EVALUATING URBAN SERVICES USING ECONOMIC VALUATION TECHNIQUES: TOWARDS BETTER URBAN ENVIRONMNETAL QUALITY AND PROMOTION OF SUSTAINABLE DEVELOPMENT

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Abstract

This PhD thesis examines and evaluates the importance of urban services in environmental quality using economic evaluation techniques. It is a consensus that one of the features of countries that are under development is the rapid growth of urbanization. Rapid urbanization is followed by an intense demand for qualitative and quantitative development in physical dimensions and urban systems. An efficient urban management system is required to tackle and solve the problems of urbanization, using appropriate policies, methods and data to ensure that not only has the urban population got access to the labour market, housing and urban services, but also urban environments are organized to enhance the quality of life for its citizens. Consequently, this research seeks to assess and define a method to help local authorities and policy makers in affective decision making and efficient city management. Thus, the main objective of this thesis is to establish a non-market benefits valuation models for use in current and future policy applications with the aim of better built environment quality and promoting sustainable development.

This research shows that allocating appropriate urban services plays a key role in promoting urban environmental quality, and fostering essential amenities such as comfort, safety, aesthetic, attractiveness etc. to citizens. Distribution and accessibility of urban services plays an important role in people’s movements, forming the city size, shape, and density, and importantly living quality in the city.

This research reveals how economic valuation techniques can be used to define the market and the value of the urban services and assesses public preferences by determining willingness to pay for better access to preferred urban services.

By employing the perspective of welfare economics to identify the structure of public preferences, including preference differences between socioeconomic groups, this study provides valuable information which should help to inform public policy deliberations over city management and land use planning objectives of promoting sustainable development and increasing quality of life and environment.

Dedication

I dedicate my dissertation work to my family. Most importantly I would like to express my gratitude to my loving wife, Samira Razmara whose word of encouragement and push for tenacity ring in my ears. I cannot find words to describe her supports and self-devotion throughout my life, especially the past few years.

I would also like to dedicate this study to my unborn child Ava, which upon her arrival encouraged me to finish this thesis and start the next chapter of my life.

I also dedicate this work and give special thanks to my parents Elaheh and Mahyar Ardeshiri who have supported me through the process. My mum has always supported me and engorged me with her unconditional kindness and love throughout my lengthy study and my dad has continuously been there when I needed any support from financial to professional advice on my research. I will always appreciate all they have done. I also need to mention my beautiful sisters Rosa and Yasaman Ardeshiri for being there for me throughout the entire doctorate program and keeping me smiling through all the tough parts of my study.

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Table of Contents

List of Tables

List of Figures and Maps

Introduction

Access to urban services is one of the most operative and effective domains of Quality of life in urban areas, which consequently is one of the important issues in sustainable urban development. This relationship is so strong that it has been accounted as a central indicators of quality of life and sustainable development (Medina et. al and Hall et. al. in "The quality of life in Latin American Cities" Edited by Lora et. al, 2010).

Sustainable development in general and urban sustainable development in particular, has been considered as the focus of development strategies in recent years. Whilst the existing wellbeing of communities is important issue, sustainable development also focusses on the future wellbeing of communities. The importance of sustainability in cities rises because every year more and more people worldwide end up living in cities. Before 1950's about one-third of the world population lived in cities but since then this proportion has been increased to more than half of the world population and this trend will intensify.

Sustainable development is defined differently by various disciplines, however improving quality of life is the main goal of recent strategies. This is because that these strategies focus on all aspects of human life. Therefore, the results of these strategies are expected to response to people's needs as well as their desires.

Although past development strategies were mainly concerns for providing basic needs to recover living conditions, but new strategies are intended to improve living condition by increasing access to social and infrastructure services.

The nature and diversity of urban services requires reconsideration in the ways in which they should be provided. Traditionally, the public sector was the main provider of these services. But since public sector resources are insufficient for investing on these services, as well as the diversity and the importance of the quality of providing these services are beyond the capability of public sector.

The investment of private sector in providing urban services requires an analysis of cost and benefits. In this thesis a new technique is introduced for valuing urban services and the number of people willing to pay for these services using a combination of "economic valuation techniques". The outcome has multi-contributions to policy and decision making with regards to providing valuable information to private sector, as well as the public sector to evaluate the provision process and decide how to invest. In this research, this technique is advanced to realise the value of these services and resident's preferences among different urban services and how accessible they should be in a neighbourhood scale.

Chapter 1: Introduction to the Research Area

1.1 Area of Concern: Provision of services and quality of life

The theory of sustainable development has emerged as the way to reconcile human development (underpinned by economic growth) and environmental protection. This widens and complicates the notion and measurement of quality of life by seeking to promote environmental quality as a key factor in human well-being and social justice. However, Enhancement of quality of life (QoL) has remained either explicit or implicit goal of public policy in almost all societies for several centuries. But regardless of the fact, QoL has come into popular usage since the late 1960’s only, as an extension of the set of measuring instruments to gauge the impact of development policies and efforts (Beukes 1997). It has been playing an increasingly important role in social science research as it has been realized that economic growth and development do not necessarily result in improvements in the lives of the inhabitants of a country. Therefore, research and development have started giving ample attention to the concept as an attempt to study the elements which determine QoL and to propose mechanisms which could contribute to its improvement (Lever 2000).

QoL has been the focus of numerous studies but a universally acceptable definition has not been derived yet. ‘Quality’ implies the degree of excellence of a characteristic, but the concept of the QoL may mean different things to different people. To some, it may mean how happy they are and to others, it may mean the level of economic status, education, health or security. Many researchers agree that the concept of QoL is too broad to describe. It is impossible to develop one universally acceptable definition of the concept. QoL is a multidimensional concept and it is context dependent. QoL relates to description and evaluation of the nature or conditions of life of people in a certain country or region.

Life quality is determined by exogenous forces, with respect to an individual or a social group, forces like production technology, infrastructure, relations with other groups or countries, institutions of the society, natural environment, and also by endogenous factors including interaction within the society and values of a person or a society (Kolenikov, 1998). The effect of these factors is not necessarily constant over time; for instance, environmental issues were given relatively small attention a century ago while today ecology is undoubtedly one of the main concerns of the people.

Pollution and erosion may be measured but how can quality of life be assessed? There are numerous examples of gauging well-being through employment, income, crime, travel, migration, house prices. However just which of these or others are important will presumably vary from individual to individual and over time. Calibration and interpretation would also appear to be problematic. Are they all to be treated equally or is crime to be rated higher than travel?' (Bell & Morse, 2000, P.15)

Conversely, in the field of quality of life measurement, researchers started to grapple with the inclusion of environmental quality as a key component of quality of life (Michalos, 1997). Researchers already steeped in the difficulties of measuring quality of life and trying to integrate the social into economic indicators, saw this as an almost insurmountable challenge:

> *'At this point in time, it is clear that what is required is a system that accommodates not only economic and social indicators, but indicators of environmental degradation and resource conservation. In short, what is required is a comprehensive system of measuring the wide variety of aspects of human-well-being, as well as the means of improving it and sustaining it. Unfortunately such a system (as I imagine it, anyhow) would involve the construction of something like a general theory of a good society (something like a utopia) which would be generally acceptable to most people ... This is practically impossible because we cannot get agreement on the elements of the utopia or on the proper evaluation of those elements.' (Michalos, 1997, p.222)*

The quality of life is highly correlated with environmental quality, the basic qualities such as health and safety in combination with aspects such as cosiness and attractiveness. Alternatively, environmental quality is sustainable development's objective in the steering of societal change, especially through changes in the way the economy functions, therefore environmental quality is the key common point between sustainable development and QoL. In addition, as Baker (2006) mentioned, is better to speak about promoting issues related to sustainable development than achieving it, and one way of promoting the urban environmental quality is by providing and assembling appropriate urban services in an area's in order to offer essential services such as comfort, safety, aesthetic, attractiveness etc. Distribution and accessibility of urban services plays an important role in people's movements, forming the city size shape and density and importantly living quality in the city. Travel to work, shopping centres, schools, leisure activities, parks and other public services affects community welfare, social equity and the environment in which we live. Urban services can have subjective and objective effects on the resident's life condition. Unlike other market goods, the consumption of urban services can promote the surrounding environmental quality, which aligns with sustainable development objectives. In addition, it will be argued that the economic basis of developed countries and those cities that are ranked high in QoL is mainly based upon the service sector (comparing with industry and agricultural sectors). Therefore, it can strongly acknowledge that urban services can be used as a means to improve economic growth and promote cities environmental quality leading to a better QoL and sustainable development. Much empirical evidence indicates that the presence of urban services contributes to the QoL and SD in many ways other than those mentioned above. However, it is essential to clarify and define which category of urban services will be used in this research, since anything that is not classified as industrial or agricultural will be classified in the service sector.

In 2004 a national survey of quality of life was conducted in Britain where neighbourhood resources, or neighbourhood social capital, was mentioned to contribute to a good quality of life by almost all respondents (Gabriel Zahava and Ann Bowling, 2004). They said they enjoyed pleasant views and areas in which to take 'nice walks' as well as the sense of belonging to a community. Good facilities and local services were also important (the following were mentioned: shops, markets, post-office, health services, street lighting, refuse collection, police, and local or mobile library). This research will investigate and evaluate the services that are categorised as neighbourhood resources that have no actual value or price in the market. It examines and explores the link and the value that people are willing to pay for urban services in order to improve and enhance their quality of life.

1.2 The problem statement: Quality of life at risk

One of the features of countries that are under development is the rapid growth of urbanization. Looking at the world's urbanization growth rate from 1950-2010, urban population in less developed regions has increased more than 7 times, and it is expected that by 2050 this increase will reach up to 16 times greater than the population in 1950 (Table 1.1). This trend also characterises Iran. During 1950-2010 Iranian urban population has increased more than 10 times with more than 70% of total population living in urban areas; and this trend will intensified by 2050 (Table 1.2).

Rapid urbanization is followed by an intense demand for qualitative and quantitative development in physical dimensions and urban systems. This despites the fact that limitation in productive capacity, commensurate with rate of urbanization, not only makes it difficult to meet demand in different dimensions but it is also the cause of urban poverty injustice, environmental degradation, lack of proper utilization of the capacity of cities in economic development and in general reducing the quality of life. Urbanization in developing countries is inevitable and preventive policies are doomed to failure in controlling the urbanization process. There is a consensus that to confront this problem in under developing countries, efficient urban management is required to tackle and solve the problems of urbanization, especially for mega cities in these countries. Urban management seeks to adopt a set of appropriate policies, effective and coordinated, in strategic areas to ensure that not only has the urban population got access to the labour market, housing and urban services, but also urban environments are organized to enhance the quality of life for its citizens and cities to play an effective role in economic development of the country by using their locational relative superiority. However as Parsa et. al (2002) argues, the process of growth and development of cities don't have a uniform process. He argued that the outcome at the regional and local level is highly path dependent on inherited economic, social and regulatory structures and relationships. Parsa describes factors such as service advantages, geographic location and resource availability as important factors on influencing the development path to regionalization and globalization of a city.

Recently the experience of economic stagnation in cities, rapid population growth and the pressures of counter urbanisation, has highlighted the question of liveability and the quality of life especially for developing countries. From any perspective, quality of life is a complex, multifaceted concept. It is also a highly relative term: What would be considered a "liveable" community in one part of the world might be deemed highly unsatisfactory in another. This might be due to cultural dissimilarity or to different standards of living that alter expectation for urban design, transportation and other infrastructure, and service provision. Nevertheless, the idea of quality of life remains a powerful one.

