness among both Qatari citizens and residents that traditional energy consumption is unsustainable. Meanwhile others are entirely unaware of the unsustainability of Qatar's current energy consumption. The fact that the Qatari government provides free energy derived from fossil fuels whilst seeking to increase renewable energy usage appears to be a contradiction in terms. It is this contradiction that has convinced the expert interviewees and some of the respondents that Qatari residents are not amenable to accepting or adjusting to renewable energy programmes.

A possible remedy to this contradiction is to heighten the public's awareness of renewable energy policies and the need to introduce renewable energy programmes. As suggested in the literature, it is perhaps best that environmental studies and studies in renewable energy be taught in all schools and universities to ensure that Qatari citizens understand how their consumption habits and behaviours impact the environment. In addition, as reported in the literature (Lindsey, 2013), education leads to acceptance and Qatari residents will be more likely to support the government's renewable energy plans and policies if they understand the rationale behind them. Although there is a general enthusiasm for renewable energy programmes, this is often based on unrealistic expectations and it is anticipated that

residents will grow impatient and disillusioned. As a result, initial popular support be lost along the way. In order to avoid this outcome, the Qatari government will have to both educate the public and establish a clear and robust policy and plan. The likely outcome of this is a reduction in excessive energy consumption and a more conscientious attempt to avoid behaviour that harms the environment.

In summary, it is clear that the majority of survey respondents and expert interviewees share the view that free electricity in Qatar is a barrier to citizen commitment to renewable energy. As it now stands, electricity and utility users are more concerned about the personal financial cost of energy and less about the social and health costs of non-renewable energy sources of electricity. It would appear that increasing awareness of the significance of renewable energy through effective education may offer a solution to this problem.

The next chapter discusses the research findings in relation to the objectives of the study and establishes the extent to which they confirm findings in the literature and the theories set out in the conceptual framework (See Chapter 2). It also presents a proposed framework model, based on the research results, to support renewable energy implementation in Qatar.

6 Discussion and Findings

6.1 Introduction

In this chapter, the research findings are discussed with reference to the objectives of this study. The objectives of this study were:

- To investigate the current situation of renewable energy and sustainability development in Qatar.
- To investigate the factors that motivate people's awareness and perception towards the actions that improve sustainability and renewable energy use in Qatar.
- To examine what types of motivation most effectively influence Qataris' awareness and perception of participating in using renewable energy.
- To develop a clearer understanding regarding the ways in which renewable energy resources can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perception.

In discussing the research findings in light of these objectives, this chapter establishes the extent to which the results of this study confirm the findings in the literature and the theories contained in the conceptual framework. The theories used in this chapter are social cognitive theory, economic theory, hierarchal needs theory and the theory of self-determination (See Chapter 2). These theories are selected because they are suitable for, and widely accepted in relation to, studying and analysing human motivation. The hierarchical needs theory is based on human needs, while the theory of self-determination allows for voluntary choice and the motivation drivers of voluntary choice. In other words, while the hierarchal needs theory assumes motivation is driven by needs, the theory of self-determination presumes that motivation is driven by free choice. Economic theory focuses on how current behaviour and choices are dictated by future rewards. Social cognitive theory focuses on how an individual's own personal attributes and future outcomes, personal and social influences are indications of behavioural decisions and intentions. Economic theory, on the other hand, is concerned with how the individual forms intentions and then behaves based on future outcomes and in particular future rewards.

This chapter is divided into two main parts. The first part discusses the findings in terms of the three objectives and the theories set out above. The second part constructs a framework model in relation to the findings discussed in this chapter. The purpose of the

framework model is to present a progressive guide to motivating Qatari residents to support and accept sustainability and renewable energy.

6.2 Findings

6.2.1 Objective One

The first objective was to investigate the current situation of renewable energy and sustainability development in Qatar. Responses from the questionnaires indicate that a change in actions is influenced by self-determination theory and by Maslow's (1943) hierarchy of needs.

Qatar is in the process of moving towards renewable and sustainable energy production and use, which has prompted both intrinsic and extrinsic motivations. Previously Qatari citizens have benefited from free energy without much regard for the negative impacts on the environment. Motivating factors are supposed to encourage individuals to see the benefits of cutting down on energy wastage as well as a gradual shift to solar energy. Meanwhile, extrinsic motivators towards a change in energy wastage have been triggered by Qatar residents in the UK who have to pay energy bills. In this case, the financial penalty for wasting energy has led them to be more cautious in their use of energy. A change in behaviour to switch off energy appliances is one of the responses to extrinsic motivations exhibited by the respondents in the UK.

The fact that energy is provided on a free basis in Qatar means there is no economic motivation to reduce waste and, typically, little or no concern is paid to the use and wastage of energy. However, intrinsically motivated individuals, both in Qatar and in the UK, are among those who are concerned about the negative impacts of energy use on the environment. Besides, loyalty towards the public awareness created by the environment conservation agency plays a role in the intrinsic motivation gained by some since they have been in the UK. These are some of the intrinsic motivations based on individual obligations towards renewable energy and sustainability.

Currently, intrinsic factors are more influential than extrinsic factors in influencing positive behaviour towards sustainable and renewable energy in Qatar. However, as the survey respondents indicated, extrinsic factors such as paying energy bills can play an important role in promoting positive behaviour. Despite efforts to raise awareness of energy sustainability in Qatar, there are still people who do not see the need for it yet. They still

cannot fathom the correspondence of changes towards solar energy; hence they are not inclined in any way to reduce energy wastage or shift towards the use of solar energy. Knowledge about the negative impacts that burning fossil-fuels has on the environment may not be relatable if respondents do not really understand the threats these pose. Hence there is an absence of motivation in such people towards renewable and sustainable energy use. A proposal by the agencies involved is to include renewable and sustainable energy in the education curriculum.

Respondents to the survey indicated that extrinsic motivators had led them to take action towards improving energy sustainability, for example, they have made purchases of energy saving appliances that conserve energy. This has been promoted by extrinsic motivation on the impact of reducing threats towards the environment. Hence satisfactory actions are an extrinsic influence on the choice of energy sustainability. However, these actions are not carried out in Qatar where energy is free, unlike in the UK. The result is high energy consumption and little consideration of wastage, of the real costs of electricity and little desire to change patterns of energy consumption. However, when limited by bills, the energy consumption behaviour of Qataris in the UK had to decline, accompanied by other actions relating to reduced energy use.

It is clear that the imposition of financial penalties on electricity use causes greater concern for energy usage and consumption. As the experiences of the Qatari respondents in the UK shows, this extrinsic factor can lead to an exploration of cheaper energy sources, energy saving appliances, as well as raising long-term awareness of the financial costs of energy consumption. When economic costs are incurred by an individual, this leads them to consider their own consumption behaviour as reluctance to do so would have future impacts on their income. Thus, a regulation on individual income to accommodate their energy needs, both primary and secondary, would influence their energy consumption behaviour. An individual could either choose to adopt renewable energy or to take measures to reduce their consumption. As this study demonstrates, attitude is linked to the cost of traditional energy consumption: individuals in the UK have high enthusiasm and knowledge about energy sustainability, unlike those in Qatar where electricity is free. Thus, financial costs raise consciousness about energy consumption in addition to environmental risks and the need for renewable energy.

The survey indicates that motivations are in line with the theory of self-determination whereby individuals are influenced to act in certain ways. In this case, it is due to the punishment or reward that is stipulated by the government. The Qatari respondents in the UK admitted that the impact of free electricity back home caused them to be less mindful of their consumption of the same. However, electricity in the UK has to be paid for, hence they experienced extrinsic motivation to regulate their consumption. The reward of free electricity in Qatar leads to high consumption while the same behaviour incurs punishment (in terms of cost) in the UK. Therefore, the respondents developed new habits in the UK like switching appliances off while not in use and when leaving their homes. Some UK-based respondents said that they were unaware of their energy consumption while in Qatar but became more conscious once they were confronted by energy bills in the UK. Under the hierarchy theory, there are primary and secondary needs which people tend to create for themselves. In the UK, conservation of energy became a primary need for these respondents, whereas, in Qatar, energy conservation was a secondary need. While electricity use at the moment provided comfort to the individual in the UK, it could also be uncomfortable due to financial losses in the future.

6.2.2 Objective Two

The second objective was to investigate the factors that motivate peoples' awareness and perceptions towards the actions that improve sustainability and renewable energy in Qatar. Research findings indicate that self-determination theory and Maslow's (1943) hierarchal theory of needs are more appropriate for understanding and explaining the factors that motivate people towards specific actions to improve sustainability and renewable energy in Qatar and to drive that improvement. The results of the study determined that the factors that motivate people in terms of sustainability and renewable energy can be divided into both intrinsic and extrinsic motivation, where intrinsic motivation is self-determined while extrinsic motivation is externally driven.

According to self-determination theory, intrinsic motivation occurs within the individual and involves a desire to conduct an activity for the sake of the perceived benefits of the activity itself (Tanaka, 2013). Extrinsic motivation, however, occurs when the individual is influenced by external factors and conditions which dictate that an activity can result in a reward or a penalty/punishment (Tanaka, 2013). Therefore, extrinsic motivation does not

occur out of a desire to carry out the activity, but rather to receive a reward for carrying out the activity or to avoid a punishment or penalty (Ibid.).

There are four types of extrinsic motivation: external, introjected, identified and integrated regulation (Assor, Vansteenkiste and Kaplan, 2009). External regulation occurs when an individual performs an activity for the sake of satisfying an outer demand or for some benefit (Assor, Vansteenkiste and Kaplan, 2009; Deci and Ryan, 2000). Introjection is complying with a regulation although the individual does not adopt the regulation as his or her own (Assor, Vansteenkiste and Kaplan, 2009; Deci and Ryan, 2000). An identified regulation is a reflection of the individual's own reasoning over the value of the regulation. An integrated regulation takes place where the regulation is connected to the self (Assor, Vansteenkiste and Kaplan, 2009; Deci and Ryan, 2000).

In the context of the results of this study it was observed that individuals were both intrinsically and externally motivated to support sustainability and renewable energy. Intrinsic motivation was observed in those survey respondents who expressed a genuine interest in taking action toward sustainability and were looking forward to Qatar's renewable energy policy. However, their intrinsic motivation came from very different places. Some were clearly motivated by patriotism or genuine concern for the future of Qatar's economy and environment. Others were motivated by a conscious respect for the environment and were determined to preserve it as much as it was possible to do so. Meanwhile, other respondents were motivated by a desire to adopt a healthy lifestyle.

Intrinsic motivation comes from knowledge and understanding of the need to take action to preserve the environment. According to Chen (2003), individuals will be motivated to take positive action if they understand what puts the environment at risk of degradation. Individuals are motivated to act when they know what actions they can take and they feel that they have a 'personal obligation to take those actions' (Chen, 2003, p. 454). Therefore, it can be conjectured that when individuals are aware of the environmental threats, know what they can do to alleviate those threats and feel that their positive acts can be impactful, they can become intrinsically motivated to act. This is also consistent with social cognitive theory because individuals are motivated by the fact that collective agency begins with personal agency. Specific collective outcomes require individual actions, and this means having some degree of belief in one's own ability to make a difference. The motivation is driven by a belief that individual actions add up to collective action.

The results of the surveys demonstrated that many of the respondents were knowledgeable in terms of environmental threats. Equally, there was a corresponding awareness of the need to preserve the environment through the conservation of energy. The intrinsic motivators were present among some of the survey participants, but compared to extrinsic motivators, these motivators were sparse. Nevertheless, based on the survey results, it can be concluded that the factors that intrinsically motivate individuals to take positive action toward sustainability and to accept or adopt renewable energy are a) knowledge of environmental threats, b) awareness of what they can do to alleviate those threats, c) patriotism/nationalism, d) the desire to live a healthy lifestyle, e) genuine concern for the future and f) genuine respect for the environment. Figure 6-1 shows a simplified representation of the factors that motivate individuals to act in ways that favour environmental preservation and renewable energy.

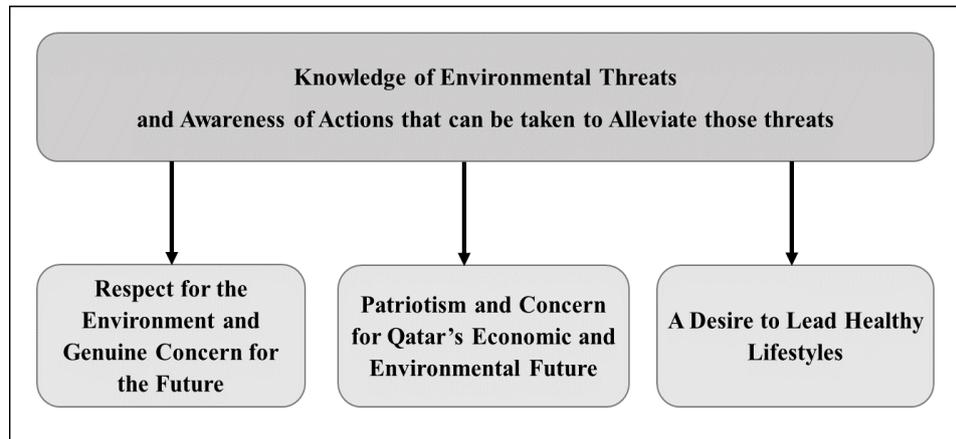


Figure 6-1: Intrinsic Motivating Factors toward Sustainability and Acceptance of Renewable Energy
(Author's Creation)

As Figure 6-1 demonstrates, motivation starts with knowledge of environmental threats and an awareness of what the individual can do to minimize or remove those threats. In other words, both knowledge and awareness are necessary for intrinsic motivating factors to come to fruition. Knowledge of environmental threats alone is not enough to motivate positive changes: individuals must also be aware that they can contribute to the elimination or minimization of those threats. Therefore, once knowledge and awareness are accomplished, individuals will automatically respect the environment and have a genuine concern for its future. This is an intrinsic motivation factor that develops into more specific motivational factors such as patriotism and specific concern for Qatar's environmental and economic future. Finally, the individual moves out of the external world and considers his

or her own personal health and safety. It is this final factor that also motivates the individual to change their environmental behaviour and to consider or accept the adoption of renewable energy. Some individuals might need the interplay between each of these motivational factors to change their attitudes and behaviours, while others may be motivated by just one or two factors.

The survey results together with the results of the interviews confirm that extrinsic motivating factors are by far the most influential in terms of promoting positive actions toward sustainability and acceptance of renewable energy. In this regard, knowledge of environmental risks is not always necessary. For example, in circumstances where respondents anticipated that unless energy was conserved, financial penalties could arise in terms of increased energy bills, they were more inclined to conserve energy. Thus, the determination to conserve energy was not preceded by knowledge of environmental threats or activities that might be taken by the individual to avert those threats. On the other hand, knowledge of environmental threats and the actions that can be taken to alleviate them did inform a number of respondents' actions and their acceptance and adoption of renewable energy and energy conservation.

Therefore, knowledge and awareness appear to be extrinsic motivating factors in their own right. The survey results indicate that when individuals are aware of environmental threats and how they can act to reduce those threats, they will identify and take specific actions toward reducing them. The results show that many of the respondents expressed knowledge and awareness of environmental threats and that these corresponded with positive actions. For example, respondents in both surveys reported purchasing and using energy saving devices, turning lights and appliances off when not in use and taking other energy conserving actions. These actions were motivated by their knowledge and awareness of threats to the environment and how their actions would contribute to mitigating them. Therefore, these actions were extrinsically motivated as the respondents contemplated some sort of benefit or satisfaction as a consequence of these actions.

More significantly, the results of the surveys and the interviews confirm that extrinsic motivating factors in terms of contemplating a penalty if positive actions are not taken are the most influential. Both respondents and interviewees acknowledged that since electricity was free in Qatar, individuals were not inclined to concern themselves with their energy consumption habits. The general consensus was that since electricity was free,

consumption was high. Therefore, if electricity had to be paid for, Qatar residents would be more conscious of their energy consumption. This was supported by the results of the survey of Qataris in the UK who reported a change in their consumption behaviour when their energy use was billable and paid for. These respondents reported being more aware of waste in terms of leaving lights and appliances on when not in use and adopting energy saving habits to reduce their electricity bills. Many respondents also reflected on how this new energy-conscious behaviour contrasted with previously wasteful behaviour in Qatar.

The benefits of penalty-induced behaviour were important. Qatari residents who had lived in the UK reported developing a greater awareness of the importance of individual energy saving initiatives. While the primary motivating factor was to save on the financial cost of energy consumption, respondents also reported being motivated by an increased awareness of the social and environmental costs of energy consumption. This is because, given the fact that energy bills are payable in the UK, there are public campaigns indicating how and why energy should be conserved.

These results are consistent with economic theory in that individuals who suffered the financial detriments of energy consumption were able to consider how their current behaviour would influence future rewards. If their energy consumption went unchecked, future costs would dip into the individual's wealth and this would negatively influence future returns. However, if energy usage was monitored, future rewards would be achieved. Therefore, the motivation to adjust one's behaviour to meet changing environmental needs exists in the discovery of the actual economic cost of energy consumption.

Based on the results of the surveys and the interviews, it can be concluded that in terms of extrinsic motivation, the primary factor motivating individuals to take positive actions toward sustainability and acceptance of renewable energy are consideration of personal financial costs (See Figure 6-2). This is followed by consideration of the overall social, environmental and physical costs. These extrinsic factors generally overlap to influence positive actions toward sustainability and acceptance or adoption of renewable energy.

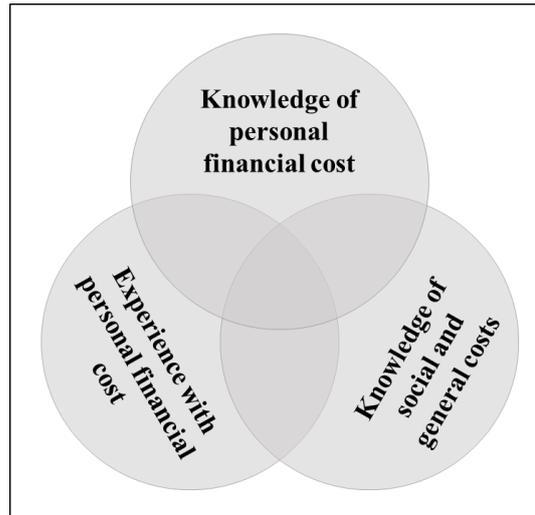


Figure 6-2: Extrinsic Motivating Factors toward Sustainability and Acceptance/Adoption of Renewable Energy (Author's Creation).

Figure 6-2 shows that the most powerful motivational factors in terms of attitudes and behaviour toward sustainability and acceptance/adaptation of renewable energy are linked to experience of the cost of traditional energy consumption. Knowledge and experience of the personal financial cost of traditional energy overlaps and creates knowledge of wider social and general costs. For example, survey respondents who were knowledgeable about both environmental risks and renewable energy also reported energy saving behaviour and an enthusiasm and appreciation for renewable energy. Moreover, respondents who had lived in the UK and experienced the financial cost of energy consumption not only became more energy conscious, but also more knowledgeable about environmental risks and the need for renewable energy. The interaction of these three motivational factors can create and sustain positive behaviours and attitudes toward sustainability and the adaptation and acceptance of renewable energy.

Based on the results of the surveys and interviews, it can be concluded that the factors influencing positive actions toward sustainability and acceptance/adoption of renewable energy are informed by both intrinsic and extrinsic motivation. However, extrinsic motivation, and in particular external regulation together with introjection, appear to be the primary drivers behind motivation to act in favour of sustainability and to accept and adopt renewable energy. Specifically, while some Qatar residents are genuinely concerned about the environmental threats in Qatar, and the consequences thereof for public and personal health, the economy and the future of Qatar, these intrinsic motivating factors are not the

primary influences on the behaviour and attitudes of Qataris in terms of sustainability and renewable energy.

The primary motivational drivers are extrinsic in nature. Although some of the respondents are influenced by general social and economic costs in terms of environmental degradation, the majority are concerned about personal financial costs. Therefore, as numerous respondents and expert interviewees observed, as long as electricity is free, individuals will continue to over consume and the prospects of behaving responsibly and accepting or adopting renewable energy are lowered. If Qatari residents were compelled to pay for energy consumption out of pocket, the extrinsic motivation to alter consumption behaviour would be heightened.

As for motivation to accept and adopt renewable energy, the survey and interview results indicate that extrinsic motivation is the driver of change. In this regard, knowledge and awareness of the detrimental effects of traditional energy on the environment could alter behaviour and acceptance or adoption. This also ties in with Maslow's hierarchal theory of needs, according to which people instinctively prioritize their needs from basic survival to personal needs. In other words, people need to have a keen awareness of their survival needs in order to prioritise those needs over their personal needs. While energy is a basic survival need, if abused, it can have a detrimental effect on the environment and thus threaten other basic survival needs such as water and food. Therefore, when introducing a policy that responds to the basic survival needs of citizens, governments or public policy-makers should ensure that citizens, who they rely on to alter their behaviour, are aware of the effects on their basic survival needs (Țicu, 2013; Gautschi, 1992).

The results of the surveys and interviews reveal that there are two main impediments to the Qatari government's ability to garner wide scale acceptance and adoption of their renewable energy policies. These findings are consistent with both self-determination theory and hierarchal needs theory. Firstly, the fact that the government of Qatar provides electricity for free is counterproductive to the acceptance of renewable energy because, according to hierarchal theory of needs, this basic survival need is already met. Therefore, individuals do not have the extrinsic motivation to consider the need for renewable energy. In this regard, much depends on knowledge and personal needs such as the need to uphold moral convictions or sensitivity to the needs of others, particularly future generations.

Secondly, the government's renewable energy policy is described as unclear and inadequate by the experts. This suggests that the population of Qatar may currently lack the details they need to evaluate the policy and decide whether to accept or adopt it. Again, knowledge and awareness of the importance of renewable energy and patience with the government's plan will drive motivation toward acceptance and adoption of renewable energy. This is because individuals will then understand how detrimental traditional energy is to the environment and, thus, its potential to negatively impact their own basic survival needs and those of future generations. In the meantime, as long as citizens and residents of Qatar are satisfied that their basic survival needs are being met by traditional energy supplies, they do not have the motivation to change or accept renewable energy.

Viewing the results of the surveys and interviews through the lens of self-determination and hierarchal needs theories, it can be concluded that knowledge and awareness are the key motivational drivers of positive attitudes and actions toward sustainability and renewable energy. Once individuals understand the detrimental effects of traditional energy consumption on the environment and its consequences for them personally and socially, positive behaviour and acceptance or adoption will follow. Where individuals are forced to cover the financial cost of traditional energy consumption, they are open to considering alternative behaviour or sources. This extrinsic motivational factor ties into knowledge. Where there is a cost to the consumer, s/he is willing to explore alternative cost saving options and to alter their behaviour and attitudes. It can therefore be inferred from this, that once individuals can reasonably contemplate the impact that excessive consumption of traditional energy will have on them personally and socially, they will be more inclined to investigate alternative options, to gain knowledge and awareness and to change in a positive way. In this regard, while the primary personal cost or rather, individual loss, may be financial in nature, other personal costs in terms of basic survival needs will have an impact. For example, the non-financial cost of traditional energy is harm to the environment, and this could, in turn, eventually lead to a food crisis. It is therefore important that renewable energy policies be accompanied by campaigns to heighten public awareness of the impact that current behaviours are having and will have on the individual's basic survival needs (See Figure 6-3).

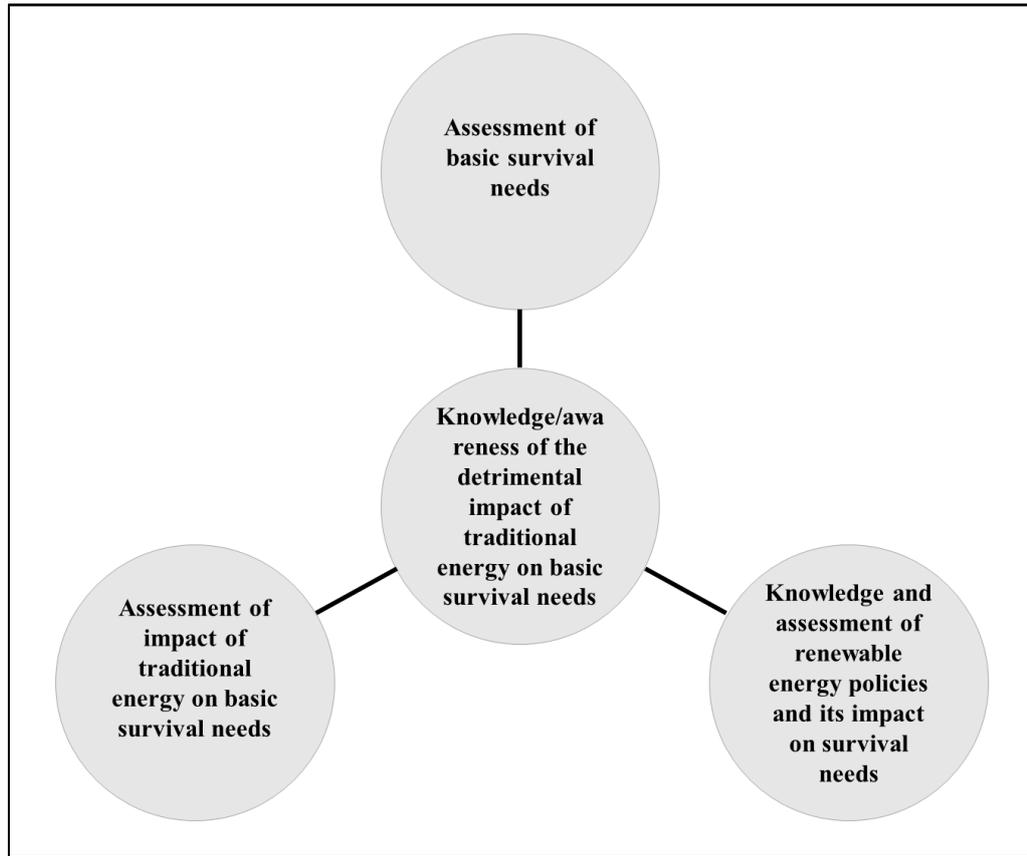


Figure 6-3: Hierarchical Needs as a Driver of Motivation to Accept/Adopt Renewable Energy (Author's Creation).

Figure 6-3 above shows that knowledge of the negative consequences of traditional energy consumption can inspire motivational factors that rearrange the higher order needs so that environmental conservation and adapting renewable energy become priorities. Knowledge of the detrimental impact of traditional energy consumption on the environment inspires individuals to reassess their basic survival needs. This involves assessing the impact of traditional energy on their basic survival needs. Such survival needs include water, and access to food sources, and thus the survival of food and water sources. This will also lead to an assessment of how renewable energy and sustainability factors into addressing and maintaining survival needs.

6.2.3 Objective Three

The third objective was to examine what types of motivation most effectively influence Qataris' awareness and perception of participation in using renewable energy. The third objective was met through an analysis of the survey and interview results in light of Maslow's (1943) hierarchical theory of needs. Based on Maslow's hierarchy, there are a number of strategies and visions that Qatar's policy makers can use in response to the

factors that motivate individuals to engage in practices and behaviours conducive to preserving the environment and, in turn, adopting and using renewable energy.

When we apply the lens of Maslow's hierarchal theory, we can conclude that energy is a basic and fundamental need of all human beings. In this regard, energy consumption is a high order need. This is particularly true in Qatar which, according to WWF's Living Planet Report (2014), currently ranks as the world's second largest energy consumer. The question for consideration at this point is determining how the government of Qatar can change the hierarchal order of needs among Qatari residents. This would require getting them to consider that using renewable energy and preserving the environment are far more important needs than energy consumption at the rates and quality presently consumed. The primary concern is whether or not Qatari residents can change their perspectives on their fundamental needs while the government continues to provide free electricity.

An additional problem for Qatar with regards to electricity consumption is water. Water is a fundamental need and although Qatar has significant gas resources, it has no natural fresh water supplies (Meier, Darwish and Sabeeh, 2013). In order to provide water to its residents, 'fresh water is obtained through energy-intensive desalination processes' which accounts for approximately 40% of gas consumption in Qatar (Meier, Darwish and Sabeeh, 2013, p. 41). Thus in order for Qatari residents to conserve energy, efforts have to be made to conserve water (Meier, Darwish and Sabeeh, 2013). Therefore, the government of Qatar is tasked with a complicated agenda in terms of convincing Qatari residents to save energy and to adopt a renewable energy programme.