Major area	**1950**	**2010**	**2050**	**Growth Rate 1950-2010**	**Increase in population 1950-2010**	**Growth Rate 1950-2050**	**population Increase 1950-2050**
World	729,317	3,486,326	6,285,881	6.30	378.03%	7.62	761.89%
More developed regions	426,930	929,851	1,099,730	1.96	117.80%	1.58	157.59%
Less developed regions	302,387	2,556,475	5,186,151	12.42	745.43%	16.15	1615.07%

Table 1.1 Urban Population, growth rate and increase in population by Major Area1950-2050 (thousands)

Source: United Nations, Department of Economic and Social Affairs, Population Division, World Urbanization Prospects: The 2009 Revision (**http://esa.un.org/unpd/wup/index.htm**)

Iran	1950	2010	2050	Growth Rate 1950-2010	Increase in population 1950-2010	Growth Rate 1950-2050	Increase in population 1950-2050
Total population	16913	75078	96975	5.73	344%	4.73	473%
Urban population	4659	53120	82931	17.34	1040%	16.80	1680%

Table 1.2 Urban Population, growth rate and increase in population In Iran, 1950-2050 (thousands)

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2008 Revision and World Urbanization Prospects: The 2009 Revision**, http://esa.un.org/wup2009/unup/p2k0data.asp,**

Between 2006 and 2011 the quality of life in Iran had an average rank of 160 among 194 countries, with an average total score of 47 out of 100 (see Table 1.3). For evaluating the quality of life index nine variables have been used. These variables are Cost of Living, Leisure & Culture, Economy, Freedom, Health, Infrastructure, Risk & Safety and Climate. Out of these nine variable, Cost of Living, Leisure & Culture, Economy and Climate had a slightly improvement during these five years but others failed to do so (Figure 1.1) the final score it is nearly a straight line showing only a very slight change. This result shows that quality of life has not been improving in the past few years, although the population is increasing, and making it very difficult to improve their position.

Year	Cost of Living	Leisure & Culture	Economy	Environment	Freedom	Health	Infrastructure	Risk & Safety	Climate	Final Score	Rank	Score Change	Rank Change
2006	60	40	45	60	17	62	31	82	48	50	151	0	0
2007	80	57	32	48	17	45	30	0	55	42	190	-8	-39
2008	61	57	38	52	17	50	41	20	64	45	159	3	31
2009	72	54	33	67	17	62	41	0	65	46	163	1	-4
2010	65	54	50	71	17	69	40	0	64	49	150	3	13
2011	82	62	53	45	17	53	31	29	65	50	145	1	5
Average	70	54	42	57	17	57	36	22	60	47	160	0	1

Table 1.3 Quality of life index for Iran (2006-2011)
Source: International living access though http://www1.internationalliving.com

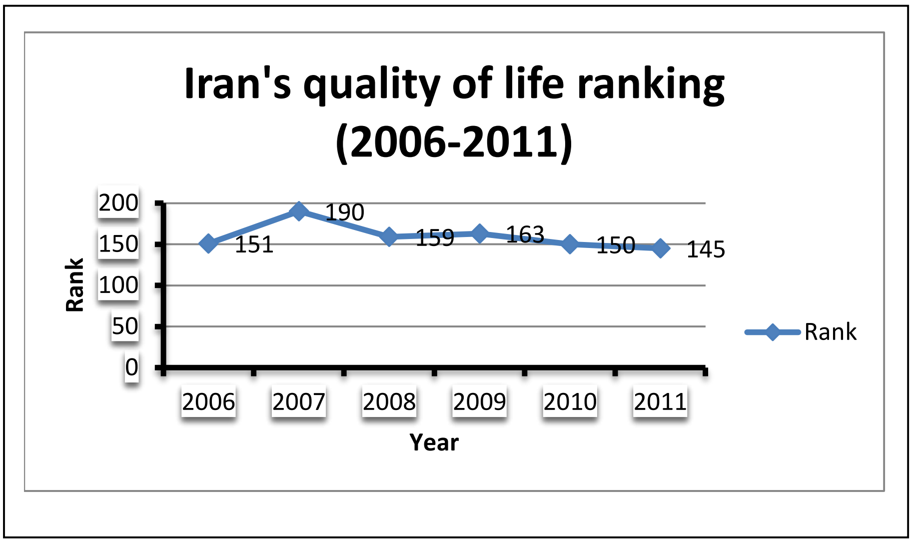
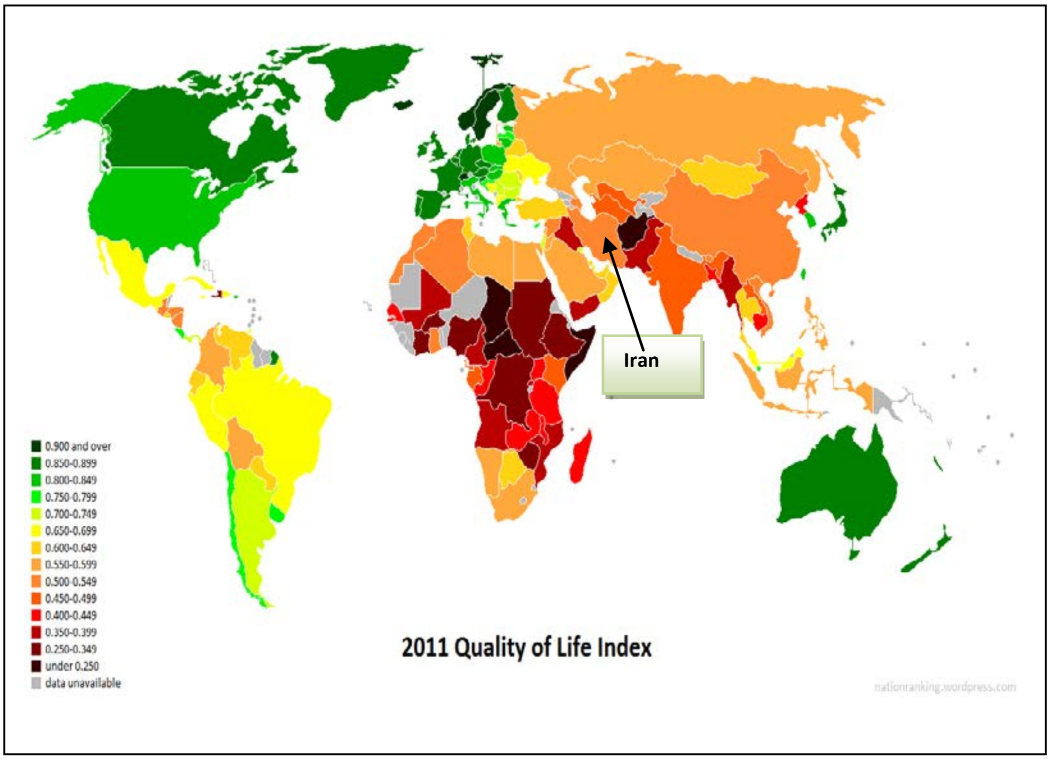


Figure 1.1 Iran's quality of life ranking (2006-2011)



Map 1.1 Nation quality of life index, 2011

Source: Nation Ranking, quantifying the world of sovereign states.
http://nationranking.wordpress.com/2011/03/06/2011-qli/

Figure 1.2 Final score for each variable used in evaluating quality of life index, (2006-2011)

A review of the literature on quality of life reveals that there is a general consensus among the researchers, policy makers and planners concerning the necessity for further research to be conducted on urban quality of life. These studies have key tasks in informing citizens, social groups and policy makers from their influence on the issue of quality of life. The results of studies on quality of life are required for evaluating policies, locational ranking and formulating urban management and planning strategies. They can assist in understanding and prioritization of social issues for planners and urban managers in order to facilitate upgrading citizen quality of life. The measurement of QoL can be used as an environmental quality diagnosis of previous policy strategies, and is a required foundation for drafting future spatial and urban planning policies (Lee, 2008). In addition studies of quality of life can clarify the problematic areas, reasons of residence dissatisfaction, citizen's priorities in life, result of social-demographic factors on quality of life, and monitoring and evaluating the efficiency of policies and strategies in life quality.

This research views quality of life as a subset of social equity, one that is concerned primarily with level of disparity in access to opportunities or material circumstances, such as income, health, education, good quality of space and the built environment that is easy and safe to use. Quality of life is about creating and maintaining a sense of place by creating an environment that is inviting, enjoyable and accessible equitably for all residence. (Turok *et al.*, 2006).

In recent studies it is possible to find many examples of analysis focusing on some particular domains of urban quality of life, such as social cohesion and integration (Berger-Schmitt 2002), urban safety (Bannister and Fyfe 2001), culture and leisure (Lloyd and Auld 2002), just to name a few. Differences in the choice of domains is related to the discipline (perspective) from which the subject is approached. In principle, all attributes of the environment and all characteristics of people are relevant domains in the person–environment relationship (Mitchell et al., 2001). It is important that the total domain is not too strictly defined. Mitchell (2000) defined six components for quality of life as shown in Figure1.3 and each component had its sub components. However there is a consensus among researcher that there is a need for more research on this topic and therefore, this thesis is structured in a way to provide more insight and knowledge about these components. Looking at the quality of life components provided by Mitchell (2000) and the works of other scholars, it can be observed that public services have direct or indirect effect on the majority of the component. For example accessibility to health services to increase the physical and mental status, or using public transport to reduce the pollution or having park to provide better climate or visual perception and scenic quality even having security station to provide a safe environment and etc. a few of the benefits of having access to public services. Hence this even makes it more crucial to conduct this research and examine and evaluate the role of urban services in improving urban environmental quality which has a major effect on increasing quality of life and consequently promoting sustainable development. Having said that, it is as important to find the right method to use as a tool to measure and evaluate the role of urban services as they do not exist in real life market and are counted as nonmarket goods. Therefore, there is clearly a need for further research to be conducted to evaluate urban services in quality of life in addition finding the best method that fits for this purpose.