In order to motivate Qatari residents to conserve energy and to adopt renewable energy programmes, the government will need to convince them to give up a practice of over consumption of traditional energy and to reduce their water consumption. Yet water and traditional energy consumption have undoubtedly served as the two most basic and fundamental needs of Qatari residents. In addition to being the world's second largest energy consumer, Qatar residents consume up to 675 litres of water per capita, on a daily basis, double the amount consumed throughout the European Union (Qatar Electricity & Water Co, 2017). To complicate matters further, the population of Qatar, although relatively small, is forecast to increase eight fold by the year 2050 (Ibid.). Therefore, the consumption of water and electricity is expected to increase exponentially unless habits and patterns of consumption change.

When we look at the efforts that the Qatari government can make to change attitudes, perspectives and therefore priorities and behaviour among Qatari residents' consumption and higher order needs, the results of the surveys and interviews are instructive. The survey results of Qatari residents who had lived in the UK for a period of time indicate that attitudes and perspectives on energy consumption among Qatari residents can be changed. These changes were made on the basis of experiencing a detriment in relation to energy consumption.

Once Qatari residents in the UK experienced what it was like to pay for the use of electricity, they became more conservative and conscientious about their energy consumption. For example, where Qatari residents had developed the habit of leaving lights and other appliances running when not in use, they were inclined to change these habits and turn such items off. This change in behaviour came when energy consumption was billed to them. The government of Qatari could therefore introduce renewable energy free of charge and impose costs on the use of traditional energy. However, at least in the initial stages, this strategy may not be fair. According to the results of the interviews with experts, the introduction of renewable energy will not be a full-scale programme and it is also unlikely that full scale renewable energy will be possible in the longer term; thus, not all residents will have access to renewable energy,

Therefore, the only plausible solution at this point is to focus on the conservation of energy. For political reasons, it is highly unlikely that the government of Qatar will begin charging its residents for the consumption of electricity. The Qatar government is committed to improving the quality of life for Qataris, both now and into the future. Therefore, it would be counterproductive to reduce that quality of life through the imposition of fees for electricity usage. Thus the challenge for the government is to continue providing electricity free of charge while devising a scheme for reducing consumption and introducing a renewable energy programme. Both the expert interviewees and the survey respondents felt that the provision of free electricity was an obstacle to changing the attitudes and consumption patterns of Qatari residents. Based on the factors discussed above, the solution is to alter consumption patterns.

The results of the surveys and interviews indicate that in order for Qatari residents to change their consumption habits, awareness and education will have to become a pivotal part of the government's plan. As previously mentioned, Qatari citizens who had spent time

living in the UK became aware of the need for conservation of electricity and energy in general once confronted with the financial costs of their consumption. What is perhaps more telling is that some Qatari residents who had never lived in the UK but who had some knowledge and education with regards to the detrimental impact of over consumption on the environment, had also developed energy conservation habits. This indicates that having to pay for energy consumption is not the only way to change the hierarchical order of needs. Qatari residents with knowledge and education on the detrimental impact of over consumption on the environment and on Qatar in general were more than willing to do their part to save energy and preserve the environment.

Therefore, it is possible for the government of Qatar to motivate residents to change their consumption behaviour and to preserve the environment for future generations. Environmental education appears to be the key to changing energy consumption patterns in Qatar. This can be accomplished through the introduction of energy and environmental education in schools. This should not be an option, but should instead be a mandatory requirement for elementary, middle and high schools. The government should also invest in a comprehensive campaign that informs people how their individual positive actions toward conserving energy make a difference in the grand scheme of things. The population should be aware that if each of them took steps to conserve energy, the positive environmental outcomes would be phenomenal.

By taking this approach, the government of Qatar will be building the necessary social and cultural capital for conservation of the environment for the benefit of the present and future generations. Education and a feeling of usefulness in doing one's part will also build the knowledge and human capital necessary for changing consumption behaviour.

In this regard, the government of Qatar can build social, human and knowledge capital by creating and running public campaigns aimed at heightening awareness of each citizen's contribution to conservation of energy, and education in schools. Children should be taught to conserve energy in schools and parental engagement should be emphasized. As children move through the school system, their education about the environment should become more intensive. In the meantime, all other Qatari residents should be subjected to public campaigns emphasizing how important all efforts are, regardless of how small they might seem, as they complement the efforts made by others and cumulatively contribute toward energy conservation and preservation of the environment for future generations. This

arguably resonates with economic theory in that future outcomes are considered and adjustments made to safeguard against a desired outcome being compromised.

As the experts participating in the interviews indicated, change will not be immediate. Therefore, beginning with school aged children is the perfect place to start. The introduction and use of energy conservation behaviour and education in schools will build the necessary social capital as it creates a feeling of solidarity among the younger generation and paves the way for future adults who are environmentally conscientious. Heightening awareness of contributory efforts among the general population will also create social capital and will likely motivate individuals to become more conservative with respect to their own energy consumption (See Figure 6-4).

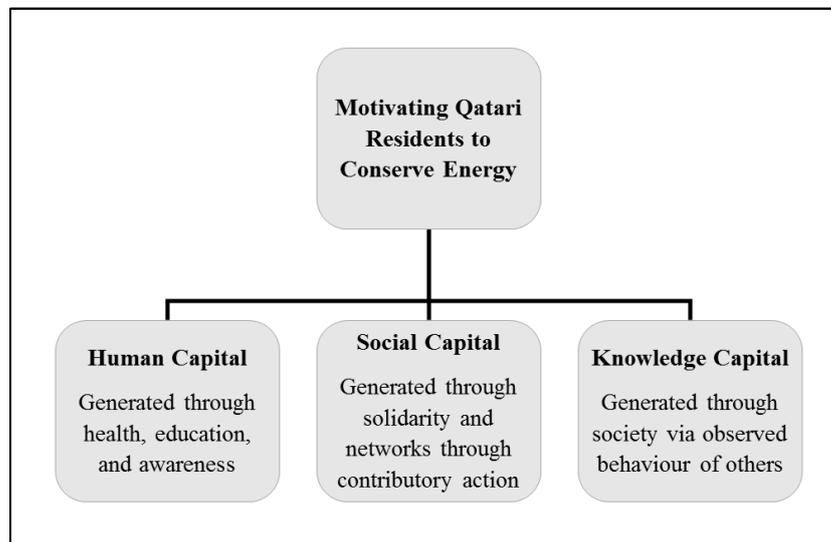


Figure 6-4: Suggested Plan for Motivating Qatari Residents' Energy Conservation Behaviour (Author's Creation).

The concepts of human, social and knowledge capital (Weston and Bach, 2009) explain the factors that can motivate Qatari residents to conserve energy. Human, social and knowledge capital unavoidably interact, but can each form the basis of motivation. Human capital is formed through health education and awareness. In this regard, individuals who are aware of and educated about the ill-effects of environmental degradation due to consumption of traditional energy, can be motivated to conserve energy. Shared knowledge and awareness can form the basis of social capital in that individuals are expected to share values and concerns, and this can, and usually does, result in the formation of solidarity. These values and concerns can be expressed through activities aimed at environmental conservation. Thus, human capital and social capital can influence energy conservation,

together or alone. Knowledge capital occurs when pro-environmental conservation activities are observed and appreciated. This could be a sole motivating factor, but it might be a stronger motivating factor when paired with social and/or human capital.

In the meantime, the government of Qatar must present a more comprehensive and unambiguous renewable energy plan in order to motivate Qatari residents' acceptance and adoption of the programme. The results of the interviews and the surveys indicate that the government of Qatar's renewable energy plan is vague and not clearly communicated. As such, the renewable energy plan is one that residents cannot fully grasp. It is thus only vaguely accepted and understood. The government of Qatar must put together a structured and sure plan for introducing renewable energy and present it to the public in ways that can be understood and envisioned by the average resident. Qatari residents need to know exactly what they are getting in terms of renewable energy, how it will be introduced, how it will benefit them and how it is expected to replace traditional energy. At this point the renewable energy strategy is unclear, leaving residents uncertain about its implementation.

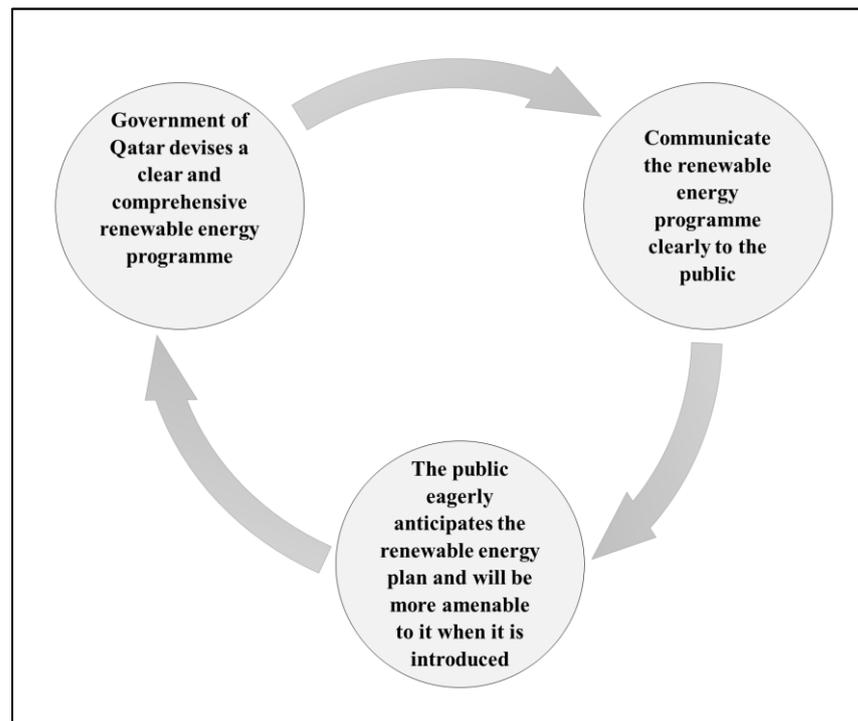


Figure 6-5: Motivating Qatari Residents to Use Renewable Energy (Author's Creation).

Figure 6-5 presents a simplified view of how Qatari residents can be motivated to accept and adapt to renewable energy. It is important to bear in mind that the government's efforts to gain popular support for their renewable energy plans and policies must be preceded by campaigns and measures to educate the public and increase awareness of the need for

renewable energy. The Qatari government must then devise a clear, consistent, manageable and realistic renewable energy plan and policy and these must be communicated clearly and precisely to the public. The public will therefore know the limitations of the renewable energy plan and will also anticipate the long and short-term benefits. With knowledge and awareness, the people of Qatar will most likely adopt renewable energy.

6.2.4 Objective Four

The fourth objective was to develop a clearer understanding of how renewable energy resources can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perception. In other words, this study was designed to determine the extent to which stakeholders, such as private companies and public organizations can motivate acceptance of renewable energy and changes in behaviour for conservation of energy and protection of the environment in general. Again, in order to achieve this objective, the results of the surveys and the interviews were examined through the lens of Maslow's (1943) hierarchy of needs theory.

Maslow's hierarchy theory has been used within the human resource paradigm to explain how the need for utility, profitability, and stakeholder satisfaction can be used to motivate changes in understanding within the work place (Amoura et al., 2014). In relation to the concerns of this study, human resources management within organizations can also motivate employees to make life style changes (Dumitrescu, 2009). Economic theory also indicates that individuals are motivated to change once they have an indication of how changes are necessary to safeguard against undesirable future returns. Social cognitive theory also shows how both personal traits and social influences spur both personal action and collective action.

Specifically, where human resources management implements strategies for saving energy and conservation of the environment, and is a part of the organizational culture, employees will automatically adopt those behaviours in order to remain employed. Thus adaptive behaviour becomes a fundamental need because it is a part of the employee's livelihood and s/he will be motivated to act in ways that will ensure continued employment. Since employees spend a considerable proportion of their time in the work place, the practice of behaving in ways that save energy will become second nature and is likely to continue in the home. However, even if the behaviour ends once the employee leaves work, it is still

an improvement and contributes to lower energy consumption since employees in Qatar will be saving energy and acting more responsibly while at work.

The survey results indicate, however, that once environmentally responsible behaviour is adopted by Qataris in one place, or at one time, that behaviour will continue regardless. For example, those Qatari citizens who became more energy conscious in the UK continued that behaviour when they returned to Qatar, even though the pressure to conserve energy and the environment was removed. Moreover, the results in both of the surveys suggest that once Qatari residents become aware of the need to conserve energy and the environment, they will usually change their behaviour accordingly.

In order for sustainability to be accomplished, the population has to change its attitudes and behaviour (Marafia and Ashour, 2003). Companies in Qatar are stakeholders in the drive for sustainable development. In order for them to continue to have a future and to become or remain profitable they need to protect the environment through the conservation of energy and through environmentally responsible behaviour. One of the main ways that these objectives can be achieved is by companies implementing energy saving boundaries in their workplaces. This would indeed improve employee awareness of the need to conserve energy and to act in ways that protect the environment from further damage.

Leadership within organizations can also change the attitudes of employees, either directly or indirectly through human resources. Subordinates can be motivated by the examples that they are exposed to by their leaders. Where leadership leads by example, followers will not only be motivated to act accordingly, but they will also become more aware of the need to change their energy consumption behaviour.

Companies are stakeholders with a vested interest in sustainable development and can also change understandings of renewable energy. This can be accomplished through conservation of energy practices or through adopting and using renewable energy. Companies can take the lead in changing from traditional energy supplies to alternative energy supplies. Alternative sources of energy, such as solar energy, are already available in Qatar and companies can introduce Qatari residents to the usefulness of renewable energy sources by implementing them in the workplace. By taking this approach, Qataris can learn first-hand that renewable energy is a viable alternative to traditional energy sources. Therefore, when the government is finally ready to introduce its renewable energy programme, resistance will be minimal, if it exists at all.

At this juncture, Qatari residents do not have sufficient information about the government's plans to implement renewable energy. According to the results of the interviews, this is primarily because the government's renewable energy policy is unclear and inadequately communicated. It can also be inferred from the results of the surveys and the interviews that the government's provision of free electricity sends mixed messages to the population. Those mixed messages arise out of the vaguely defined renewable energy policies and the provision of free electricity. On the one hand the government's renewable energy policy is an indication of the need to conserve energy. However, due to the unclear nature of the plan, Qatari residents are not attached to the idea, and, as the experts interviewed here noted, there is not yet sufficient evidence of the implementation of the renewable energy policy to persuade them otherwise. In the meantime, the provision of free electricity contradicts the message that renewable energy is an urgent need.

Stakeholders in the public and private sector can help to clarify this confusion for Qatari residents. The stakeholder companies can take the initiative to emphasize the importance of renewable energy and conservation of energy and the environment through adaptive behaviour. While this might not compensate for a perceived lack of evidence of the implementation of the renewable energy policy, it can improve attitudes toward renewable energy and conservation of energy and the environment. With attitudinal changes that are accompanied by changes in behaviour, the government of Qatar would come under pressure to move forward with its renewable energy policies and its sustainability agenda.

Furthermore, companies as stakeholders can project a measure of stewardship in the area of both energy conservation and renewable energy. As Reno (2011) reported, acceptance and understanding of renewable energy is not always contingent upon the ability to convert and develop sophisticated technologies for alternative energy sources. This also applies to sustainable energy or conservation of energy. However, the reality is, both sustainable energy and renewable energy availability can be accepted and understood through the efficient utilisation and management of available sources of energy (Reno, 2011). This would include both the conservation of traditional energy and the implementation of renewable energy. Thus, if companies as stakeholders take on the role of stewardship in the conservation of energy and the efficient use of available renewable energy sources, Qatar's employees and others who come into contact with these companies can gain a clearer understanding and awareness of energy conservation and renewable energy.

The results of the surveys and interviews indicate that there is a current attitude and prevailing atmosphere in Qatar that traditional energy is limitless. This is consistent with findings in the literature that where abundant resources for producing traditional energy exist, this method of energy generation is taken for granted (Lee and Zhong, 2014). However, if companies, who provide employment (which is a high order need for residents of Qatar), take on stewardship roles in relation to sustainability and renewable energy usage, attitudes can and are likely to change.

Furthermore, the results of the survey demonstrate how attitudes can and will change in situations where Qatar residents' awareness of the pitfalls of traditional energy and the utility of renewable energy increases. As revealed in the results of the interviews, when Qataris were forced to suffer a personal detriment such as having to pay for the use of traditional energy, they became motivated to save on their personal costs. In the process, Qataris learned and adopted cost-saving behaviours, and these carried over to their lives in Qatar, even where they were not charged for traditional energy. This persistence in energy saving behaviour even where energy was subsequently free indicates that while experiencing traditional energy at a cost, Qataris became aware of the significance of saving energy and what this means for the preservation of the environment.

When this phenomenon, relative to changed behaviour and motivation to change behaviour, is placed in the context of employment, we can expect similar outcomes. Workers spend a majority of their time in the workplace. Where employers as stakeholders of sustainable development, implement and enforce energy saving solutions and perhaps renewable energy, they are not only educating employees, but are helping them to develop and maintain environmentally responsible attitudes and behaviour. The survey results indicate that Qatari residents are entirely likely to continue with that behaviour even if their context changes. Therefore, it is anticipated that once exposed to environmentally responsible behaviour at work, Qatari residents will transfer that knowledge and behaviour to their homes and their daily lives.

The input from employers as environmental stakeholders brings us right back to the discussion of human, social and knowledge capital (Weston and Bach, 2009). When employers implement and enforce environmentally responsible behaviour it can build social capital through the identification and adoption of shared values and stronger relationships between workers, between workers and employers, and between workers and

their communities. In this regard, the workplace builds social capital for the immediate network of workers and for the community as a whole, and this social capital is built through the introduction and transference of shared environmental values.

Employers as stakeholders also build human capital through the implementation and enforcement of environmentally friendly behaviours. These values build human capital because they point directly to the long-term health of the community and to individual health. These values also build human capital because they both educate workers and help them develop the skills and knowledge necessary for preserving the environment and adopting renewable energy. This is consistent with the belief that human capital is ‘derived from our health, education, skills, and knowledge’ (Weston and Bach, 2009, p. 19), that knowledge capital is also constructed through the development of environmentally conscious behaviour in the workplace, and that ‘individual knowledge’ is accumulated ‘within a society’ (Ibid.).

In this regard, it is anticipated that if all employers, or at least the largest employers within Qatar, implement and enforce environmentally conscious behaviour among their workforce, this knowledge and resulting behaviour will be accumulated by the wider society. Thus, human and social capital can be built throughout Qatar with positive outcomes for general attitudes and motivation toward adopting renewable energy and acting to preserve the environment. In other words, knowledge capital has the potential to change all of Qatar if employers as stakeholders take the lead in adopting environmentally conscious policies, even if renewable energy is not adopted. It is assumed that once Qatari residents become aware of the need to preserve the environment, renewable energy becomes a viable option. However, the viability of the renewable energy option depends on the government’s ability to convince the population that they have a workable policy and a clear plan for its implementation and maintenance.

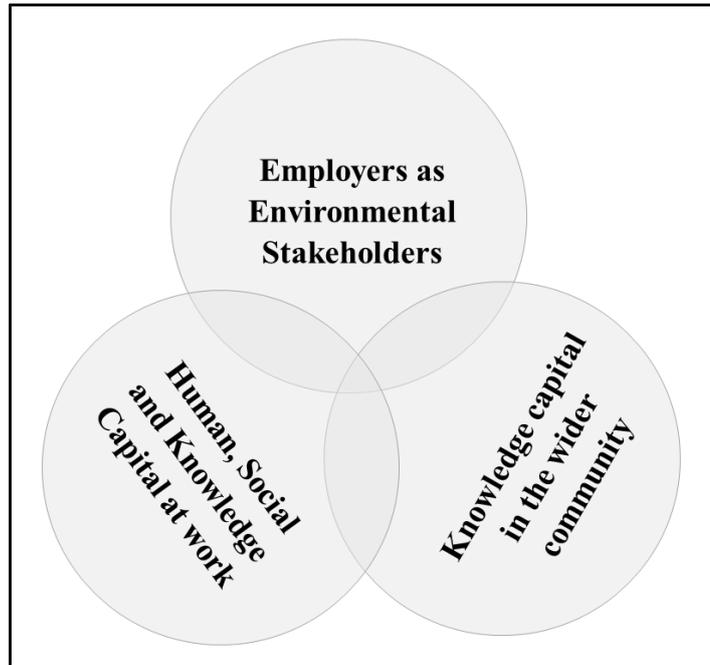


Figure 6-6: Stakeholders' Role in Changing Understanding of Environmental Preservation and Renewable Energy (Author's Creation).

Figure 6-6 demonstrates that employers, in both the public and private sector, are the kind of environmental and sustainability stakeholders with the potential to revolutionize energy consumption and environmental consciousness in Qatar. Employers are in a unique position to create and sustain human, social, and knowledge capital in the workplace which can be transferred into the wider community. This can be accomplished through modelling behaviour in human resources policies and programmes for environmentally conscious behaviour in the workplace. This would contribute to the formation of knowledge, human, and social capital. In other words, modelling behaviour in the workplace can transfer over to changing individual behaviour at home and within the community, and this can generate knowledge capital within the wider population.

As was to be expected, the investigation of objective four revealed the knowledge and awareness themes discovered in the investigation of objectives one and two. Using the lens of self-determination and hierarchy of needs theories, it can be concluded that stakeholders in both the private and public sector have the power to create and transfer the knowledge and awareness necessary to change attitudes and strengthen understanding of the need and desirability of preserving the environment and adopting and using renewable energy. These will equip individuals with adequate information and understanding of the urgent need to

save energy and, in turn, the environment, and the importance of adopting alternative sources of energy pursuant to the fulfilment of those needs.

Knowledge and awareness therefore contributes significantly to the shifting of higher order needs. The need for traditional energy is replaced with the need for alternative energy which is, in turn, tied to the need to preserve the environment for Qatar's future, and the future of humanity in general. The shifting of these higher order needs creates and sustains human, social, and knowledge capital and provides the basis upon which Qatari residents are motivated to change their environmentally directed behaviour and how they anticipate and will use renewable energy once it becomes available to them.

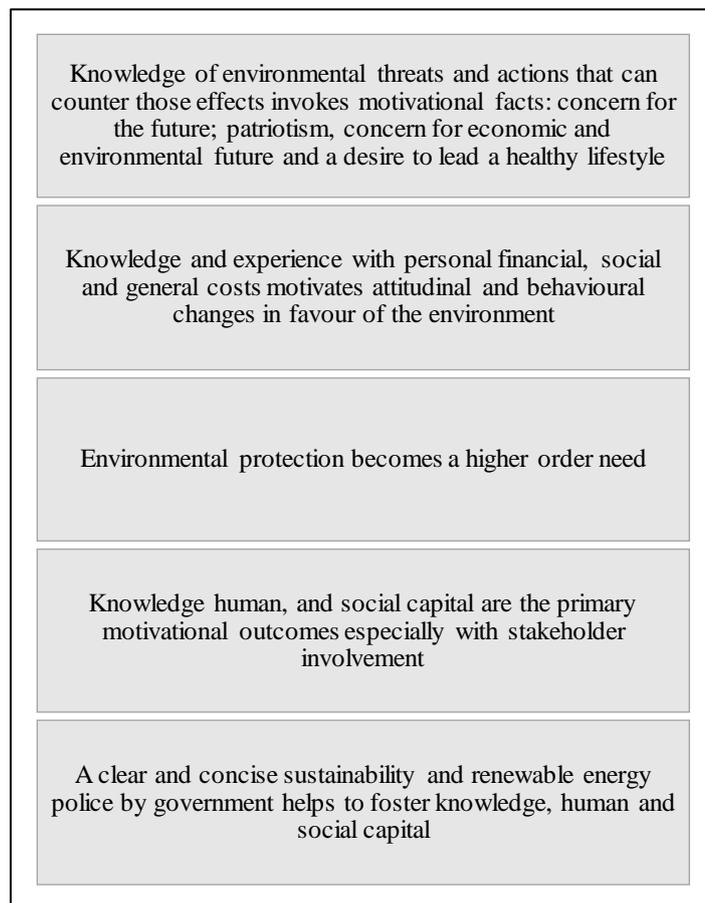


Figure 6-7: Results of the Investigation of Objectives One, Two, Three and Four (Author's Creation).

As Figure 6-7 illustrates, knowledge, awareness and experience of the costs (financial, personal, social and general) of traditional energy usage leads to the creation of social, human, and knowledge capital which combine to motivate changes in perspectives and attitudes. With a clear government renewable energy policy and stakeholder support, Qataris will not only form the intention to adapt to sustainability and renewable energy,

but they will also consume energy more responsibly and use renewable energy, when and where available and affordable. This is because, with knowledge, awareness and experience, Qataris are expected to see that conservation of energy and protection of the environment are higher order needs. This is supported by the survey results where respondents with knowledge and experience of the costs of energy consumption also expressed concerns for the economic and security future of Qatar.

6.3 Framework Model

Based on the results of the surveys and the interviews and the discussion of the findings, a framework model has been developed on the basis of the research results. It relates particularly to the approach the government of Qatar should employ to motivate the population to change their traditional energy consumption habits, as well as their attitudes and behaviour toward environmental protection and conservation, and to encourage them to adopt and use renewable energy. The framework model is based on the application of the hierarchy of needs and self-determination theories as they were applied to the survey and interview results.

6.3.1 Purpose of the Proposed Framework Model

The framework model is constructed on the basis of the survey and interview data collected and analysed using hierarchal needs and self-determination theories. Thus, the framework model draws on empirically tested theories and devises an approach that the government of Qatar can take to the implementation of policies and plans for national acceptance and adaptation of renewable energy. The framework model plots the most effective course of action as gleaned from the empirical data and the application of hierarchal needs and self-determination theory. It is assumed that the Qatari residents participating in the two surveys are representative of the wider population of Qatar. Moreover, input from the interviewees adds the necessary expertise as to what an effective renewable energy policy and plan should look like. The combination of the three data sets therefore provides adequate information for the Qatari government to move forward effectively with its renewable energy policy and plans.

6.3.2 The Proposed Framework Model

The proposed framework model is intended to capitalize on the factors that motivate Qatari residents to accept and adapt to sustainable development and renewable energy use. In

general, the framework model contains a step-by-step process for the government of Qatar to follow in the promotion of sustainability and renewable energy that secures the support and acceptance of its citizens.

As demonstrated throughout this study, intrinsic and extrinsic motivation comes from knowledge and experience which together create awareness of the social and economic costs of traditional energy consumption. As the analysis and discussion of the survey and interview results shows, Qatari residents can be intrinsically motivated to conserve energy, protect the environment, and accept renewable energy if they can appreciate a benefit from taking those actions. Similarly, Qatari residents can be extrinsically motivated to conserve energy, protect the environment and accept renewable energy if they can identify and be sure of a penalty or punishment if they do not. In this regard, the government of Qatar can intrinsically and extrinsically motivate Qatari residents through the creation of social, human, and knowledge capital.

It is expected that knowledge capital sits at the core of motivational factors because it reaches the individual's higher order needs. Through knowledge capital, Qatari residents are not only aware of community concerns and safety issues relative to environmental protection, but also of the ill-effects that over consumption of traditional energy has on the environment and the consequences for their future health, economic security and the wider community in Qatar. Thus, it is expected that the higher order need to consume traditional energy be replaced by a higher order need to save energy, protect the environment and to accept that renewable energy is the most effective solution. This expectation is based on the application of the theory of hierarchal needs to the results of the primary data collected and analysed in this research project.

While it is possible that knowledge capital will have no real effect on Qatari residents, the results of this study indicate that the opposite is true. The survey data shows that residents with knowledge based on education and/or experience are more conscientious about energy consumption. Those with experience and knowledge of the ill-effects of traditional energy consumption appear to care about it and have shown a willingness to contribute to minimizing the effects of traditional energy consumption on the environment. It is, therefore, not unreasonable to assume that a knowledgeable and experienced population would be open to the possibility of converting, either partly or wholly, to renewable energy.

Knowledge capital can be more effectively created in the form of early education in elementary schools. Early education ensures that learners are immediately aware of the dangers that the environment confronts and what this means for their future. Early learners should be taught that each and every one of us has a role to play in protecting the environment and that no effort or action is too small. Just as each poor habit contributes to environmental degradation, so each good habit contributes to environmental protection.

Starting with early learners is especially important. Educational theories have repeatedly shown that early learners form lifelong values (White and Stoecklin, 2008). Therefore, environmental education at the early stages of the child's development will ensure that Qataris are taught to value their environment 'enough to protect it' into the future (White and Stoecklin, 2008, p. 6). From the onset, children love and interact with nature, and, if this bond is nurtured and developed, children will grow into environmentally responsible adults (White and Stoecklin, 2008). Therefore, it is important that the Qatari government taps into this opportunity to change the attitudes of Qataris in terms of their treatment of the environment and the consumption of energy. Environmental education for all school aged children beginning in the early years has the potential to revolutionize citizens' understanding and support for the government's renewable energy plans and sustainable development policies.