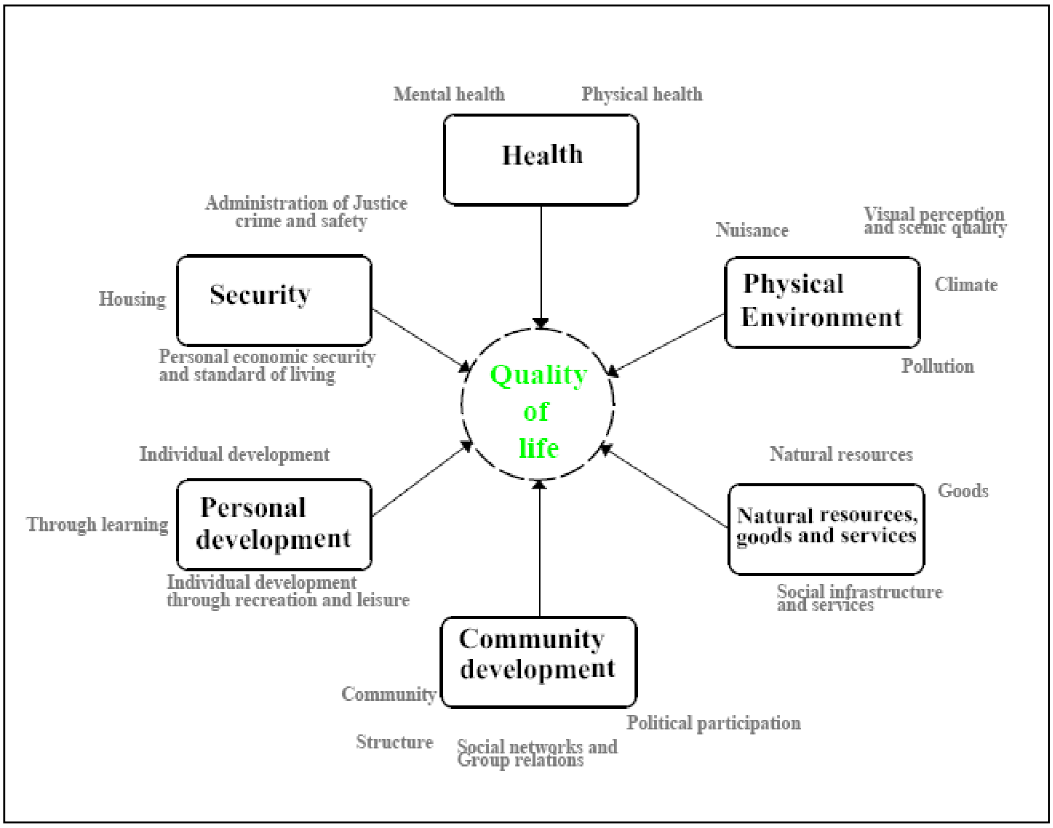


Figure 1.3 Quality of life components (Mitchell, 2000)

Figure1.4 Urban services and sustainable development

1.4 Research objectives

This study explores quality of life in the living built environment. It places quality of life as the central focus while taking into account the interaction between man and their urban environment. In this study, environment refers to a local urban environment where people are living. Such urban environment is human built with having high pressure of population. The quality of the urban environment as a living space for the peoples of the world has emerged as an issue of fundamental concern for academic researchers, policy makers and citizens for the first time in the history of humankind as majority of the world's population lives in urban places. Whether developed or developing countries, urbanization is a complex socioeconomic process closely linked with the scientific and technological process of societies and it has deep repercussions on all aspects of life (Fakharuddin, 1991). Quality of life depends on quality of environment. There are physical, biological, psychological, economic and social needs in a man's life. These needs are met by resources from environment. Quality of life from the standpoint of environment is the degree to which the environment has capacity to provide resources necessary to meet needs of human life (Bubolzet al., 1979). The demand for environmental resources is always growing but there is serious degradation in the capability of the environment to provide these resources. Quality of life is affected by the increasing gap between demand and supply of these resources.

Residents care about the appearance of the buildings and public spaces in their neighbourhoods, about the people who live there, about the proximity to shops, schools and parks, about access to work and about the absence of crime and other nuisances in the area. The quality of a neighbourhood, however, extends beyond the realm of daily living experiences. Neighbourhood quality plays an important role in the pursuits of developers, city officials, planners, realtors and researchers. In order for their construction projects to succeed, developers must understand the types of locations and amenities that are most valued by buyers. City officials sometimes view the upgrading of neighbourhoods as a way of combating various social ills. In order to realise this goal, however, the planners who prepare the upgrades must first learn about the aspects of neighbourhood quality that are missing. Realtors, who act as intermediaries between buyers and suppliers of dwellings, must assess the quality of the neighbourhood before assigning a list price to a vacant dwelling. Sociologists, geographers, economists and other scholars working in the wider field of urban studies are interested in the reasons why households relocate, why relocating households choose particular destinations and how the quality of the surrounding area figures into the price of a house.

The societal importance that is attached to neighbourhood quality and the attention that it is receiving within various scientific disciplines suggest a high level of understanding regarding the quality and value of neighbourhoods. Despite the importance of this topic, such is not the case. It is obviously preferable to have some access to jobs than to have no access at all; good schools are obviously preferable to bad schools, parks are seen as attractive landscape features and nearly everyone abhors crime. Nevertheless, when scholars try to assess the impact of neighbourhood quality on residential mobility or house prices, the task proves surprisingly difficult. While investments in infrastructure can sometimes improve the accessibility of neighbourhoods, the proximity of roads and railways can also depresses property values. While ethnic enclaves have become popular tourist attractions in some places, buyers in other places may view them as no-go areas. While high-density construction still takes place in inner-city areas, residents in the outskirts of a city often see such developments as an invasion of their privacy. Although efforts are invested in urban restructuring, many restructured neighbourhoods fail to attract more affluent households by not providing the essential need to improve the quality of life in the neighbourhood. This is due to incapability of their government to meet the demands with the limited budget that they have.

Therefor the main objective of this thesis is to present how environmental evaluation technique can be used as a tool to help the urban management system, developers, city officials, planners, realtors and researchers etc. with their policy making, effective decision making and efficient city management procedures. In addition it will provide a clear understanding how to evaluate urban services as a non-market good and what are the priorities among the residents. It will provide a perfect representation of how much people are actually willing to pay for urban services and thus how important is each services in their quality of life.

1.5 Research questions and hypotheses

Having mentioned the objectives and the need for further study on quality of live and its relationship with urban services it is very crucial that at this stage to accurately and clearly define the research question for this study. Choosing a research question is the central element of both quantitative and qualitative research and in some cases it may precede construction of the conceptual framework of the study. A clear research question makes the theoretical assumptions in the framework more explicit, most of all it indicates what the researcher wants to know most and first.

Looking at the previous arguments different questions arises for this research. However since the objective of this research is mainly focusing on the method and the outcomes of using different economic evaluation techniques. Therefore, the main question arises when someone wants to make a trade-off between different resources (urban services) in a neighbourhood. Is accessing to parks more preferable to accessing schools? Or is it the other way around? Is safety important or having access to public transportation is more preferable? How can we measure these preferences? If there is a preference deference of services than what is the current distribution of these services? In addition do properties with exact characteristics have different rental price with regards to their location and available urban service in the neighbourhood? How much people are actually willing to pay for different urban services?

Therefore, the research questions for this study are as follow:

- *Do properties with exact characteristics have different rental price with regards to their location and available urban service in the neighbourhood?*

- *Can calculating the willingness to pay for urban services provide a reliable measure to identify resident's priorities among services and its value in the real market?*

For proper evaluation and to provide valid answers to research questions, hypotheses are required be defined specifically. This involves more work by the researcher in order to either confirm or disprove it. In other words a supposition or explanation (theory) that is provisionally accepted needs to be provided in order to interpret certain events or phenomena, and to provide guidance for further investigation. A hypothesis may be proven correct or wrong, and must be capable of refutation. If it remains unrefuted by facts, it is said to be verified or corroborated.

The nature of hypothesis is described as a clear statement of what is intended to be investigated. It should be specified before research is conducted and openly stated in reporting the results. This allows identification of the research objectives and key abstract concepts and its relationship to both the problem statement and the literature review. A problem cannot be scientifically solved unless it is reduced to hypothesis form. Hypothesis is a powerful tool of advancement of knowledge, consistent with existing knowledge and conducive to further enquiry. Usually a research question is essentially a hypothesis asked in the form of a question. Having said that, for this study the following hypotheses have been considered.

H1: Properties with exact characteristics have different rental prices with regards to their location and available urban service in the neighbourhood.

H2: Calculating the willingness to pay for urban services will provide a reliable measure to identify resident's priorities among services and its value in the real market.

In order to test the research questions and these hypotheses Shiraz has been selected as a case study. In continue the research methodological approach to test our hypotheses and answer our research questions are explained.

1.6 Methodological approach

Carrying out a successful evaluation is very much dependent on choosing the methodology to go about doing it. Different methodologies represent a different approach towards evaluation of the research. There are three main forms of research types;

- Exploratory research, which helps to define and identify a problem or a question, it is commonly used to answer "what" questions.
- Constructive research, which tests theories and proposes solutions to a question or a problem
- Empirical research, which tests the feasibility of a solution and gaining knowledge by means of direct and indirect observation or empirical experience.

Choosing the most appropriate method depends on the type of research question. With a clear question in mind, it is possible to start working out which methodology to choose. Whereas, in this research the issue of using economic evaluation techniques to evaluate urban services and their effects in quality of life is something that have never been experienced in the past, therefore this research can be categorised as a form of *empirical research*.

To answer the research questions a combination of different economical evaluation methods are used to test the hypotheses. However, to understand the role of public services in our case study and provide the required data for our economic evaluation techniques, an analytical framework is designed based on three main approaches. These are, monitoring and observing the current condition. This approach explores the current situation in terms of quality and quantity of the services and observing the distribution and the accessibility of services in the case study. This is shown by preparing maps in geographical information system (GIS) mainly using secondary data provided by the municipalities and relative organizations. Observations combined with in-depth interviews from the locals are also used to evaluate the quality of the services. The second approach is evaluation and assessment of services position in the quality of living environment. This approach uses a Hedonic Pricing Model (HPM), which is one of the revealed preference techniques in economic valuation. HPM is a well-established technique based on consumer theory and explains variation in a house price by differences in preferences for the attributes of properties in question. These attributes are mainly structural characteristics, locational and accessibility characteristics and neighbourhood and environment characteristics. This method uses primary data gathered from housing agencies of properties that have recently been bought in the case study region. Thus, by using this method the importance of services in improving the environment, location and accessibility of the neighbourhood, as reflected by households' decision making in choosing a more suitable environment to live, will be revealed and this can help the sustainable development of a city since housing as a social and economic product has a positive impact on the economy of the city (Parsa et. al, 2011). The third approach measuring the willingness to pay for services as a strategy towards understanding public capitalization on services. With this approach, the value for urban services will be measured. In addition it can indicate residents most preferred services as well as the level of public partnership concerning improvement and development of the services. For this approach the choice experiment method is used as one of the state preference techniques in economic valuation. This method derives the value of a certain good by separately evaluating the preferences of individuals for the relevant attributes that characterize that good, and in doing so; it also provides a large amount of information that can be used in determining the preferred design of the good. Primary data is used for this approach from a questionnaire survey.

Mainly this research is a mixture of quantitative and qualitative methods. This approach has evolved through study of the relevant literature, in particular within quality of life studies including the work of Grayson and Young (1994), Nuvolati (1998), Yuan et al. (1999) and Hudler and Richter (2002) van Praag, B et. al (2010).

Essentially, empirical studies use two types of indicators to evaluate the quality of life (Seik 2000; Pacione 2003). One type is that of quantitative indicators, which are used to measure concrete aspects that relate to environmental, economic or social conditions of a specific urban centre, based on statistical data. An important strand of this kind of study is the use of singular indexes to summarize the evaluations of a defined set of characteristics of urban areas (Giannias 1998; Burnell and Galster 1992). The other type of empirical study that should be mentioned comprises qualitative data, obtained from field surveys, where citizens are asked their subjective "opinion" regarding the various fields of quality of life.

1.7 Thesis structure

Further to the introduction, this thesis consists of four parts: Conceptual issues; Research methodology and case study design; Case study analysis and Discussion and conclusions, which are structured as shown in Table 1.4.

Chapters 2 to 4 consider the conceptual issues relevant to the study. Chapter 2 presents a literature review on quality of life and its connection with environmental quality. Chapter 3 provides a definition and the category of urban services that it is used for this research and provides some literature and previous study on urban services. Chapter 4 presents a literature review on economic valuation techniques and its application.

Chapters 5 and 6 consider the research methodology and case study design. Chapter 5 outlines the relevant method for this research by looking at the objective of this study. Chapter 6 discusses the relative case study for this research.

The analysis of each approach is presented in chapters 7 and 8. Finally, chapters 9 present the discussion and conclusions.

Table 1.4 Thesis Structure

Part One: Conceptual issues	Chapter 1	Introduction
	Chapter 2	Urban Environmental Quality and Quality of Life
	Chapter 3	Urban Services
	Chapter 4	Economic Valuation Methods
Part Two: Research methodology and case study design	Chapter 5	Methodology
	Chapter 6	More about Shiraz (Case study)
Part Three: Case study analysis	Chapter 7	Valuating "Quality of life's" Objective and Subjective Urban Environmental Characteristics
	Chapter 8	Analysis of Choice Experiment Model
Part Four: Discussion and conclusions	Chapter 9	Conclusions

Chapter 2: Urban Environmental Quality and Quality of Life

2.1 Introduction

Since early Athenian times, when Aristotle was philosophising about the correct way to live the good life, a proliferation of academic theories and religious texts have considered the question of human quality of life(QOL) and wellbeing.[1]

With the rapid growth in urban population, large cities are facing typical problems such as neighbourhood degradation, increased road traffic socio-economic deprivation and inequities in health, well-being and health care accessibility, etc. This is reflected in the essential role of local environmental quality in recent strategic governmental policy papers with respect to housing, spatial planning and local environmental policy. At an international level, this focus is apparent in numerous scientific publications, and other documents concerning quality of life and urban planning.

So far, science has not advanced a comprehensive framework to address these issues in an integrated manner and to enable an evaluation of physical, spatial and social indicators. Review of relevant literature revealed that no generally accepted conceptual framework in relation to well-being and QoL has been neither developed, nor any coherent system to measure and properly evaluate aspects of, and trends in, environmental quality. The concepts of urban environmental quality and related terms such as liveability, QoL and sustainability enjoy great public popularity and form a central issue in research-programmes, policy making, and urban development—or at least they do so in terms of the appearance of these terms in the respective literatures. However, the manifestation and context in which environmental quality and QoL is used in research and policymaking is seldom uniform. Therefore, research on QoL is a very complex issue in terms of choosing the right methodology and theoretical framework; however, it is very essential for achieving more clarification on this subject.

There is a massive literature on QoL, environmental quality, liveability, living quality, well-being, living environment, sustainability, quality of place, life satisfaction, welfare, standard of living, human development and so on. This research focuses on terms QOL, Environmental Quality and Sustainability. The terms QoL and well-being are the dominant terms used in the literature. For the most part, these two terms can be used

[1] For historical discussion of the pursuit of the good life, see Schoch, R. (2006) *The Secrets of happiness: Three Thousand Years of Searching for The Good Life*. London: Profile Books.

interchangeably and often are for example the opening sentence in Parta Dasgupta's book on human well-being states 'The term well-being will be used to donate the QOL', showing a range of ideas on what constitutes a 'well-lived life'(Dasgupta, 2004). For most of parts in this thesis, this is how it is used.

In this chapter, descriptions of the concepts of Urban Environmental Quality (UEQ) and QoL will be explored more specifically. Key theories relevant to development of indicators of QoL are highlighted and a new classification of QoL aspects will be illustrated, emphasising the importance of UEQ and urban services that are acting in this environment, in QOL.

2.2 Conceptual approach to Urban Environmental Quality and Quality of Life

The notion of the manifestation of concepts such as liveability, QoL and quality of living environment is not unequivocal. This notion is not original; others have remarked that QoL and UEQ has become a repository, in which almost anything fits.

QOL and UEQ are an elusive concept approachable at varying levels of generality from the assessment of societal or community wellbeing to the specific evaluation of the situations of individuals or groups. Conceptualisation has reflected such variation. Broad social indicators have been used to chart the wellbeing of populations at the aggregate level (Flax, 1972b; Liu, 1976; Schneider, 1976). Social and psychological indicators have been developed to reflect individual welfare (Campbell et al., 1976; Heal & Chadsey-Rusch, 1985; Bigelow et al., 1991). Operational definitions of QoL are diverse, with variability fuelled not only by use of societal or individualistic perspectives but also by the range of applicable theoretical models or academic orientations. Many writing on the subject of QoL have commented on this diversity. Liu (1976) stated that there were as many QoL definitions as people, emphasising the axiom that individuals differ in what they find important. Baker and Intagliata (1982) point to there being as many definitions as the number of people studying the phenomenon, a comment that throws the spotlight on the lack of agreement between those attempting to operationalize the concept. In their view, writers had done little up to that point to achieve definitional consistency. A decade later, Cummins, McCabe, Gullone & Romeo (1994) has echoed this position in observing that not 1 of over 80 quality of life scales identified has achieved a level of acceptance against which other scales can be validated. Szalai (1980) concludes that, when we deal with a developing concept, the lack of uniformity is normal.

> *"... To attribute at first some vaguely circumscribed meaning to it that can be subsequently clarified and specified by more research and reflection".*

Others argue that uniformity in concepts is not per se necessary: QoL and UEQ are a container concept; different theories relate to different aspects of them, the concepts are multi-dimensional. Still other authors claim that it is not really possible to define these multi-dimensional concepts. In continue attempts are made to clarify the definition of QoL and UEQ and also describe some of the theories and conceptual approaches towards each subject.

2.2.1 Definitions

During the past quarter century, a number of scholars operating at the interface of the social sciences and planning and other design professions have argued that quality of any entity has both a subjective dimension as well as an objective reality. Central to this assertion is the meaning of quality of both built environments and natural environments. Much of the literature gives at most only an implicit definition of concepts. Based on the context or the choice of indicators, one has to conclude what meaning has been given to the concepts. Nevertheless, a broad variety of definitions of the concepts of UEQ and QoL was encountered in the literature. Below some representative definitions are presented in Table 2.1.

Definitions in itself are not that interesting, but their implications in terms of underlying theories and hypotheses are extremely important for the discussion about relevant domains, indicators, scale levels and causality.

This research supports the contention that a better understanding of the meaning of UEQ requires systematic study of the interrelationships between objective measures of environmental phenomena and people's responses to them. Furthermore, it suggests that such study can occur within the context of QoL research. This argument begins with a review of quality of life research that acknowledges linkages between objective and subjective measures. Kamp et al.(2003) believes that subjective indicators allow us to gain insight into the well-being/satisfaction of a person, and insight into what people consider important.

Environmental quality	
Lansing and Marans (1969)	'An environment of high quality conveys a sense of well-being and satisfaction to its population through characteristics that may be physical, social or symbolic'
Porteous (1971)	Environmental quality is a complex issue involving subjective perceptions, attitudes and values which vary among groups and individuals
RMB (1996)	Environmental quality is the resultant of the quality of composing parts of a given region but yet more than the sum of parts, it is the perception of a location as a whole. The composing parts (nature, open space, infrastructure, built environment, physical environment amenities and natural resources) each have their own characteristics and partial quality
RIVM (2002)	Environmental quality can be defined as an essential part of the broader concept of 'quality of life', the basic qualities such as health and safety in combination with aspects such as cosiness and attractiveness
Quality-of-life	
Szalai (1980)	Life quality refers to the degree of excellence or satisfactory character of life. A person's existential state, well-being, satisfaction with life is determined on the one hand by exogenous ('objective') facts and factors of his life and on the other hand by the endogenous ('subjective') perception and assessment he has of these facts and factors, of life and of himself
WHO-QOL Group (1993)	An individual's perception of his/her position in life in the context of the culture and value systems in which he/she lives and in relation to his/her goals, expectations, standards and concerns
Diener and Suh (1997)	Life satisfaction
Raphael et al. (1996)	The degree to which a person enjoys the important possibilities of his/her life
Veenhoven (1996)	Happy life expectancy = product score of life expectancy (in years) and the mean 'happiness'
Musschenga (1997)	The good life is a combination of enjoyment: positive mental states (the hedonic component), satisfaction: evaluation of success in realizing a life-plan or personal conception of the good life (the cognitive-evaluative component) and excellence: the virtuousness or value of a person's activities (acetic component)
Cheung (1997)	'The good life' is a combination of: The hedonist good life (life satisfaction, pos./neg. affect; depression) The dialectical good life (mutual interpersonal concern, understanding of others) The humanist good life (the realisation of human potential, self-actualising value, autonomy) The formalist good life (according to what is right: conformity with moral conventions, religious commitment)
RIVM (2000)	Quality of life is the factual material and immaterial equipment of life and its perception characterised by health, living environment and legal and equity, work, family, etc.

Table 2.1 Examples of definitions of Environmental Quality and Quality of Life

They contribute to the commitment of people to their environment, and to the creation of public support. Objective indicators are necessary for aspects of the environment that are hard to evaluate, they form the point of departure for environmental policy and enable the validation of subjective measures. Therefore, the first and obvious step in the formulation of a comprehensive definition is to acknowledge the strengths of each position and to agree that any general definition must include both dimensions. This conclusion has, in fact been endorsed by many previous QoL researchers (Romney, 1994; Raphael, 1996; Kamp I. *et al.*, 2003; Schoch, 2006) and does seem the common-sense view. After all, if QoL is to embrace the totality of human life then both objective and subjective dimensions must surely be included. The following paragraphs, provides more clarification about these two major categories of social indicator.

The first category, and perhaps most commonly employed type of indicator, has sought to evaluate societal well-being by utilizing objective measures of community conditions. Heavy reliance is placed on Census data and other governmental reports to assess the quality of life available to individuals in a given community. Measures of societal conditions in such areas as housing, health, and income are employed to describe the quality of life. Postulating 'consensus' that such conditions are inherent to the definition of the good life and that the direction of change in these conditions can be normatively evaluated (e.g., that higher income is better than lower income), comparisons of the quality of life of communities are made using these objective social indicators (Sheldon and Moore, 1968; Flax, 1972a; Smith, 1973). Conceptually, QoL becomes a function of the objective conditions of the community in which one lives.

On one level the equating of objective conditions and the QoL is of course true. If we agree that less infant mortality, less substandard housing, less unemployment, etc. are desirable objective social conditions, are normatively 'good' for people to experience, and are part of the definition of the QOL, then the distribution of these objective conditions across groups, between geographic units, or over time can be examined and comparisons made indicating improvement or retrogression in the QoL as measured by these specified and observed social conditions. As long as the analysis of the QoL using objective data is kept on this level there would appear to be no real problem. However, there is a strong tendency to use these specific social indicators data to generalize to more global QoL statements and to equate the observed patterns in objectively measured conditions with actual differences in the life experiences of people. The nature of problems caused by this tendency can best be seen in the broadness of the terms 'social well-being' and QoL that are used in social indicators research. Comparisons of welfare between groups of people are being made based on the generated objective social indicators data. Yet it is arguable that actual individual welfare and the QoL actually experienced by people is a much more highly subjective condition than implied by the social indicators research based on the objective data most frequently employed. It is certainly possible that individuals or social groups may be exposed to objectively better conditions of health care, environment, employment, etc. than other individuals or groups but subjectively feel that the quality of their personal life experiences are no better. Despite the often found assumption that objective social indicators data actually reflect the QoL experienced by people, we have no reason to a priori assume that such a correlation exists. The connections between the QoL as measured by objective social indicators and the QoL subjectively experienced by people is really open to question (Campbell and Converse, 1972).