However, it is clear that knowledge capital development in school only applies to future adults. The question for consideration at this point is how to develop knowledge capital among adults with little or no experience or knowledge of the ill-effects of the excessive consumption of traditional energy. Based on the change of attitudes observed among adult Qataris who had studied, worked or otherwise lived in the UK and learned the importance of saving energy, it can be concluded that building knowledge capital among adults in Qatari is feasible. Knowledge capital is also created and distributed by stakeholders in the public and private sector. Employers, as environmental and sustainability stakeholders, are the most viable source for changing understanding and behaviour. This is because, employees spend a majority of their time in the workplace and are more likely to adopt environmentally responsible behaviour if it is a part of their job description or duties under a code of ethics. As the results of the survey conducted with Qataris who spent time living in the UK show, once individuals adopt good habits in terms of environmental protection, they are unlikely to go back to poor habits. Knowledge capital is therefore demonstratively significant for the protection of the environment. Moreover, in order to effectively protect

the environment and to promote related programmes such as sustainability and renewable energy, the public's support and cooperation are absolutely necessary. Thus, knowledge appears to stimulate the factors that motivate both citizens and residents to support and cooperate with sustainability and renewable energy endeavours.

In order for knowledge capital to be effective, it cannot be constructed in isolation. It must be a part of community learning as well. For example, public service campaigns in the UK, coupled with requirements to pay for energy consumption, created significant knowledge capital among Qataris living, studying, working or otherwise residing in the UK. Public campaigns tend to indicate on a subconscious level that the energy waste and environmental degradation is a shared concern and a shared responsibility. This kind of knowledge capital builds social and human capital.

Knowledge capital which is developed as shared knowledge also ensures that individual actions spill over into the wider community, where positive environmental behaviour is observed and learned. In other words, the public campaigns build the feeling that the environment is a shared concern. This feeling can influence individuals to take action both privately and publicly. Private actions are those calculated to save energy in the home or to reduce pollution from one's private dwelling. Public actions would include not driving to destinations within walking distance, not littering, and so on. These public actions are observable and become a form of knowledge capital for those who observe them. We would therefore expect knowledge capital to create or interact with social and human capital which are also both necessary to change perceptions of higher order needs and to motivate positive change toward the environment, energy conservation and renewable energy.

Based on the foregoing discussion, the proposed framework model begins with mandatory education in Qatar's schools beginning with the early years. Early mandatory education of the limitations of and threats to the environment and the role that traditional energy plays in those limitations and threats can shape early knowledge, awareness, behaviours and acceptance of the need for renewable energy. Early learning is expected to aid in the formation of lifelong environmental and energy values. Education throughout the school years is expected to fortify those values and help to build a future generation of Qataris that love the environment enough to want to protect it.

In respect of the current adult population, who are largely responsible for the overconsumption of traditional energy, stakeholders and the government have a role to play in revolutionising attitudes and behaviours toward sustainability and renewable energy. At this time, old habits have to be broken and this can be accomplished through the construction of knowledge capital, and in turn, social and human capital. Although the experts interviewed here suggested that these habits are difficult to break, the results of the surveys suggest otherwise. According to the survey results, knowledge capital based on experience, education and public campaigns have worked to change both wasteful habits and the lack of concern for the environment common among adult Qataris.

Stakeholder and government involvement in continuing education, and in education/knowledge per se, can be conducted through two separate channels. Employers as stakeholders of sustainable development can create knowledge, social, and human capital in the workplace, with renewable energy provision where possible, and modelling energy saving and environmental protection policies. The government can also step in with publicity campaigns that not only inform but also identify problems and solutions to environmental degradation, and also introduce and implement programmes that motivate individual and group activities toward energy conservation and environmental protection.

The government can also provide incentives for those who choose to adopt renewable energy. For example, organizations that implement renewable energy in the workplace could benefit from waived or reduced government fees. Moreover, individuals who opted for renewable energy in their homes can be the beneficiaries of discounted mandatory government fees. In the meantime, the government should publicly recognize organizational, community and individual initiatives toward going green and adopting renewable energy. Such actions by the government will draw the public's attention to the need for renewable energy and for sustainable development. It will also create the kind of knowledge, human, and social capital necessary to motivate individuals to take action, both for the sake of taking that particular action and for the benefits/penalties associated with actions taken/not taken. The obvious benefits are financial, recognition, preservation of the environment, the future economic and security survival of Qatar, community and individual health and so on. The obvious penalties are damage to the environment, to Qatar's future and the health of the individual and the community if positive action is not taken to conserve energy and protect the environment.

Therefore, the government needs help and that help comes from each and every citizen, as well as from experts. It will take a national initiative to change energy consumption habits and to preserve the environment for sustainable development. The framework model presented in Table 6-1 is intended to motivate citizen involvement in the drive to change energy consumption habits and, eventually, to accept and use renewable energy.

Table 6-1: Proposed Framework Model (Author's Creation)

Government Action	Expected Outcome
Education: Mandatory environmental education beginning in elementary school	Knowledge creation from the early education years and onward. This will help to shape behaviour toward sustainability through healthy lifestyles, respect for the environment and energy conservation
Public service campaigns on the effects of over consumption of traditional energy on the environment, the economy and the future of Qatar	The creation of human capital with regards to concerns about individual health, community health, security, natural resources, the economy and so on.
Policies for stakeholder modeling of environmentally conscientious behaviour and the use of renewable energy where possible	The creation of social capital which is manifested through solidarity and unity with respect to managing traditional energy consumption and protecting the environment and an introduction to and acceptance of the need for renewable energy.
Activity policies which include incentives and programmes for Qatari residents to go green, reduce waste, conserve energy, and adopt renewable energy	The creation of knowledge capital through observable community action. This should motivate Qatari residents to follow suite.
The establishment of a clear, concise and effective renewable energy policy and plan	This will inspire confidence in the government's ability to put the plan and the policy into action. It will help the government minimize waste and expenditure in streamlining its renewable energy plan and policy.
Clear communication of the government's renewable energy plans and policy.	Qatari residents will know what to expect and can prepare for the transition from traditional energy consumption to renewable energy consumption. By taking this approach, Qatari residents will be more amenable to accepting and adopting the government's renewable energy policy and plans.
Establishment of a review panel of experts to review the policy and plan as it moves into action	This panel will help the government ensure that the policy and plan goes into effect with minimal or zero defects. It will also ensure that its acceptance is more fluid.

This proposed framework is demonstrative of the steps that the government should take in order to motivate energy consumption and environmental respect among the population.

These steps are based on the results of the surveys and interviews as analysed through the lens of self-determination theory and the hierarchal needs theory. The government can build knowledge capital and in turn, human, and social capital by following this framework model. The idea is to shape the minds and attitudes of both young and old alike, so that the future of Qatar's economy, environment and its energy security are established and maintained through renewable energy and sustainable development.

6.4 Summary of Discussion and Findings

This chapter has discussed the results of the surveys and interviews based on the objectives of this study and proposed a framework model to assist the Qatar government in motivating the population to save energy, to act in ways that contribute to the protection of the environment and to be open to accepting and adopting renewable energy. It can be concluded that this chapter determined that Qatari residents are flexible in terms of their ability to shift from traditional energy consumption and wasteful energy habits to conservative energy consumption and protection of the environment. All indications are that once knowledge capital is created, social and human capital will follow, and Qatari residents are likely be intrinsically/extrinsically motivated to save energy, protect the environment and become accepting of renewable energy. Based on the hierarchal needs theory as applied to the survey results, once residents are aware of the detrimental impacts of traditional energy on their environment, their health, their country, their future and the economy, they are inclined to change their higher order needs from the need to consume energy to the need to conserve energy. Moreover, knowledge also motivates Qatari residents to change their consumption habits because they perceive a reward in terms of saving their future and a penalty in losing much of that future to environmental degradation.

The next chapter provides a summary of the research undertaken and draws a number of conclusions. It describes the limitations and delimitations of the study and sets out the contribution it makes to academic knowledge and to theory. It also suggests possible avenues for further research to supplement the empirical data presented here.

7 Conclusion, Contribution and Further Research

7.1 Introduction

This chapter pulls the research results together in one place and provides a summary and conclusion. Areas for further research are also identified and explained. The contribution that this thesis makes to academic knowledge and to theory is provided in this chapter. The limitations and delimitations of this research are also discussed.

7.2 Research Aim

The aim of this study was to understand the factors that motivate the population of Qatar to increase their awareness and perceptions of using renewable/sustainable energy. The research explored the status quo in terms of energy consumption in Qatar in the context of the Qatar government's sustainability and renewable energy policies and plans. The status quo can be described as an economic environment in which Qatar is an oil-wealthy country seeking to diversify its economy in response to declining oil prices and environmental threats linked to overconsumption of oil-generated electricity. The Qatari government plans to resolve these concerns by promoting and implementing sustainable development and renewable energy. Given Qatari residents' tendency to excessively consume traditional energy, this research explored and identified measures the government of Qatar can take to motivate them to change their consumption behaviours and accept and support sustainable development and renewable energy.

7.3 Research Problem, Questions and Objectives

The research questions, aim and objectives were formulated on the basis of the problem definition. The Gulf States have experienced significant change in a period of less than a century, and their governments are now coming to the realisation that there is a need to respond to a number of issues effecting their economies and their voluminous oil reserves (Watson, 2011).

Research in the literature has generally studied population growth in these states, changes in the socio-economic climate, and also the economic growth, which is increasing due to natural resources of oil and gas. However, due to volatility in the gas sector and to environmental threats, Gulf State governments are interested in adopting alternative energy solutions and are thereby drawing public attention to the need to engage with renewable

energy. In addition to a growing population, business is also booming which means that electricity, gas and water are being consumed at an accelerated rate. Given these circumstances, it is necessary for Qatar to consider its environmental and ecological future, and to devise and organize a strategy aimed at balancing its natural wealth (Williams, Bhanugopan and Fish, 2011). The Global Investment Center (2000) reported that up to the year 2000, its oil reserves were at 3.7 billion barrels with gas reserves at 300 trillion cubic feet (TCF). However, balancing current and future generational needs requires thorough investigation and careful planning. This would include establishing the growing population's knowledge of energy conservation and its link to the country's future, including the implications of energy and resource waste (Marafia and Ashour, 2003), as their consumption behaviour will have to change if Qatar's future is to change for the better.

This research study set out to explore and answer four research questions:

- What is the current situation in Qatar regarding renewable energy and sustainability?
- What factors influence Qataris' awareness and perceptions of renewable energy/sustainability?
- How are Qataris motivated to improve their awareness and perceptions of using sustainability/renewable energy?
- To what extent can the factors identified be employed to increase awareness and enhance perceptions of using renewable energy in Qatar?

To answer the research questions, the following objectives were established:

- To investigate the current state of renewable energy and sustainability development in Qatar.
- To investigate the factors that motivate people's awareness and perceptions of the actions that improve sustainability and renewable energy in Qatar.
- To examine what types of motivation most effectively influence Qataris' awareness and perceptions of using renewable energy in Qatar.
- To develop a clearer understanding regarding the ways in which renewable energy resources can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perceptions of renewable energy.

Each research question and objective was designed to accomplish the aims of this study. The relationship between them is set out in Table 7-1: Data Collection Guide (Author's Creation)

Table 7-1: Data Collection Guide (Author's Creation)

Research Aims	Research Question	Research Objective	method
<ul style="list-style-type: none"> ▪ To understand the current situation regarding renewable/sustainable energy. ▪ Identify the factors that motivate Qataris to increase their awareness and perceptions on renewable/sustainable energy. 	What is the current situation in Qatar regarding renewable energy and sustainability?	To investigate current situation of renewable energy and sustainability development in Qatar.	<ul style="list-style-type: none"> • literature review • Questionnaires • interviews
	What factors influence Qataris' awareness and perception on renewable energy/sustainability?	Investigate the factors that motivate people's awareness and perception towards the actions that improve sustainability and renewable energy in Qatar.	<ul style="list-style-type: none"> • literature review • Questionnaires • Interviews
	How are Qataris motivated to improve their awareness and perception of using sustainability/renewable energy?	Examine what types of motivation most effectively influence Qataris' awareness and perception of participation in using renewable energy.	<ul style="list-style-type: none"> • literature review • Questionnaires • Interviews
	To what extent can the factors identified be employed to increase the awareness and perception of using renewable energy in Qatar?	Develop a clearer understanding regarding the way in which renewable energy resources can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perception.	<ul style="list-style-type: none"> • literature review • Questionnaires • Interviews

7.4 Research Methodology and Data Collection

The mixed method research methodology used in this study provided for the triangulation of the data. More importantly, the weakness in one data source was compensated for by the corresponding strength of the other data source. For example, the collection of data from survey participants allowed for the collection of statistical data from numerous sources and thus increased the chances of obtaining empirical evidence from a sample that was representative of the general population of Qatar. At the same time, however, the data collected lacked detail since the researcher collected the data via surveys, and this did not allow for detailed responses. However, this weakness was compensated for through the collection of detailed and robust qualitative data, specifically through the interviews. Again, because the qualitative data was in-depth and detailed, it was only possible to collect this data from a relatively small sample of participants, but this small sampling was compensated for through the large sampling size of the survey participants.

The data sources provided triangulation in that each data set provided some form of corroboration for the other data set. For example, several of the survey participants reported that since electricity was free, users were careless with its consumption. These sentiments were echoed by the interview participants who expressed concerns that free electricity has created an atmosphere of wasteful energy consumption in Qatar. In other words, the data sources combined to provide credible evidence of the impact that free electricity has on Qatari residents with regards to the consumption of traditional energy. The researcher could, therefore, proceed on the basis that free electricity was factored into the thoughtless consumption of traditional energy in Qatar.

Another example of corroboration between the data sets, is the clear indication that the Qatar government's renewable energy policy and plans needs significant clarification. In the survey results, many of the respondents claim to be prepared for the government's renewable energy programme. However, the difficulties in adopting any form of renewable energy were pointed out by the experts. These disparities in expectations indicate that the government's renewable energy plans have not been communicated clearly enough, and, therefore, the population do not have the requisite knowledge about the implementation of, and adoption of, renewable energy. Therefore, the Qatari government's task at this time is to improve the clarity of the renewable energy plan for public consumption and to educate

the public on both its utility and its limitations so that their expectations are more reasonable and better informed.