This obvious point has led to the development of the second major class of quality of life measures - 'subjective social indicators'. This type of indicator is based not on the normative evaluation of objective social conditions but on survey research reports about life experiences and subjective evaluations of life conditions made by individuals. Subjective social indicators seek to directly tap the QoL as experienced by people rather than imply a connection between objective social conditions and personal well-being. And, as argued above, despite the implications of much of the work on objective social indicators, there is no a priori reason to believe that these two sets of conditions, i.e., objective life situations and subjective feelings of life quality, vary together. Yet the assumption of such correlations is intuitively appealing and has frequently been made. This in turn has led to confusion in the concept QoL as a tool of comparative research as well as a blurring of the distinction between the physical and psychological aspects of life quality. These ambiguities have produced a need to examine the extent (if any) of the inter-correlations between objective and subjective social indicators – a need that has been recognized by several researchers. For example, Stagner (1970) argues that:

> *Objective indices are limited; inherent factors in (social) situations demand that subjective data… be considered. A set of psychological indicators would focus on the frequency and intensity of satisfaction (or dissatisfaction) with aspects of (life) ....Effective use of these indicators will require that they be analysed in relation to the objective (social indicators) data.*

Andrews and Withey argue that:

> *Only when both (indicators of objective and subjective conditions) are concurrently measured, will it be possible to know how demonstrable changes in living conditions are affecting people's sense of life quality, and conversely whether changes in people's sense of life quality can be attributed to changes in life conditions (Andrews and Withey, 1973).*

Smith (1973) similarly believes that attitudinal measures of life quality should be analysed and compared to the patterns suggested by objective social indicators. It would be at this juncture that social indicators could have their most significant impact on policy. If a set of objective conditions and indicators of those conditions could be identified that are strongly related to feelings of subjective life satisfaction, the significance of that finding for both policy makers as well as scholars is obvious.

Above arguments presents three perspective of QOL:

(a) QoL defined as the quality of one's life conditions, (objective indicators)

(b) QoL of life defined as one's satisfaction with life conditions, (subjective indicators) and

(c) QoL of life defined as a combination of both life conditions and satisfaction (subjective and objective indicators).

Felce and Perry (1995) argue that there is a fourth perspective that has advantages over the first three (p.54):

> *"… similarly depicts quality of life as a combination of life conditions and satisfaction but emphasises the need to take account of personal values, aspirations, and expectations."*

He argued that defining quality of life in terms of life conditions without any subjective interpretation of how the individual perceives and reacts to such conditions, room is left to advance such subjective assessments as personal satisfaction with life as more important. Therefore, from this perspective, defining quality of life as synonymous with personal satisfaction would appear more preferable. However, he continues the argument by rejecting this definition, because reasonable independence and autonomy of action cannot be assumed due to widely different life condition. Finally, he develops the idea of combination of life conditions and satisfaction by believing that the manner of combining subjective assessments across separate life domains to produce an overall appraisal should take account of the importance the individual places on the particular aspect being considered. Such a principle could also be applied to objective assessments: The significance attached to objective life conditions might also take account of the individual's scale of values. This formulation gives rise to a three-factor model in which personal values as well as life conditions and life satisfaction interact to determine quality of life (Fig.2.1). The significance of either the objective or subjective assessment of a particular life domain is interpretable only in relation to the importance the individual places on it. For example, size of income (the objective measure) may contribute little to quality of life for a person whose values are non-materialist, although satisfaction with income (e.g., enough to meet personal needs) might still carry a high weight. This model compared to the third model is more strengthened by giving the capacity to put an individual weighting on how subjective and objective assessments are combined across life domains.

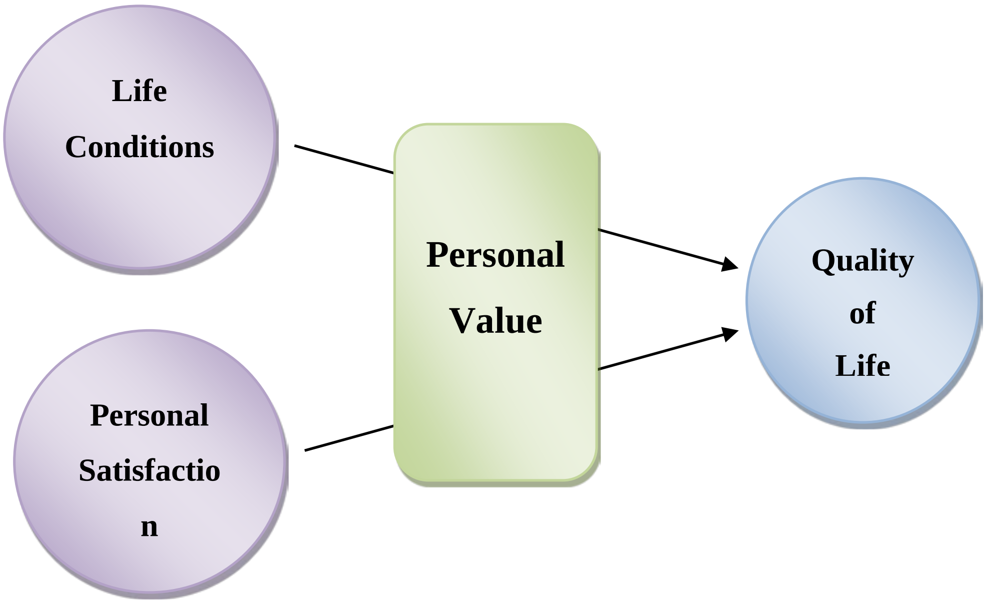


Figure 2.1Quality of Life defined as a combination of Life Conditions and Satisfaction weighted by Scale of Importance

Having discussed the Felce and Perry's (1995) three-element model of quality of life, in this research, quality of life is defined as:

> *"An overall general wellbeing that comprises objective descriptors and subjective evaluations of different categories of wellbeing (e.g. physical, material, social, and emotional...), all weighted by a personal set of values."*

Changes in some objective facet of life may change satisfaction or one's personal values or both. Similarly, changes in values may change satisfaction and precipitate change in some objective circumstance. In the same way, a change in a sense of satisfaction may lead to reappraisal of values and lifestyle. As well as affecting each other, the three elements are capable of changing independently as a result of external influences. Such external influences might include genetic, social, and material inheritance, age and maturation, developmental history, employment, peer influences and reference points, and other social, economic, and political variables.

2.3 Moving from conceptual models to explanatory theory

It is intuitive that QoL may be described by its component parts. These are commonly referred to as 'life domains' and are commonly referenced in the literature (Parmenter *et al.*, 1991; Raphael *et al.*, 1996; Schalock, 1996; Felce, 1997; Schalock and Verdugo, 2002) Two issues regarding these domains are of special interest. The first is how to characterize such domains, and the second is how to use them to measure QOL. In terms of domain characterization, it is clear that their identification must operate according to some fundamental theoretical principle. In the absence of theory, anything goes, and because the number of potential domains is so large, the idiosyncratic opinions of individual researchers might well rule. Second, while some degree of commonality can be found within various domain listings, authors generally fail to provide a testable theoretical justification for their domain selection, including empirical support for the respective domains to represent the QoL construct. Thus, in order to generate the basis for future discussion and advancement the following discussion is about different theories related to welfare and QOL.

During the early part of the 20th century, the dominant idea of human welfare was defined by material well-being (Veenhoven, 1996). Subsequently, economic growth, measured by Gross National Product (GNP), became a proxy for human development. Although economists have often pointed out that it was never intended to be a measure of welfare, politicians have used it in this way, placing huge importance on raising GNP levels as a goal in itself (Levett, 1998; Dasgupta, 2004). This was strongly linked to utilitarian theories of maximising welfare in society through increased access to markets. It is thought that increased societal well-being will follow due to the ability of more people to satisfy individual preferences which will make them happier (Cobb, 2000). This idea of individual preference has been the dominant influence on well-being studies in economic theory for over 100 years (Dolan *et al.*, 2006b). GNP has now become internationally institutionalised, a powerful indicator within which the notion of human development is deeply embedded. The prioritisation of economic growth fuelled by the aspiration to raise GNP underpins western public policy.

However, during the 1960s new theories about the ideological basis and measurement of wellbeing started to emerge:

> *'It was in this period of prosperity, when for the first time doubts were raised in the highly developed western societies about economic growth as the major goal of societal progress. The "social costs" of economic growth and "public poverty" as the other side of the coin of "private affluence" got public attention and received prominence in political discussions. There was increasing doubt whether more should ever equal better, and it became a public claim to prefer quality to quantity. The concept of "quality of life" was born as an alternative to the more and more questionable concept of the affluent society and became the new, but also much more complex and multidimensional goal of societal development'.(Noll, 2000)*

Dissatisfaction with GNP as an indicator for human development grew. L.B. Johnson, US president at the time, picked up on this mood in his 'great society' speeches, and is credited with coining the phrase 'quality of life' in its modern form:

> *'The great society is concerned not with how much, but with how good- not with the quantity of goods but the quality of their lives.' (Johnson, 1964. cited by Noll, 2000)*

This change in how people viewed human development and the resulting attempt to measure it has been termed the 'social indicators movement' or 'quality of life movement' which spread throughout the US and Europe (Michalos, 1997; Cobb, 2000; Rapley, 2003). Promoters of this movement sought to measure this new complex idea of 'quality of life' and to reproduce the success that economic indicators had previously enjoyed in terms of directing policy. Commentators describe a proliferation of social reporting projects and a huge amount of statistical information being gathered in the USA (Gasteyer and Flora, 1999; Cobb, 2000). In Europe, this trend is exemplified by the first Swedish Level of Living Survey in 1965. Responding to the recognition that 'GNP is an insufficient measure of the well-being of citizens' this survey commissioned a study of 'the distribution of welfare in non-monetary terms' using 'objective' indicators like life expectancy, employment and education levels.

In the UK, the annual *Social Trends* report was first published in December 1970 and contained over 200 pages of charts, tables and diagrams intended to measure social as well as economic progress. Muriel Nissel (1995), its first editor, gives an engaging account of its launch at No 10 Downing Street to a rendition of chamber music and massive media coverage. That the report was responding to a widespread public call for change is evident in it being voted runner up for the title of the best new reference book that year. The report for the first time gathered together in one volume a wealth of social statistics, to give a picture of Britain that had not been seen before: it was 'above all concerned with people' (Nissel, 1995).

However, authors reviewing this period of social reporting in the 1960s and 70s record the disappointing impact on policy that this huge amount of social data achieved. Three main reasons for this ineffectiveness are put forward in the literature. Firstly, there was a vain expectation that the more production of data would inform policy and the more data the better. This expectation failed as the bewildering array of indicators and data were not linked to any theoretical or ideological analysis of what quality of life was, what needed to be achieved for whom, and how (Innes, 1990; Cobb, 2000). Accordingly, although there was a growing recognition of the limitations of GNP, it remained the most powerful indicator because it was a single indicator linked to embedded, if flawed, theories of how to create well-being, and it continued to influence and justify policy decisions, which prioritised economic growth. Secondly, a growing realism crept in that measurement of social phenomena was much more complex than at first imagined and researchers became disillusioned with inadequate 'surrogate measures' for public goods like education and health (Nissel, 1995)

Thirdly, the political climate changed in the late 70s and 1980s, as economic difficulties and the rise of right wing neo-liberal ideologies in the Thatcher/Reagan era caused the social indicators movement to falter (Nissel, 1995; Rapley, 2003). This was a low point in social indicator research, and it was during this time when 'conservative ideology with its celebration of the market and the responsibility of individuals' was promoted, that interest in QoL as an individual level construct began (Rapley, 2003)

The term 'quality of life' became re-embedded in the discourses of government at this time but now linked to the rise in the enterprise culture. The concept of quality of life has been deployed in all sorts of public talk since the 1980s: from adverts for double-glazing which will 'improve your quality of life' to healthcare strategies. It has become enmeshed with the creation of 'subjective beings' who can buy/choose from different quality of life options in all areas of life. The idea of QoL was thus not only closely linked with new forms of service provision, but also with a new construction of a person with intellectual impairment, as an enterprising being who can choose services and be responsible for their own care and support.

This construct of individual quality of life provoked a rise of interest in 'subjective social indicators' to measure individual self-reported experience of well-being. In 1983, these subjective indicators were included in the British Social Attitudes Survey, which highlighted the importance of factors like marriage, friends, family life, the weather as well as the already reported jobs, health and housing concerns (Nissel, 1995). These subjective indicators provided new dimensions to the notion of well-being, focused on individual experience and preference.

Social researchers in Scandinavia however, rejected this model. For instance, Erikson and Uusitalo (1987) argued that it should be resources rather than satisfaction or self-assessed needs that should be measured, for through these resources people acquire their own welfare. This means that in the so-called 'Scandinavian Model' thinking focuses on objective indicators of level of living or quality of life of society as a whole, such as employment rates and life expectancy, and rejects measurements of personal satisfaction (Noll, 2000).

So, to summarise, during this period the dominant theory of well-being based on economic growth had been challenged. A proliferation of alternative social forms of measurement reflected new ideas about quality of life as a much more complex concept. However, the profusion of measurement and the lack of theoretical clarity hampered the effectiveness of the social indicators movement to influence policy. Ideas of well-being were influenced by neo liberal discourses, which promoted quality of life as a property of autonomous beings to be enhanced in the market place. In addition, ideological tensions arose between 'objective' measurement and individual subjective evaluation, and between QoL as societal wellbeing and as an 'individual construct'.

In the academic world of political philosophy, new ideas emerged which also challenged utilitarian views of how best to promote human well-being. Utilitarian theories sought to promote policies that improved utility for the greatest number of people in a society. According to critics of utilitarianism, this aggregation of general welfare levels can overlook some glaring inequalities (Sen, 1980; Dasgupta, 2004).. With the growing realisation in the 1960s and 1970s, that rising affluence was leaving some people behind, and concerns about distributive justice rose, these theories were increasingly challenged.

Possibly the most significant challenge to utilitarianism came from political philosopher John Rawls, whose seminal work, 'A Theory of Justice', was published in 1971. This book was highly influential and challenged the basis of utilitarianism by arguing for 'justice as fairness' as opposed to maximising aggregate happiness in society without regard to equity. He rejected 'utility' as the goal of policy but instead proposed the presence of 'primary goods' which are certain inviolable basic rights and freedoms that all individuals in society must be able to exercise and these cannot be compromised in seeking to maximise happiness(Rawls, 1971; Cohen, 1993).

Rawls argued that equality of opportunity to basic rights like free speech and resources like wealth were crucial to enable people to pursue their own good life. However, he recognised that in a complex society inequalities exist and must be mediated and so he also argued that society should be organised so that any inequalities were to the advantage of the worst off (Rawls, 1971). His work was extremely influential in both academic and policy circles. Attendant to his theory are questions of measurement, how would we know who was the least well off in society? Rawls himself considers using the measurement of income related to social groups as one indicator to signify this. He was in the 'objective' indicator camp and believed that the happiness of a society was not measurable, but that his theory of justice, if applied, would increase happiness. He enunciated a liberal notion of well-being, which is to allow people the means by which they can freely choose their own life course but adding some rules in order to create a form of distributive justice.

Rawls's work influenced a new generation of philosophical thought on human well-being developed around theories of equity and justice, Important debates arose around what sort of equity should be promoted: should we aim for equality of welfare (happiness) or for equality of resources? This debate was notably explored by Dworkin (1981; Dworkin, 1981a) who argued that equality of resources should be prioritised over equality of welfare. An important contribution to this field of inquiry was also made by Amartya Sen, an economist, who promoted the concept of 'capabilities' as the basis of human flourishing (1980; Sen, 1993) arguing that equality of resources and equality of welfare are both flawed methods of achieving social justice, His ideas have had wide impact particularly in the development field. This approach was influential in the creation of the Human Development Index (HDI) in 1990, now an internationally recognised and used composite indicator that includes longevity, literacy and education as well as GNP.

The above statements show that the development of a common approach towards QoL has not become consensus among the researchers in this field. This is due to different reasons, first the fact that life condition and satisfaction with life inevitably vary across individuals in all groups in within the society. Second, different definitions and interpretations of the concept has been raised, for example, should it be to aim to increase some aggregate measure of happiness in society or to aim for some form of equity and justice, where all individuals are regarded equally? If the latter, what sort of equality should we promote equality of happiness, resources, or capability? This brief account cannot hope to fully represent the extensive, complex and often highly abstract debates in the literature about the proper focus of well-being measurement. Nevertheless, in continue different domains of QoL will be explained followed by highlighting the importance of urban service in QoL and finally a framework will be set out using the sustainable development concept to narrow down the discussion on urban services and its effects in UEQ.

2.4 Quality of Life Domains

Despite disagreement on the definition of quality of life and approaches towards this concept, there is considerable overlap among researchers on relevant domains for assessment. Felce and Perry (1995) have grouped the majority of aspects mentioned in 15 key literature sources into 5 heading domains and with 33 subheadings (Table 2.2). Also in 2002, Schalock and verdugo offered the same aspects that Felce and Perry did but in eight different domains extracted from 2455 articles (Schalock and Verdugo, 2002)

Physical Wellbeing	Material Wellbeing	Social Wellbeing		Development and Activity	Emotional Wellbeing
		Interpersonal Relationships	Community Involvement		
Health	Finance/Income	Family/ Household life	Activities and Events	Competence/ Independence	Positive Affect
Fitness	Housing Quality	Friend and Social Life	Acceptance and Support	Job	Status/ Respect
Mobility	Privacy	Relatives		Home life /Housework	Satisfaction
Personal Safety	Possessions			Leisure/ Hobbies	Fulfilment
	Meals/Food			Education	Self-esteem
	Stability/ Tenure			Productivity/ Contribution	Faith/ Belief
	Security			Choice and Control	
	Neighbourhood				
	Transport				

Table 2.2 Domains relevant to quality of life

However, to emphasis on urban services possession in life's quality and also to stress the importance of environmental quality in achieving a better QOL, a new classification of different aspects and domains of QoL is mentioned. This classification is based on the location that these aspects can happen or be more effective. First location is the place that a person lives in (home) and spends some of his daily time for sleeping, eating and undertaking other ordinary family life.

The second location is the surrounding environments of the home. This could be in different scales, the neighbourhood, city, region, etc. Another location is the location that the person works.

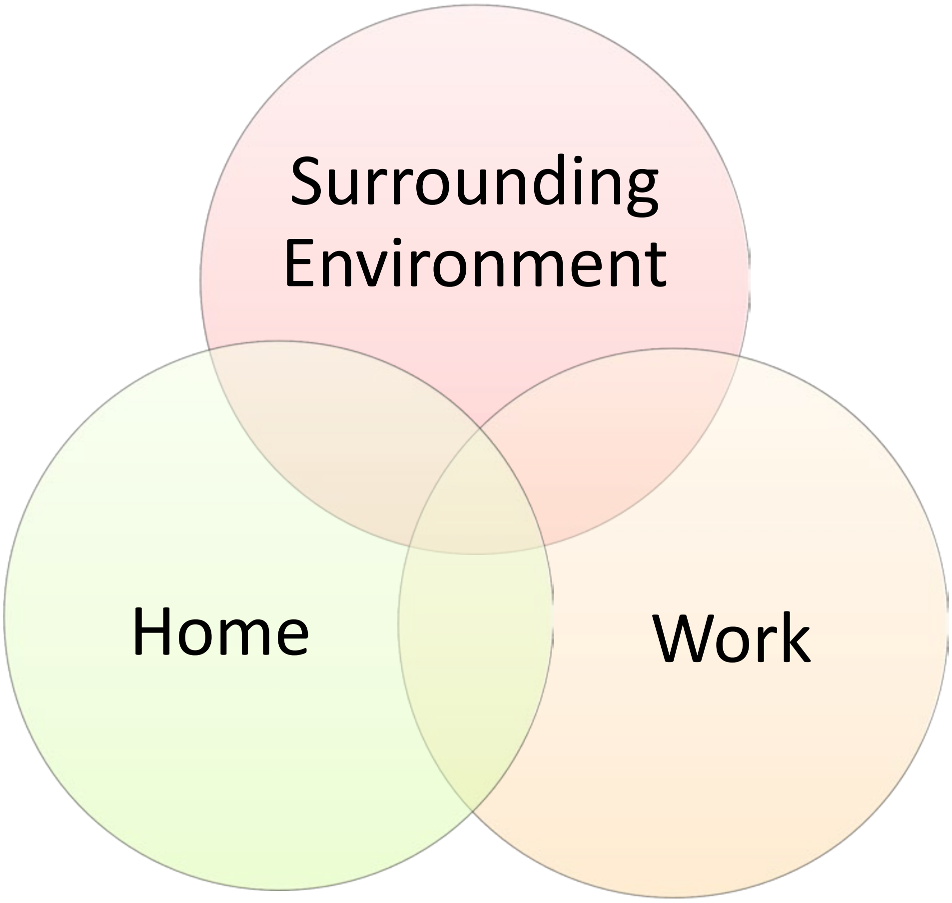


Figure 2.2 QoL domain classifications regarding the location of happening or being more effective of different aspects.

Some of the aspects can take place in all three locations or only two locations and be effectual on life's quality. For example, all the Physical and Emotional wellbeing aspects are influenced by activities in the home, the environment and work place. People's health, fitness, believes, satisfaction, safety, etc. can built up either in their living spaces or the outer environment such as hospital, sport centre, religious places, etc. You can visit your friends and relatives at either your place or a public place such as parks, bars, restaurants, etc. The amount of involvement of each location on these domains depend on different features such as comfort, expenses, distance and accessibility, space or quality... and even the personal characteristic.

The second group of aspect are those that can only take place in one location and do not have the influence of the other location on it, for example, the family household life that takes place at home or the neighbourhood or transports, which only takes place in the environment.

Finally, the last group is consisting of the aspects that, one location has the major effect on them and the other location has a fewer efficacies. For the environmental location, these aspects are finance, job, education, leisure, activities and events, security, housing quality, acceptance and support. For home location, this aspect is food and meal.

From the total aspects mentioned by Felce and Perry ten of the aspects are either entirely effected by the environment or it has the major role on them. From the rest of the aspects, only two of them are related partially or completely to home and the rest are affected by all locations.

However, some may argue that different aspects may have different level of influence on quality of life as total. They may provide statistical analysis showing that the quantity of aspects are not important but it is the total effective rate of each aspect that is important in measuring QOL, which statistically can be true. However, it is the belief of the author that in a real life, statistics don't apply and QoL can be enhanced through sets of aspects although each with a small correlation with QoL as total. This is what it makes one person to be satisfied from his or her life. Moreover in terms of urban planning and city management, the local authority has more direct power to interfere with the environmental quality than the other two locations.