In using a mixed methods approach, the researcher was able to apply two philosophies to the collection and analysis of the data. With respect to the qualitative data, an interpretivist philosophy was used. Interpretivists take the position that truth is subjective and that there is no fixed form of the truth. The truth is discovered through multiple sources, which presents a narrative indicative of the truth in specific contexts. In this regard, the truth revealed from the interviews were regarded as subjective. As such, these subjective truths are contextual in terms of the experiences of the experts with Qatari residents and the Qatari government, and in relation to energy consumption, environmental protection and renewable energy policies, plans and perspectives. Reality was therefore constructed based on the diverse experiences of energy experts and this allowed for the formation of a subjective reality. This is important because subjective reality is contextual, and the truth depends on the special circumstances and conditions existing at a particular time. In other words, the experts gave their opinions, perspectives and predictions based on their lived reality and experiences in Qatar, with the government of Qatar and with the wider population in general.

With regard to the quantitative data, the philosophy used was positivism. Positivism takes the position that all truth is objective, and this generally means that truth can be measured and reduced to statistical descriptions. Thus, in the collection of data via surveys, the researcher employed the positivist philosophy and, in doing so, measured Qatari residents' perspectives and attitudes toward energy consumption, environmental protection and renewable energy. Based on the results, it can be concluded that, objectively, a majority of the population are amenable to positive change, provided they are educated about renewable energy and aware of the dangers associated with the overconsumption of traditional energy resources.

In the analysis of data, the researcher used inductive reasoning. With this, the researcher began at the bottom and then set about exploring and explaining the phenomenon of environmental protection, traditional energy consumption in Qatar and the government of Qatar's renewable energy plans, programmes and policies. Sustainable development in Qatar was also explained. The researcher did not rely on the qualitative data for confirmation of the theories. Instead the qualitative data was used to generalise and theorise.

This research study used a mixed methods approach in the investigation of the perspectives of Qatari residents relative to their government's renewable energy policies and plans. This necessitated the investigation and exploration of the experiences and perspectives of experts on environmental issues specific to Qatar and the relevance or adequacy of the government's renewable energy policies and plans from the perspectives of those experts. Experts were interviewed with a view to collecting narratives of their experiences and perspectives in this regard. Input from energy experts were important for assessing the challenges that the Qatari government faces as it moves forward with sustainability and renewable energy targets. Experts were able to offer insight into the status quo in terms of energy consumption, Qataris' behaviour towards energy, and what the government needs to do to change the status quo for optimal outcomes in sustainability and renewable energy.

Data was also collected directly from Qatari residents and Qataris in the UK. This data was quantitative in nature and measured the perspectives of Qatari residents on environmental degradation, their experiences with energy consumption, their perspectives on renewable energy and their views on Qatar's environmental issues and energy consumption as it currently stands. A number of variables were measured. These variables were the actual factors that might motivate Qataris to accept and support renewable energy and sustainability. The variables were, therefore, a) education/knowledge, b) attitudes toward renewable energy, c) attitudes toward sustainability, d) desire for renewable energy, e) desire for sustainability, and f) energy consumption habits. Some of the variables were not directly linked to motivation. The variables can be combined to construct a narrative. For example, a respondent that conserves energy, has knowledge of environmental effects, and desires sustainability and renewable energy can be said to be an individual motivated to support sustainability and renewable energy. The factors that motivate such an individual might be education/knowledge, concern for Qatar's future and so on. Each of the motivating factors can be gleaned from the survey results.

In analysing the empirical data, the researcher applied social cognitive theory, economic theory, the theory of self-determination and the theory of hierarchal needs. However, the focus has been on self-determination theory and Maslow's (1943) hierarchal theory as they are more appropriate for identifying the factors that motivate people towards specific actions to improve sustainability and renewable energy in Qatar and to drive that improvement. Self-determination theory allowed the researcher to examine the survey data results and identify the intrinsic and extrinsic factors that motivate Qatari residents to

subscribe to sustainable development and renewable energy. Intrinsic motivation was found to come from knowledge and awareness of the contribution individual actions can make toward preserving the environment. However, extrinsic motivation was found to be the strongest indicator as it is formed on the basis of penalties or punishment that might arise if residents fail to subscribe to sustainable development and renewable energy. Research findings revealed, however, that knowledge and awareness were the primary keys to the formation of both intrinsic and extrinsic motivation.

In applying the hierarchy of needs theory, it was found that knowledge and awareness were also the key to positive changes in attitudes, perspectives and behaviour relative to sustainability and renewable energy. Once they are aware of the negative effects of excessive traditional energy consumption on the environment, Qatar residents are able to shift their higher order needs from the need for excessive traditional energy consumption to more frugal consumption for the sake of preserving the environment. As some of the responses to the survey questions indicated, environmental protection and sustainability go beyond preserving Qatar's environment. Instead sustainability and renewable energy are seen as necessary steps for saving the country and preserving its future for children yet to be born. As a result, Qatari residents were found to be good candidates for renewable energy provided that knowledge, human, and social capital are created and developed among the population. At the same time, however, qualitative data results indicated that residents would not be ready for renewable energy consumption until the government produced a clearer and more precise renewable energy plan and policy. Research findings indicate that a clear and well communicated workable renewable energy and sustainability policy and plan are needed together with a change in attitude and behaviour toward environmental threats, especially those linked to the consumption of traditional energy.

7.5 Research Result and Findings

Working within the confines of the problem definition, this study was able to answer the research questions within the context of the overarching objectives (See Table 7-1).

The first research question asked: 'What is the current situation in Qatar regarding renewable energy and sustainability?', with the associated objective of investigating the current state of renewable energy and sustainability development in Qatar. The survey findings indicate that a change to renewable energy is comparatively cheaper to respondents living in Qatar, a transition to solar energy is the most appealing alternative.

However, their awareness and perceptions of renewable energy, and of solar energy in particular, are unrealistic. Energy in Qatar is currently provided to residents at little or no cost; however, the transition to solar would be expensive in the initial phases, and it would take time for costs to come down as the expense lies chiefly in the conversion process and in the use of technology and expertise. In addition, the transition may not be as quick as the respondents expect. Hence some residents would be obliged to continue with their high consumption patterns. Furthermore, installation of photovoltaic panels to generate sufficient solar energy will require a lot of space. However, for Qatar, the positive attitudes by respondents is a good start for the country. Equally, while solar energy is currently expensive in its conversion to transmittable energy, the extrinsic motivation of environmental threats may push the government towards this goal.

Solar energy is developing steadily in Qatar through small, medium and large scale projects. This is to meet the projected 2% renewable energy contribution by 2022. It is expensive in terms of research and development as current growth depends on research centres, universities and pilot projects that require central government funds. However, an extrinsic motivation towards renewable energy is fostering the nation's research capabilities. As the country faces space constraints, plans are being made to install solar panels on redundant surfaces, and on rooftops, which will reduce transmission costs. With regard to the high expectations of residents, it may take time to achieve low cost renewable energy, but a large proportion of the population is aware of clean solar energy and this is altering their views about wasting energy. This sensitization to wastage means that, even though energy is free, they moderate their consumption behaviour based on intrinsic motivation towards protecting the environment. However, there is a need to intensify awareness of renewable energy in a systematic way as some people are still not aware of its benefits.

The population in Qatar seem to be prompted by different influences regarding the conservation of energy. They are divided between those who care about energy conservation and those who do not. However, consumption habits are likely to change for the better. According to the hierarchy of needs, individuals will change their behaviour due to a change of circumstances. Therefore, increasing environmental damages accrued from high energy consumption will change consumption behaviour in Qatar. A willingness to convert to solar energy has been observed through increased demand for energy, and, as self-determination theory suggests, prompts to reward or punishment will lead to a change in their energy consumption as well as a shift to solar energy. Since energy is already free,

the provision of free renewable energy would not, in itself, cause a change to consumption patterns by opting to shift to solar energy; however, concern about the nation's future has led to a reduction in energy wastage in Qatar.

The second research question asked: 'What factors influence people's awareness and perception on renewable energy/sustainability in Qatar?', with the associated objective of investigating the factors that motivate people's awareness and perceptions of the actions that improve sustainability and renewable energy in Qatar. This investigation was conducted through the collection of empirical data via surveys, interviews and secondary data, and via a review of literature on the theoretical foundation. In order to identify the factors that motivate Qatari residents to support and accept sustainability and renewable energy, the survey and interview results were examined through the lens of self-determination and hierarchal needs theories.

Analysing the results based on the self-determination and hierarchal needs theories, revealed that knowledge and awareness are the primary factors influencing positive attitudes and actions to enhance sustainability and use of renewable energy. Recognition of the negative individual, social, and environmental implications of using traditional energy, induces a willingness to accept and adopt positive behaviours which support the utilization of sustainable and renewable energy. The external motivational factors mostly draw from the concepts of knowledge and awareness. For instance, high financial costs improve the willingness of the consumers to explore less costly alternatives and, thus, change their attitude and inclinations to promote the use of renewable energy sources. This is because the cost implications, whether financial or in another form, inherently affects the basic survival needs of the individual. Therefore, the ability to comprehend the adverse effects of excessive consumption of traditional energy motivates people to think reasonably about the discovery or adoption of new energy source options. Therefore, policies aimed at promoting the use of renewable energy sources must be accompanied by awareness campaigns to impart knowledge, as well as to sensitize the public to the current and future impacts of their traditional energy consumption behaviours on their survival needs.

Therefore, the findings of this study support the position that knowledge is the primary motivating factor for the public. This will help the shift towards renewable energy and sustainability. Equipping Qatari citizens and residents with the appropriate expertise will make them aware of the damages from traditional energy sources, as well as the long-term

adverse effects on the environment, security, economy, health, and the wider society. In this case, awareness of the outcomes can influence them to promote sustainability and renewable energy consumption.

The third research question asked: ‘How are people in Qatar motivated to improve their awareness and perception of sustainability/renewable energy?’, with the accompanying objective of examining what types of motivation most effectively influence the population’s awareness and perceptions of using renewable energy. In examining the future strategy and vision in terms of which motivational factors will effectively engage participation, the survey and interview results were analysed using the hierarchal needs and self-determination theories. The results of the survey identified the factors that motivate people in Qatar to accept and support sustainability and renewable energy. The interview results revealed the reality of the Qatari government’s renewable energy policy and, in doing so, drew attention to the challenges the government confronts in motivating the population to modify its behaviour.

Again, the hierarchal needs theory and the theory of self-determination were used to analyse these results and to suggest the following solutions. The Qatar government should establish a strong social, human, and knowledge base through the creation of public campaigns and educational programs in schools. Notably, this will increase individual awareness of the need to contribute to energy conservation. The educational programmes should teach children about the subject of energy conservation; whereas the awareness campaigns should be designed to influence adults. Environmental education should be made more detailed and intensive as children scale up the academic ladder in the school system. Concurrently, the Qatari population should benefit from campaigns that emphasize energy conservation efforts, regardless of how small each contribution might appear. Cumulatively, such activities will lead to environmental and energy conservation to benefit future generations.

According to the expert participants in the interviews, change cannot be immediate; therefore, working to raise awareness among school-aged children is a good starting point. In essence, the promotion of energy conservation behaviour and educational programs in schools will help in the establishment of a strong awareness foundation among young people. Over time, this will create generations of people who are energy-conscious and can promote efficient energy consumption across the entire society. Equally, it is important that

the government of Qatar develop a clear, consistent, manageable and realistic renewable energy plan and policy. This should then be communicated to the public in clear, simple and precise terms in order to increase their knowledge and environmental awareness and encourage them to adopt renewable energy.

The fourth research question asked: ‘To what extent can the factors identified be employed to increase the awareness and perception of using renewable energy in Qatar?’, with the associated objective of developing a clearer understanding regarding the way in which these factors can be employed by stakeholders (both public and private) as a means of effecting changes in awareness and perception. The data compiled to achieve this objective consisted of a review of literature on sustainability and renewable energy in Qatar and the results of the surveys and interviews. Analysis of this data revealed the ways in which stakeholders can contribute to effecting change in Qatari residents’ understanding of and support for sustainability and renewable energy and identified employers as the most important stakeholders in this respect. Again this analysis was carried out using the hierarchal needs and self-determination theories.

Research findings indicate that if all employers, or at the very least, the largest employers within Qatar, implement and enforce environmentally conscious behaviour among their employees, this knowledge and behaviour will be accumulated by the wider society. Thus, human and social capital can be built throughout Qatar with positive outcomes for general attitudes and motivation toward adopting renewable energy and acting to preserve the environment. In other words, knowledge capital has the potential to change Qatar as a whole if employers as stakeholders take the lead in adopting environmentally conscious policies, even if renewable energy is not adopted. It is assumed that once Qatari residents become aware of the need to preserve the environment, renewable energy becomes a viable option. However, the viability of the renewable energy option depends on the government’s ability to convince the population that they have a workable policy and a clear plan for its implementation and maintenance.

It can therefore be concluded that knowledge capital has the greatest influence in terms of motivating Qatari residents to modify their energy consumption habits and to safeguard Qatar’s environment for the future. Knowledge capital can contribute toward the creation of human and social capital by putting the population on notice that if the status quo in

terms of energy consumption continues, Qatar may suffer a devastating blow to its environment and its physical and economic health.

7.6 Contribution to Knowledge

The current research on renewable energy in Qatar is still limited. Reports in the literature tend to acknowledge the high consumption of traditional energy in the country, but only provide anecdotal rationalisations for over-consumption. This research study, however, went directly to the source of that consumption and produced evidence of factors contributing to that behaviour and factors that motivate changed consumption behaviour.

This study's academic contribution and contribution to theory are summarised in the following statements:

7.6.1 Academic Contributions

- This research study will contribute to the literature by providing empirical evidence of the factors that motivate the population of Qatar towards acceptance of and participation in sustainability and renewable energy. The results of this study can also contribute toward a general understanding of the factors that motivate all individuals to prioritise renewable energy as a higher order need over traditional energy.
- The results of this study also contribute to the literature by providing statistical evidence of the steps that the government of Qatar can take to motivate its population to accept and participate in sustainable development and renewable energy.
- This research has added to the academic literature by providing insights from energy experts in Qatar shed light on energy consumption and environmental behaviour in the country. These experts also helped to make sense of how this behaviour presents a challenge for Qatar's energy policy makers and how the government can respond appropriately to these challenges to its sustainability and renewable energy policy and plans.

Ultimately, the academic contributions of this research adds a new level of empirically tested data to the literature. This data provides reliable evidence of the factors that influence and drive ordinary citizens' behaviour in terms of the environment and renewable energy. More importantly, this empirical data adds reliable evidence of the perceptions, attitudes

and drivers of those perceptions and attitudes among the citizens of an oil rich, Gulf state where consumption of traditional energy is free and, therefore, excessive.

7.6.2 Contribution to Theory

- This study has contributed to theory by providing empirical evidence that confirms the economic, social cognitive, hierarchal needs theories and the theory of self-determination.
- Based on the findings of this research study, a theory of knowledge transformation can be developed. In this regard, a theory of knowledge transformation maintains that energy consumers can be motivated to modify their energy consumption habits if they have the requisite knowledge of three specific factors. The first of these factors is the detrimental impact of traditional energy consumption on the environment. However, it is not enough that individuals merely know that their consumption habits have detrimental environmental consequences; they must have this knowledge in common with others who they observe acting on this knowledge. This will then put the individual under pressure to act on that knowledge themselves. It also puts them in a position to act in solidarity with others. Therefore, knowledge that leads to the formation of social networks can transform traditional consumption habits (See Figure 7-1). The second factor is knowledge of what the individual can do to minimise or eliminate environmental degradation. This would include more conservative use of appliances, lights and other electrical devices. For example, if an individual is the last to leave a room, he or she should ensure that the light and all other appliances, such as the television are turned off. Moreover, knowing that energy saving light bulbs can help to reduce the electricity consumed will help the individual make and execute plans to modify his or her energy consumption behaviour. The third factor is the knowledge that these actions for saving energy will help to protect the environment. In general, if individuals feel that their efforts to protect the environment are meaningless, they are less likely to modify their behaviour. This is especially true in Qatar where traditional energy is supplied free of charge, so there is no financial incentive to reduce consumption.

In summary, a theory of knowledge transformation is predicated on the presumption that energy users will modify their consumption behaviour if they have the requisite knowledge that:

1. Continued consumption at the current rate will contribute to environmental degradation.
 2. There are actions that the consumer can take to modify their energy usage in ways that contribute to the conservation of the environment.
 3. The modification of one's behaviour in positive ways is helpful to the environment.
- Based on the results of this study it is also possible to develop a theory of detrimental consequences. A theory of detrimental consequences is informed by the survey results pertaining to the Qatari citizens who lived in the UK for a period of time. The instruction data arises out of the fact that Qataris, who were forced to pay for traditional energy consumption for the first time, modified their behaviour relative to conservation of energy as a consequence and continued to do so even after returning to Qatar and regaining access to free electricity. It is therefore possible to theorise that when individuals are confronted with a personal cost or loss, they are prepared to take steps to minimise that harm to themselves (See Figure 7-1). In order to minimise the cost to themselves, individuals are more inclined to learn all they can about the behaviour and the object at issue. For example, where individuals are seeking to avoid high energy bills, they will typically learn what they can do to lower their bills. In the case of the Qatari citizens, this led them to conduct research on traditional energy consumption and to discover the personal and community costs associated with traditional energy consumption. This explains why they modified their energy consumption behaviour in the UK and continued with those modifications after returning to Qatar. In other words, the modification of their behaviour was not motivated by a mere desire to lower their energy bills as there were no bills to pay in Qatar. Rather, this behaviour was motivated by the knowledge that to do otherwise was harmful to Qatar's environment and its economic future. As the theory of detrimental consequences assumes, once an individual has a bad or otherwise unpleasant experience with traditional energy consumption, the individual's attention will be directed toward energy and this will lead to the discovery of its potential impact on the environment and the future. This discovery will then lead to modification of consumption habits.

The theories developed as a result of this study are summarised in Figure 7.1 below.

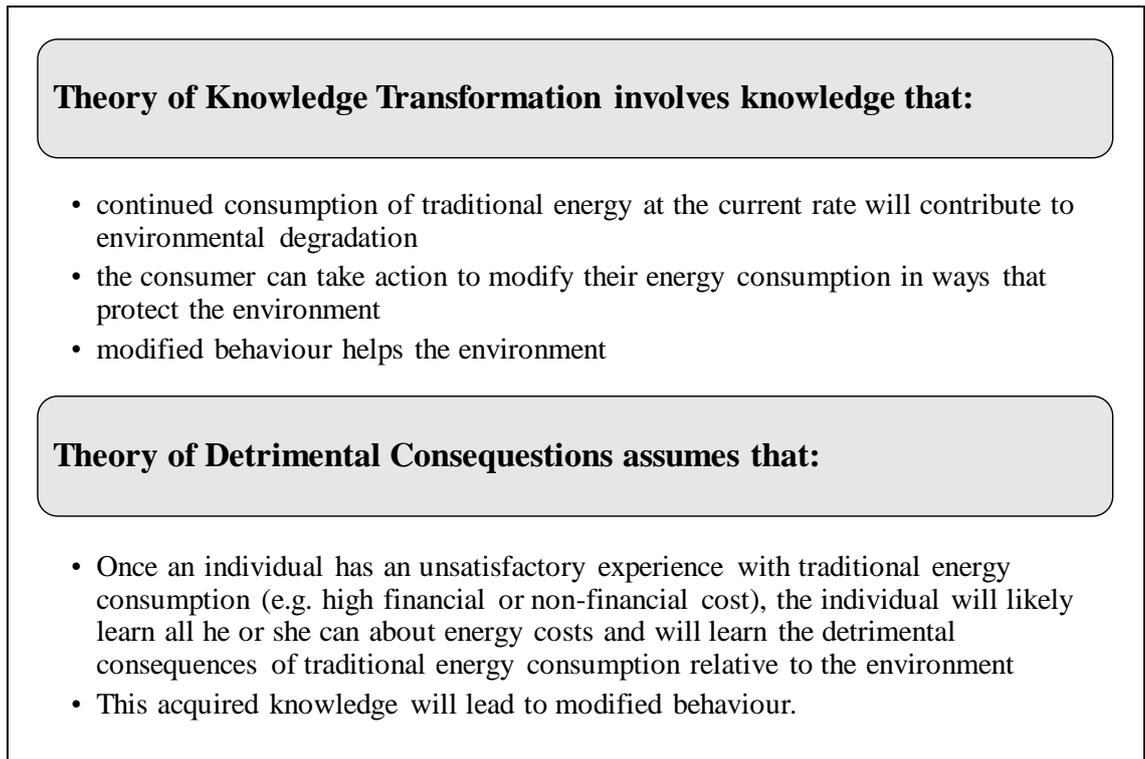


Figure 7-1: Theories Developed by this Study (Author's Creation).

7.7 Practical Implications

Based on the results of this study, the ideal solution for improving awareness and knowledge of the cost of traditional energy consumption is to impose fees for consumption. The interview results showed that when Qatari citizens were forced to pay for electricity in the UK, they changed their behaviour. In these circumstances, the respondents reported paying greater attention to energy consumption and taking steps to reduce or eliminate energy wastage. When returning to Qatar, where traditional energy is free, this modified behaviour continued. These results, therefore, suggest that if Qatari residents were forced to pay for electricity, they would become more conservative consumers. However, taking this kind of approach to acceptance of sustainability and renewable energy is too risky from the perspective of the Qatari government and is unlikely to attract popular support.

If Qatari residents were forced to pay for electricity consumption, this would obviously help to lower consumption rates in Qatar. However, Qatari lifestyles would be significantly altered, and some residents would find themselves living in poverty. This could have serious ramifications for sustainability. When facing poverty, residents will experience a change in their higher order needs. The basic survival need of access to food and water will be heightened and under threat. This would lead to exploitation of the environment for

survival. Moreover, as this higher order need is amplified, concerns about renewable energy becomes secondary. Therefore, while forcing Qatari residents to pay for electricity would reduce energy consumption, it would also create problems for environmental protection, sustainability and the acceptance of renewable energy.

The solution to the traditional energy consumption problem and cooperation with sustainable development is to be found elsewhere. The results of this study suggest that the most practical solution is the development of social, human, and knowledge capital. This would create the factors that drive both intrinsic and extrinsic motivation to alter energy consumption habits and to participate in sustainable development through environmentally conscious behaviour.

In order to develop knowledge, human, and social capital, Qatari residents need to be aware of how their current consumption levels negatively impact their health, their community, Qatar's economic and environmental future, food security, and the health and economic welfare of future generations. Knowledge in this regard, is a progressive exercise and this level of awareness is only the beginning of practical changes in behaviour. Awareness of the detrimental impact of traditional energy consumption habits will not lead directly to altered behaviour. Qatari residents need to couple this awareness with knowledge that altering consumption habits can and will make a difference toward sustainability. This knowledge capital can be more effectively achieved through the development of human and social capital. Thus, the population need to know that sustainability is a community and national effort and the participation of every individual is required. Once Qatari residents develop knowledge, human and social capital relative to sustainability, acceptance of renewable energy will follow. Thus, the development and generation of knowledge, human, and social capital, provides the best possible solution to the long-term success of a sustainability and renewable energy policy.

Therefore, the practical implications of this study are clear. The Qatari government needs to take steps to generate and develop human, social, and knowledge capital with regards to the detrimental impact of current rates of traditional energy consumption, to encourage behaviour modification that helps to reduce environmental harm and to build support for sustainability and renewable energy policies. The development of knowledge, human, and social capital creates shared value and motivates individuals to participate in sustainability and renewable energy. A number of motivating factors will arise out of or contribute to

these shared values. These motivating factors include, but are not limited to, patriotism, a sense of belonging, a sense of usefulness, security for the future, good personal and national health, environmental protection, and so on.

Once the government takes steps to create and maintain social, human, and knowledge capital, its continuity will depend on the government's ability to manage renewable energy expectations in a realistic way. In other words, if the government of Qatar presents a renewable energy policy that the population understands and accepts, the momentum created through human, social, and knowledge capital will continue to support positive attitudes and behaviours in relation to sustainable development and renewable energy.

7.8 Suggestions for Further Research

While this research study fills a gap in the literature through the provision of empirical data evidencing the factors that motivate individuals in Qatar to modify behaviour and attitudes relative to sustainability and renewable energy, it points toward a number of areas for further research. A major discovery via this research is the impact of free electricity on consumption habits. Both the qualitative and quantitative data used in this research confirm that when electricity is free, it is over-consumed, and users are less careful about wasting energy. While this was to be expected, what was surprising was the fact that once Qatari citizens were forced to pay for electricity abroad, they altered their consumption habits to show greater care for wasted energy. When returning to Qatar, where electricity is free, they continued to be conservative in their energy usage. It would therefore be interesting to know whether individuals who are accustomed to paying for electricity and are suddenly placed in a situation where they are able to use electricity free of charge, modify their behaviour during and after using free electricity.

It is therefore suggested that research should be conducted on a sample population who have always had to pay for electricity but are suddenly in a situation where electricity is free. This research would be designed to determine whether conservative behaviour learned when electricity had to be paid was sustained when energy was free, and, if so, what factors motivated that continued behaviour. This research would also attempt to find out if careless use of electricity during the exposure to free electricity carried over to a return to paid electricity. The results of such a study would be important because this research project revealed that where Qataris are exposed to paid electricity, they learn to be more conservative consumers, and this learned behaviour carries over even when electricity is

once again provided for free. The results of such a study could provide insights for renewable and sustainability policy makers moving forward. The main issue for research is whether or not individuals learn and unlearn bad energy behaviour and whether or not they similarly learn and unlearn good energy behaviour. The results of such a study would help policy makers know how committed and consistent their efforts for sustainability and renewable energy should be in order to achieve and maintain optimal levels of cooperation, support and participation from members of the public.

Another interesting area informed by this research study is the feasibility of renewable energy in an area where the overconsumption of conventional energy is prominent. This kind of research could be set up as a clinical trial in which residents of the designated country or region were exposed to renewable energy installations. The study should be designed to determine how well the residents adjusted to renewable energy, what they expected going in, how well the renewable energy installation met or exceeded their expectations, what they liked and did not like about it, whether they would be prepared to use it instead of traditional energy, and what improvements they would need to see in order to accept renewable energy in place of traditional energy. Such research would be very important to energy policy makers, particularly Qatari policy makers. The results of this suggested study would help governments to identify the renewable energy sources that would best meet residents' expectations and would identify and counter weaknesses which might discourage them from adopting renewable energy.

The results of this study have also opened up possibilities regarding the effect that knowledge has on the environmental behaviour of individuals. It has been suggested that in order to build knowledge, human, and social capital, environmental education and behaviour should begin by including compulsory environmental education on the curriculum for early learners and throughout the school years that follow. This education should be coupled with environmentally responsible behaviour at school. Therefore, a study could be conducted on school-aged children who have environmental education included on the school curriculum and/or are in schools with environmentally responsible behavioural policies. Such a study should be designed to test the environmental consciousness of these children and how this impacts their environmental behaviour away from the school setting. The results of this kind of study could guide educators and energy policy makers in ways to improve environmental education and behaviour.

A similar study could be conducted on employees in stakeholder organizations that practice and enforce energy saving processes and that have implemented, either wholly or in part, renewable energy sources. Such a study would be able to determine whether or not the employees exposed to renewable energy and sustainability standards are influenced to the point where they continue their energy-conscious and environmentally-friendly behaviour when away from the workplace. This research study would be able to test the assumption based on the reported behaviour of survey participants who had been exposed to responsible energy consumption in the UK and who continued that behaviour after returning to Qatar even though there was no specific obligation to do so. It is important to note, however, that these respondent spent a considerable period of time in the UK before returning to Qatar. The results may be different within an organizational setting where employees return to their usual lifestyles on a daily basis. Therefore, further research would clarify whether or not responsible energy consumption can be learned and sustained where there are daily breaks in this behaviour.

It is widely reported in the literature and duly noted in this research paper that Qataris have a tendency to overconsume electricity. Likewise, it has been reported that the reason for overconsumption of electricity in Qatar is the fact that electricity is free. While this is a reasonable assumption to make, it is still an unsubstantiated contention since there is a lack of empirical evidence of the link between free electricity and overconsumption. Further research is therefore required to strengthen this claim. Research should be based on both qualitative and quantitative data. The quantitative data should be aimed at measuring energy consumption of those who receive free electricity and those who pay for its use. Patterns in the data would be able to determine whether or not overconsumption of electricity is more intricately tied to free electricity than to paid electricity. Differences in consumption habits between the two groups would provide evidence of whether or not overconsumption of electricity is indeed linked to free electricity.