2.5 Conclusion

To summarise, the Felce and Perry classification of different domains of QoL has been redefined using the location that each aspect can happen or be more effected. Through this new classification, five different groups have been illustrious. These groups are aspects that are depended on all locations, aspects that are completely depended on the environment, aspects that are completely depended on home or work, aspects that are more depended on environment and finally aspects that are more depended on home or work. It was concluded that aspect related to environment were much more that aspects related to home or work and the local authority has more power to act to promote the quality of this location. By looking at the environmental aspects the importance of services such as parks, schools, hospitals, religious places, public transportation, etc. will arise. To give this research a suitable framework in the next chapter we will examine the sustainable development approach and the way that it is going to shape this research and finally providing the theoretical framework of this research.

Chapter 3: Urban Services

3.1 Introduction

From late 1970's socio-economist had become a bit more aware, and focused on how development is shifting from manufacturing base to services base. After a long neglect, there was a sudden boom in the scientific research about services. In mature capitalist economics services have become the dominant sector, in terms of both employment and value added. In many developed economies, the proportion of people predominantly employed in service sector is well over 70% of the work force (Akehurst, 2008). Therefore, in the current economy, service industries have come to occupy a very prominent position, although it is not something that has very recently happened. This trend is a product of much larger process of integration of services into economy that goes back to three centuries or more.

On the other hand, service sector is made of a very great diversity of activities, which makes it a very complex phenomenon. Bryson uses the term "Services World" to highlight the importance of service activities as an integral part of the production process (Bryson *et al.*, 2004). Beyond the very general notions of a service sector and of a service society, which erroneously convey the idea of a more or less homogeneous phenomenon, services encompass a highly heterogeneous, evolving, long established and complex phenomenon. Its only consistent characteristics seem to be its diversity and the fact that it never fully fits any definition. Yet, it is a totalising phenomenon, affecting all dimensions of contemporary development: economic, social, political, cultural. (Bryson *et al.*, 2004; Martinelli, 2007).

Therefore, we should not underestimate the role of services in city's economy and its residence quality of life in terms of job opportunities and providing diverse service for them as well as quality and aesthetics of cities environments. In addition, the complexity of this phenomenon makes it crucial to accomplish more research on services sector. In this chapter some of the theoretical literature on services well be explored, different general attributes of services would be extracted from the literature, and finally the targeted service category required for this research will be determined.

3.2 What are services?

Over the past 30 years in order to emphasise the growing importance of services much was made of the inherent characteristics of services (intangibility, heterogeneity, nonstorability, simultaneous and inseparable production and consumption and replication difficulties). It was argued that a service can be “defined by reference to these necessary and sufficient characteristics or conditions” (Akehurst, 1989) although it was not clear how many of these characteristics should be present, whether all or some, and how many of these characteristics should apply to a product in order to be considered to be “a service” (Blois, 1983).

Every definition of 'services' is slippery. For example, does 'services' refer to a set of industries or occupations? Is the secretary who works for an automobile company part of manufacturing, while the secretary who works for a bank part of services? The use of industrial versus occupational definitions is particularly critical given the growth of many 'non-direct' production workers within many manufacturing firms, such as clerical, administrative, research, advertising, and maintenance functions. Clearly, different definitions of 'services' have significantly varying implications for assessments of the size and composition of the service sector. Bell writes:

> *...if an industrial society is defined by the quantity of goods as marking a standard of living, the post-industrial society is marked by the quality of life as measured by the services and amenities -health, education, recreation and the arts -which are now deemed desirable and possible for everyone. The word 'services' disguises different things and in the transformation of industrial to post-industrial society there are several different stages. First ... a necessary expansion of transportation and public utilities as auxiliary service in the movement of goods.... Second, in the mass consumption of goods and the growth of population, there is an increase of distribution, finance, real estate and insurance, the traditional centres of white collar employment. Third, as national incomes rise as in the theorem of Christian Engel ... the proportion of money devoted to food at home begins to drop, and marginal increments are used first for durables and then for luxury items, recreation and the like. Thus a third sector, that of personal services, begins to grow; restaurants, hotels, auto services, travel, entertainments, sports, as people's horizons expand and new wants and tastes develop ... two areas that are fundamental to [the good life] health and education. (Bell, 1973)*

This is the central notion of the service economy in Bell's formulation. As economies 'modernise' and human labour becomes more productive, new demands are generated and the structure of the labour force changes so as to provide for these new demands. As Bell points out, this is the vision implicit in 'Engel's Law' of diminishing marginal expenditure on food with rising income a vision of an established hierarchy of needs, such that as the more basic needs are progressively satisfied by the increasingly productive working population, so new needs arise, and the labour now unnecessary for the production of (relative) necessities is transferred to that of (relative) luxuries. As we gradually have our fill of material goods, so our aspirations turn to the consumption of immaterial services.

This is Bell's explanation of the service economy; 'From Goods to Services', as his chapter title has it, the service worker comes to predominate because of unsatisfied social demands for the consumption of nonmaterial products. Despite this, Bell never directly tells us what a 'service' is; he defines 'service workers' by inclusion, as in such passages as the one quoted above, but he never explicitly describes this attribute of 'service' that they have in common. Of course, it becomes obvious by contrast with the nature of 'goods'; goods are material, permanent, made by people using machines, which are sold or otherwise distributed to people who thereafter may use them at their will. Services, we infer by contrast, are immaterial, impermanent, made by people for people ('post-industrial society is essentially a game between persons') and consumable only at the instant of production. At the moment of its acquisition by the consumer, a good is a thing whereas a service is a state or activity or sensation. Why is it necessary to qualify this statement by confining it to the moment of acquisition? Simply, because even goods eventually supply a service or to put it another way, both goods and services answer needs, and generally the same needs may be met by either goods or services.

Bryson et al. uses the term 'service world' to highlight the importance of services activities as an integral part of the production process, tangible or intangible (The concept of tangible and intangible was first introduced by Shostack, (1977) among others). Bryson et al. writes:

> *"A broad consensus exists that services may be understood as the production and consumption of intangible inputs and outputs and, thus, stands in contrast to manufacturing, the product of which can be 'dropped on one's foot'. What, for example is the output of a lawyer? a teacher? a doctor? It is impossible to measure these outputs accurately and quantitatively, yet they are real nonetheless. To complicate matters, many services generate both tangible and intangible outputs. Consider a fast-food franchise: the output is assuredly tangible, yet it is generally considered a service; the same is true for a computers software firm, in which the output is stored on disks. The fact that it is difficult, if not impossible; to measure output in services has enormous implications for their analysis. If outputs do not differentiate services from manufacturing then what about inputs? All forms of manufacturing as well as services involve inputs of both good and services: an automobile producer must purchase legal services, advertising, banking, and public relations input, just as airlines or securities firms must purchase hardware and equipment to do what they do(Walker, 1985; Coffey and Polese.M;, 1989). Clearly, the lines between services and manufacturing are blurred and no simple definition will suffice (p.18)"*

Recently Lovelock and Gummesson (2004) challenge the validity and continued usefulness of the core paradigm in services management and marketing based on the inherent characteristics of services mentioned earlier. They propose an alternative paradigm based on the premise that marketing exchanges that do not result in a transfer of ownership from seller to buyer are fundamentally different from those that do. Lovelock and Gummesson suggest that services offer benefits through access or temporary possession, instead of ownership, with payments taking the form of rentals or access fees. This rental/access perspective and the notion of services as a means of sharing resources offer a most promising new direction for services research.

However, Gary Akehurst in his work 'What do we really know about services' highlights that The borderline or difference between manufacturing and services has become increasingly blurred and in many ways is out of date and irrelevant but back in the early 1980s it was necessary to draw attention to the appalling lack of knowledge about services and the service sector and that there was a need to almost over-state the case for treating services as different from manufactured products in order to rectify the chronic knowledge and data problem. He continues explaining that it would be a mistake now in an increasingly internationalized economy to continue this over-statement. Foxall (1984) was one of the first to point out that we buy products which have greater or lesser intangibles embedded, surrounding and attached, with a view to obtaining the benefits and satisfactions supplied. Also Greenfield (2002)reminds us:

> *"In my view, an analytical problem lies precisely in the widespread acceptance of the bifurcation of goods and services – so much so as to consider them as discrete entities – the one completely disassociated from the other and being influenced by separate supply and demand forces…. The point I wish to stress here is that the definitionally separate streams of goods and services are intimately related – that they are, in fact, interdependent. More emphatically, no services can be produced without a prior investment in capital goods having been made (p.35)."*

Greenfield goes on (and it is worth quoting him in full):

"A few illustrations may suffice to clarify the argument:

- *The demand for the services of teachers cannot be met without the prior construction of school buildings (allowing for a suitable lag).*
- *The demand for the services of dentists cannot be met without the prior investment in offices and dental equipment.*
- *The demand for auto repair services cannot be met without prior investment in buildings, tools, and other equipment.*
- *The demand for transportation services cannot be met without prior investment in transportation equipment (trains, trucks, planes, cars, etc.)*
- *The demand for a range of services provided by lawyers, architects, engineers, accountants and other business consultants cannot be met without prior investment in specialized educational facilities and currently in computers and associated technology (p.37)."*

What Greenfield is telling us is that the increases and decreases in demand for services will, after time lags, result in corresponding changes in capital goods output and associated employment but not all capital goods output results in an output of services.

Looking at the above statements, complexity of service world is evident. In addition, no consensus can be found in defining services. However, for this research, services are defined as:

> *"The production and consumption of utilities provided by public or private suppliers, tangible or intangible, through temporary access for an improvement in the quality of life of the residents of a community. These services can be from people to people or business (manufacture) to people. The type of the services in a community is based on community's statues in terms of increase or decrease in demands for services and also the flow of capital and investment by the public or the privet sector resulting changes in capital goods out come and also associated employments."*

In continue the reasons of growth in services sector is explained, and evidence are provided to show how services can influence QoL indicators such as income, health, education, employment. Although, these indicators are more socio-economic indicators, certainly environmental indicators (such as parks, green areas and the efficient use of energy, of which public transport is an example) are important in the growth of the use of services.

3.3 The service world and Forces driving the growth of services

Services characterise a branch of socio-economics in their own right and concept. A relevant body of research and literature has been developed, and this has highlighted the multifaceted relevance of the growing share of services activities in contemporary development. However, it is very complicated to keep an accurate track of the full elaboration of the debate.

Fundamentally, the economy in the world is based on some form of production. The process of the production involves utilization of land, labour and raw material. Although, it looks a very simple process, as production develops, complexity increases. This comes with development of a division of labour that is rapidly transformed into a spatial division of labour whereby the production process is constantly subdivided into smaller activities that are distributed geographically as a complex network mosaic of production functions that span the global(Bryson *et al.*, 2004).

There can be no question that the developed market economies have experienced significant structural changes that have transformed their economies. Two related processes have been at work: structural change in the economy and alterations in the way individuals experience work. Broadly, these are readily identifiable transformations, but attempts to explain and theorise them have produced considerable confusion. Urry (1987) argues that the literature that explores these structural changes suffers from a fundamental ambiguity concerning the very notion of ‘services'. This confusion is at the heart of the debate into the nature and extent of structural changes being experienced by developed market economies.

The word, service, is used in three distinct ways: services industries consist of enterprises in which the final commodity (service or product) is in some ways intangible or immaterial, and ‘which-contains a labour force made of both services and non-service occupations' (Urry, 1987); service occupations are forms of work that are not directly, but may be indirectly, involved in producing physical products; and service functions are the uses that customers/clients obtain from consuming the products of both service and non-service industries. Understanding structural change thus requires an awareness of the forces that are driving growth in the number of service enterprises and creating new forms of what are essentially, services occupations.

Why have service activities been growing so rapidly? Bryson (2004) suggested six reasons that incorporate a mix of historical and contemporary factors in services growth. In following more explanations are provided for each reason.