Other items that can be measured through quantitative data for determining the link between free electricity and consumption of energy are methods or practices for saving energy, knowledge of and use of energy intensive appliances, knowledge of environmental effects of overconsumption and so on. This data would not only provide empirical evidence of the link between excessive consumption and free electricity but would also help policy makers identify perspectives and attitudes that should be targeted in order to motivate popular support for sustainability and the use of renewable energy.

Qualitative data should be collected by way of interviews. These should be designed to collect detailed and in-depth data from a population sample of individuals who consume electricity free of charge. The purpose of the interviews is to collect data on consumption habits, knowledge and respect for the environment, sustainability and the prospects for accepting renewable energy. Interviews would allow for the collection of robust data capable of presenting a narrative that explains consumption habits, energy conservation, attitudes towards environmental damages and to renewable energy. Such data would provide in-depth details that could help energy policy-makers understand the challenges ahead of them regarding the use of renewable energy and sustainability. This data could also be used to triangulate the quantitative data collected. Such mixed methods research is not only an opportunity to provide empirical evidence of the link between excessive energy consumption and free electricity, but also to explore the perspectives and attitudes of users towards sustainability and renewable energy.

This study was conducted specifically on Qatari residents and may only be replicable in countries with similar demographics, cultures and economies. To broaden the scope of this study, a similar study could be conducted on a population of Western energy users to determine whether or not they are amenable to sustainability and renewable energy. The results of such a test could be used to determine whether or not there are any practical differences in the attitudes of Western and non-Western energy consumers in terms of sustainability and renewable energy.

Theories of knowledge transformation and detrimental consequences were developed out of the results of this study. These theories could be tested by empirical studies. One such study could be in the form of a clinical trial where two groups are tested. One group should consist of a focus groups where environmental issues are discussed and experiences shared. The other should be a control group whose members do not participate in the focus group. Surveys should be distributed among the groups following the focus group's discussions to test their respective energy consumption levels. In order for this to have relevance, baseline measurements of energy consumption prior to participating in the focus group should be taken. Baseline measurements and post-survey measurements should be compared to see if there are any meaningful differences in energy consumption behaviour after the acquisition of knowledge and shared values arising out of participation in focus group discussions. The measurements for this group should also be compared to the measurements for those participating in the control group.

The theory of detrimental consequences was tested in this study through the collection of data from Qatari citizens who had lived in the UK and had paid for electricity there. However, further tests could be conducted to improve the authenticity of this study's results. It may be that residents of other oil rich countries with access to free electricity have not been motivated to alter their behaviour in similar circumstance. On the other hand, the results may match the results reported here. Unless more tests are conducted, we can only speculate about the possibilities.

7.9 Limitations of the Study

Limitations are shortcomings or factors that limit the scope of the research and are those things that are outside of the control of the researcher (Grant and Tomal, 2013). The main limitation encountered by the researcher in this research project was access to open discussion and debate by government officials on the nation's renewable energy policy and plans. The only secondary data available to the researcher was information published for public consumption. This information was typically in the form of concluded policies and plans. Access to government debates could have revealed the challenges the government of Qatar has confronted and continues to confront in devising a concise renewable energy policy and plan.

Another limitation that impacted the collection of data was the distance between the researcher and Qatar. This meant that the sampling and data collection had to be scheduled carefully. This allowed very little flexibility for broadening the sample population and the data collection process.

There was also a language barrier as the thesis was written in English. The data was collected primarily in English, but some of the data was collected in Arabic and subsequently translated into English. While a translator was used to ensure the reliability of the data, more time and effort was used in the collection and documenting of data than would have been necessary if the data had been collected in English. The time and effort necessitated by this language barrier could have been put to use elsewhere in this thesis.

7.10 Delimitations of the Study

Delimitations are those limits that the researcher deliberately establishes to narrow the scope of the research (Grant and Tomal, 2013). This is often influenced by time, resources and practicality as it is virtually impossible for a researcher to investigate and collect data

on all the possible variables in a research (Ibid.). In this regard, the researcher delimited the sample population to Qatar residents rather than residents of the GCC states. Had the researcher studied those states, the collection of data would have been too much to manage on the researcher's budget in light of the time it would have taken. Equally, it would have been impossible to travel to multiple GCC states for the purpose of distributing surveys and conducting interviews. In order to facilitate the collection of data from multiple GCC states, the researcher would have had to conduct interviews by telephone in many cases and would have had to mail surveys to multiple participants. The ability to conduct online surveys was limited by the language barrier. All in all, the barriers to data collection from multiple GCC states and the scarcity of available channels meant that the data collected would have been unreliable or at least not as reliable as face-to-face interviews and the collection of survey data at the site of investigation. Therefore, delimitation was necessary for ensuring collection of the best available data and for ensuring reliability.

7.11 Weakness of the Research

This research was a snapshot study in that it was carried out over a relatively short period of 4 years. The period is short compared to a longitudinal study which normally follows a population, or the object studied, over a long period of time, often many years. This research involved one interaction with the subjects in the form of either surveys or interviews. There was no returning to the subjects intermittently over a period of time. Therefore, the data collected in this research was based on a one-time interaction aside from preparations that were made in advance of collecting the data. A longitudinal study would have allowed the researcher to determine whether or not knowledge was acquired and whether or not acquired knowledge had a lasting impact on the energy consumption and environmentally friendly behaviour of Qataris. However, a snapshot study was necessitated by virtue of the distance and the time and resources it would have taken to conduct a longitudinal study. While respondents who had lived in the UK reported that they changed their consumption behaviour, a snapshot study did not allow for the researcher to observe this phenomenon or follow up on it after the expiration of a period of time. Therefore, in this research, it is only possible to conclude that, based on the self-reports of the respondents, knowledge and experience are the primary factors motivating modified energy consumption behaviour.

Due to distance and the general difficulties with arranging interviews with government officials, no government officials were interviewed for this research project. Input from government officials would have been useful for determining their perspectives on the consequences of free electricity in terms of the excessive consumption by Qataris, as well as their perspectives on the policies and implementation of renewable energy in the country. Interviews with officials would have been very useful in explaining how the government plans to deal with that issue, if at all. Moreover, input from officials would have helped to explain what the government plans to do about communicating its renewable energy policy and plans to the public more clearly.

7.12 Strengths of the Research

A major strength of this research was the inclusion of a sample of Qataris who had previously lived in the UK where they were exposed to energy bills. This is important because Qataris are accustomed to free energy and this study allowed for an examination of the consequences of exposure to the financial costs of energy consumption. This study was able to discover that exposure to electricity bills was a learning experience for Qataris. Rather than returning to old habits of consumption and complete disregard for the environment, Qataris who had been exposed to electricity bills in the UK modified their behaviour in positive ways.

Another strength of this research is the diversity of the respondents participating in the surveys. The respondents were of both genders and of varied ages with different levels of environmental education. Some knew little or nothing about environmental degradation while others were quite knowledgeable. The diversity of the sample population strengthens its ability to be applied to the wider population in Qatar. It was also possible to compare and contrast the perspectives based on environmental education and experiences, and to link conservative energy consumption to environmental education and experience.

The mixed methods research approach was also an important strength of this research project. As previously stated, this improved the reliability and credibility of the findings. This is because, as a mixed methods research, this study was able to collect both qualitative and quantitative data. While each data set has its weaknesses, they also have their strengths. By using both qualitative and quantitative data, this research was able to compensate for the weaknesses in one data set through the strengths of the other and vice versa. For example, the brevity of quantitative data was compensated for by the detailed data collected

qualitatively. Likewise, the small sample size usually associated with qualitative data was compensated for by the significantly larger sample size used for the collection of quantitative data.

This research also included a sample population of experts who were able to apply science, experience and expertise to the problem statement giving rise to this study. Input from the experts provided a unique layer of insight and understanding so that the researcher was able to more thoroughly examine the issues and the challenges that the Qatari government faces in preparing, planning and implementing its renewable energy and sustainability initiatives. Moreover, this study was strengthened by its mixture of experts and laypersons who provided their perspectives on renewable energy and sustainability in Qatar. The differences between the experts and the laypersons was significant because where these diverse population samples shared the same perspectives, those views were very likely to represent fact rather than fiction.

7.13 Conclusion

The results of the surveys and the interviews present two different perspectives on the attitudes of the Qatari population with regards to sustainability and renewable energy. The interview results revealed that the experts do not have much confidence in people's willingness to alter their energy consumption behaviour as long as traditional energy is free. According to the experts participating in the interviews, traditional energy is wasted in Qatar because it is free. In other words, Qatari consumers are not concerned about the cost of energy because they do not have to bear the personal cost themselves. They use it as they see fit, without any concern for their consumption and its impact on the environment. In the absence of personal costs, individuals do not feel an obligation to reduce or eliminate wasteful energy usage. Therefore, getting the population to support sustainability and renewable energy is challenging.

The survey results reveal that a number of respondents share the views of the energy experts that free electricity has resulted in electricity being squandered in Qatar. Based on the matching results in both the interviews and the surveys, it can reasonably be concluded that the population are less considered with regards to their use of electricity because it is free.

The survey results presented direct evidence of mixed perspectives and behaviours among Qatari residents. However, knowledge appears to be the number one indicator of how residents will behave in terms of energy consumption. Where knowledge, either through

education or experience exists, they are more likely to act in ways that are respectful and conservative in terms of energy consumption and sustainability. For example, where survey participants revealed knowledge or education with regards to environmental issues, sustainability, renewable energy and so on, there was a tendency to support renewable energy and to adopt energy efficiency and environmentally friendly behaviours. This occurred despite the fact that Qatari residents enjoy free electricity.

Experience also altered behaviour in positive ways. This conclusion was drawn from survey results involving Qataris who had spent time living, working or studying in the UK for a period of time. The results of this particular survey revealed that Qatari citizens learned to behave in very different ways when exposed to energy at a cost and modified their behaviour in an attempt to lower their energy bills. This modified behaviour included turning appliances and lights off when not in use and monitoring increases in usage and costs. The survey results also revealed that Qatari residents who had not lived in the UK but who had some form of environmental education, were also environmentally and energy conscious.

The results of this study reveal that knowledge is the key to reducing energy consumption and changing attitudes toward sustainability and renewable energy in Qatar. Knowledge capital appears to be the key to building social and human capital which together drive the factors that motivate individuals to modify their behaviour toward sustainability and renewable energy. With knowledge, Qatari residents will be equipped with the knowledge and awareness of the detrimental consequences of traditional energy for the environment, for their livelihoods, and the lives of future generations.

This knowledge capital can grow into social and human capital where Qatari residents find kinship with other residents who share the same values or who are simply humanitarians. This kinship is capable of building a common desire to save Qatar from future economic, and environmental disaster. Human and social capital arising out of knowledge capital will also be formed naturally through networking and cooperating in campaigns for environmental sustainability.

The results of this study revealed that Qatari residents, when educated or informed in respect of the detrimental consequences of traditional energy consumption, are motivated to alter their consumption habits. What is important here is that individuals in the country are amenable to change if they are aware of the harm traditional energy causes to the

environment, their personal health, the health of the community, the economy, and to Qatar's future. Moreover, if the population are aware that modifying their behaviour will help to reduce harm, they will be motivated to change their behaviour accordingly.

Research findings also indicate that with knowledge of the detrimental consequences of traditional energy consumption, Qataris residents are amenable to the idea of renewable energy. The survey results revealed willing signs in this direction. However, as the interviews with energy experts revealed, the energy policy presented by the government is too vague to garner adequate citizen support. Therefore, the Qatari government must clarify its renewable energy policy and plan and greater efforts must be made to create knowledge, human, and social capital to encourage environmentally sound behaviour. For the time being, there is a significant potential for change. The government of Qatar can tap into that potential to fully develop its sustainability and renewable energy policy and plans.

Two theoretical concepts were developed in this study which will be of use to the wider academic community. These are knowledge transformation theory and the theory of detrimental consequences, both of which were formed on the basis of the results from both data sets. It is anticipated that these theories could be used to test the impact of knowledge and electricity bills on the consumption behaviour of individuals. Furthermore, these theories will help to answer questions relating to the factors that motivate individuals to save energy and reduce consumption in both the short and long term. One of the most important questions arising out of these theories is whether or not individuals can be motivated to change their energy consumption behaviour when they have been accustomed to free access to traditional energy and regard it as a right rather than a privilege.

The government of Qatar's decision to grant free electricity to its citizens has complicated its plans for sustainability and renewable energy. However, as the results of this study demonstrate, it is possible for the government to work through this complication. It may be difficult for some Qataris to modify their consumption habits, but the government can reach adult workers by engaging employers as stakeholders with a view to modifying the energy consumption habits of those individuals and encouraging support for sustainability and renewable energy. In the meantime, the government of Qatar can look to the future and begin educating early learners in order to create new energy conscious generations.

It is also important for the government to partner with stakeholders with a view to creating the kind of social and human capital necessary for successfully developing and sustaining

solidarity in relation to sustainability and renewable energy. Initially, the government and stakeholders should model the behaviour that they expect the population to follow. Once residents begin to follow the lead, the government should publicly recognise their efforts as a means of motivating others to join the combined push for sustainability and renewable energy. In the meantime, financial incentives such as government fee discount benefits should be introduced to encourage positive actions in favour of sustainability and renewable energy. This is important because intrinsic motivation is driven by what is perceived as a benefit to the individual when performing a certain act.

All of these efforts must be combined with public service announcements and campaigns designed to heighten public awareness of the threat their continued behaviour poses to those higher order needs that are serviced by the environment. While extrinsic motivation is driven by a fear of punishment when an act is not carried out, the government, for political reasons, may not want to pursue this avenue of change. However, it needs only to present information about the negative long-term effects Qatar will experience should the population continue to exploit the environment. In the case of Qatari nationals, the government can play on their patriotism and take an approach that informs Qataris that their country needs them to cooperate with the government, and with each other, to safeguard both Qatar's future and their own.

As the experts participating in the interviews suggest, sudden change is not expected: it will require time and effort. If the government of Qatar is genuinely committed to launching its renewable energy and sustainability plans and policy, it will have to be both patient and prepared. The hope of the researcher is that this study can assist in that endeavour and contribute to a more energy-conscious and sustainable future for Qatar.

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