3.3.1 Rising per capita incomes

Rising per capita incomes, particularly in the industrialised world, have contributed markedly to rising services employment (Ginzberg and Vojta, 1981). The demand for many services is income-elastic; that is, increases in real personal income tend to generate proportionately-larger increases in the demand for services (in contrast to most manufactured goods). Services with particularly high income-elasticises include entertainment and transportation, which largely explains why tourism is the largest industry in the world today. In the 1990s, US households, for the first time in their history, spent slightly more on services' (51 % of disposable income) than they did on durable and non-durable goods combined. An important reason contributing to this growth is the increasing value of time that accompanies rises in income (especially where there are two or more income earners per family), As the value of time climbs relative to other commodities, consumers generally will attempt to minimise the time inputs needed for the accomplishment of many ordinary tasks. While this phenomenon also explains the demand for goods such as washing machines, dishwashers or motor vehicles, it is especially important for the growth of services. The explosion in the number of fast-food restaurants, for example, has little to do with the quality of the food (or even the price), but much to do with the effort by consumers to minimise cooking at home. Similarly, the expansion of repair services reflects both increasingly sophisticated technologies (e.g. in automobiles or televisions) and a generalised unwillingness to spend limited recreation time undertaking such chores. Thus, the increasing value attached to individuals' time or to that of a family has led to a progressive externalisation of household functions; tasks which used to be performed within the home become commodities purchased through the market for a profit.

3.3.2 Demand for health and educational services

Second, rising levels of demand for health and educational services are an important part of the broader growth of the service economy. The provision and consumption of health care has increased steadily, linked in large part to the changing demographic composition of the populations of industrialised nations. The most rapidly growing age groups today are the middle aged and elderly, precisely those demographic segments that require relatively high per capita levels of medical care. Higher life expectancies and soaring costs of medical care have added to the costs of this sector. Consequently, medical services as a proportion of GNP have increased steadily throughout Europe, North America and Japan, often leading to political and economic conflicts about how to contain them. Similarly, a changing labour market and increasing demand for more skills (particularly literacy, numeracy and computer skills) at the workplace have driven an increasing requirement for educational services at all levels, a process reflected in higher enrolments in universities, which have become prerequisites for recruitment to many types of job.

3.3.3 Division of labour

The growth of services reflects the increasing complexity of the division of labour. Statistically, this process is manifest in a rising proportion of non-direct production workers, including firms in the manufacturing sector. Virtually all corporations today devote considerable resources to dealing with a complex marketplace and legal environment, including many specialised clients, complex tax codes, environmental and labour restrictions, international competition, sophisticated financial markets, and real estate purchases and sales. Deregulation the lifting of state controls on many industries has increased the uncertainty faced by many firms, and has had significant impacts on the profitability, industrial organisation, and spatial structure of numerous sectors. To negotiate these environmental complexities, firms require administrative bureaucracies to collect and process vast quantities of information and to make strategic decisions; clerical workers to assist with mountains of paperwork; researchers to study market demand and create new products; advertisers and sales people to market their output; and legions of people engaged in public relations, accountancy, legal work and financial experts to assist in an enormously complicated decision-making environment. Similarly, the introduction of sophisticated machinery requires skilled maintenance and repair staff, while office buildings or industrial plants require security and building maintenance staff all non-direct production workers, and all services. Unlike income-based or demographic arguments, this approach has the added appeal of explaining the growth in producer services, the most rapidly growing part of the economy of most developed countries.

3.3.4 Size and role of the public sector

A fourth reason underpinning the growth of services is the increasing size and role of the public sector and concomitant expansions in government employment. Despite the oft-repeated insistence that capitalism is confined to market relations, the state is, in fact, a major actor shaping markets, building infrastructure, controlling the money supply, subsidizing firms, negotiating trade and framing the broader legal and institutional context for economic activity. Governments contribute to the growth of services in two ways. First, government employment has, itself, increased steadily, especially since the 1930s, because the public demands the services that governments provide. It may be, as conservatives often insist, that governments are inherently inefficient at providing these services, which may be more effectively provided through the private sector (i.e. with fewer workers per unit of output). This is the rationale behind the move by some governments towards privatization of the services that they provide. Whether true or not, this is not the issue; efficient or not, government employment has increased steadily. A second way in which government contributes to the growth of services is indirectly through a labyrinthine web of laws, rules, restrictions and regulations. This, in turn, has contributed to the growth of tax attorneys, accountants, consultants and other specialists that assist firms (externally or internally) in negotiating with the legal environment.

3.3.5 Expansion of trade in services

A fifth reason for the growth of services is the rising level of service exports and imports within and among nations. A widespread myth exists that services, by necessity, cater to local demand, i.e. they are non-basic activities and are, thus, of secondary importance to manufacturing. Many cities, regions and nations derive a substantial portion of their aggregate revenues from the sale of services to clients located elsewhere. Many urban areas export services to clients located elsewhere in the same nation (Beyers and Alvine, 1985; Stabler and Howe, 1988; Geo, 1990). Even declining manufacturing regions export services (Harrington and Lombard, 1989). And major cities such as London, New York, Frankfurt, etc, export some services internationally.

3.3.6 Externalisation/outsourcing of service functions

A sixth explanation for the growth of services concerns the externalization of many functions as large, previously vertically integrated firms began to 'down size' in the 1980s and 1990s in response to mounting international" competition. As a result, the amount and degree of subcontracting grew explosively. While the incentive to engage in this transformation lay in the pressing need to reduce costs and enhance productivity, it was enabled by the technologies of the microelectronics revolution. In the context of emerging post-Fordist capitalism, the automation of the office beginning in the 1970s initiated a steady series of technological innovations springing forth from the microelectronics revolution that fundamentally reshaped the nature of office work and many non-office types of services. Mainframe computers and batch processing initiated a wave of capital intensification that accelerated in the 1980s with the introduction of microcomputers into the workplace, making services major purchasers of flexible production technologies and far more capital intensive than they used to be (Quinn *et al.*, 1987). One common stereotype of services is that they are uniformly labour intensive: wages in service industries typically comprise 70-90 per cent of total costs (compared to 10-50% in manufacturing industries), largely because many service jobs are difficult to automate and involve variations in tasks.

This process witnessed the growth of many producer service firms that primarily offer expertise, reflecting the growing technological and administrative complexity of the workplace (Scott, 1983; Wood, 1991).As a result of externalisation, many functions formerly performed in-house by manufacturing firms are subcontracted to small suppliers, some of which are in the service sector. Subcontracting and externalisation are often studied in the context of manufacturing firms, but have also become increasingly common among large service firms, which often face similar competitive pressures to reduce costs (Storper and Christopherson, 1987). Sub-contracting is now extensively used in agriculture in developed countries e.g. in harvesting crops.

3.3.7 Efficient use of resources and energy

Rapid population growth is followed with an increase in growing dependence of energy resources. Many environmental problems, such as rising levels of atmospheric carbon dioxide, global warming, and pollution, are aggravated by the population expansion and inefficient use of energy. A vast variety of research and data have been developed and conducted in the past few years all emphasising and illustrating this issue. Spatial concentration of energy use has been suggested as a way to use energy more efficiently. This way of thinking was very much helpful in the growth of public services. Services such as educational and health centres, parks, public transport, banks, post offices, etc were developed in order to have beneficial use of manpower, time, energy, land and space in addition to decreasing the rate of carbon dioxide and other pollutions in the atmosphere.

By looking at these seven forces that helped the growth of services, a better understanding of the relation of services role and its development in the form of improving life condition in a community, can be extracted. However, reviewing the literature reveals that service started to join the regional and city development phase through its influence on economy rather than on society or environment. Below this will be argued in details with related theories.

3.4 Services and its influence on countries economic

As job creation in Europe and North America shifted from agriculture to manufacturing during the latter half of the 19th and first half of the 20th century, since 1950 it has shifted even more dramatically from manufacturing to services in the most economically advanced nations and to a lesser extent even in developing countries. Over the past half century, the share of employment in agriculture worldwide has declined steadily from 67% in 1950 to 34% in 2008 as shown in Figure 3.1. Meanwhile employment in the industrial sector expanded its share of employment from 15% in 1950 to 20% in 1990, reaching 23% in 2008. The service sector, in contrast, has grown steadily in share of jobs since 1950, when it accounted for 18% of total employment globally, growing to 31% in 1990 and reaching 43% in 2008. In the US, employment in the service sector rose from 53% of total jobs in 1956 to 70% in 1977 and 81% in 2009, accounting for virtually all

U.S. job growth since 1972. Services now are the source of 77% of all jobs in the U.K. and France, 71% for all OECD countries, 69% in EU, 69% in Japan and Korea, 33% in China, and 31% in India. Services also account for 77% of GDP in U.S., 73% in EU, 70% in OECD countries and 68% globally.

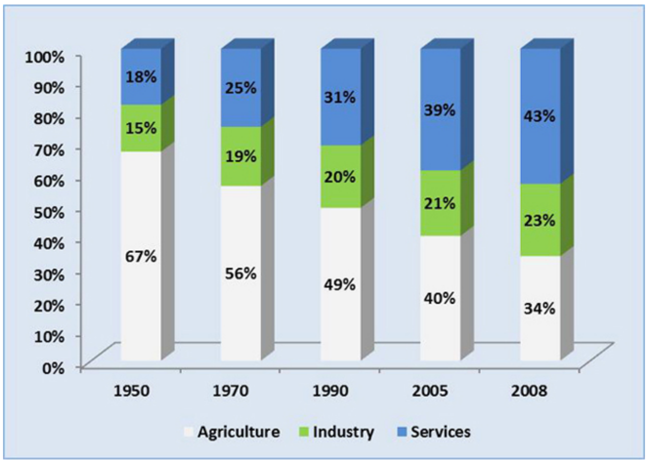


Figure 3.1 The growth of employment in service sector from 1950 until 2008

OECD Stats Extracts. Available online: http://stats.oecd.org/Index.aspx (accessed on 16Feb 2010).
Source: Services and Global Competitiveness: Growth Opportunities for Developing Economies; IBM Governmental Programs: Armonk, NY, USA, October 2006; pp. 2, 4.
Global Employment Trends: January 2009: International Labour Office: Geneva.

The worldwide distribution of economic wealth is strongly correlated with employment by sector. Those economies with the largest share of total employment in services also have the highest gross domestic products (GDP) per capita. As a general rule, the poorest economies also have the highest share of their total employment in agriculture.

Although employment in services is still low in most transition and developing economies, it should not be inferred that it is unimportant. The International Labour Organization (ILO) statistics are based on estimation of employment in the formal sector but in many of these countries the informal economy cannot be overlooked (Figure 3.2). This is the system of exchange that is outside state -controlled or money-based economic activities. It is a pervasive and persistent economic feature of most developing economies, contributing significantly to employment creation, production, and income generation. Many of the activities forming part of the informal economy are, in fact, service-related, such as barter, mutual self-help, street trading and other similar activities. In developing countries these activities account for between 20 and 80 percent of non-agricultural employment. There are nine African countries (such as Cameroon: Gambia; Ghana-arid 'Kenya) with more than 50 percent of total employment in the informal sector; there are seven in Latin America (such as Brazil, Paraguay and Peru), and one in Asia (Pakistan). In terms of its contribution to GDP, the informal sector accounts for between 25 and 40 percent of annual output in developing countries in Asia and Africa so that, in practice, most of the world's population participate in their local informal service economies.

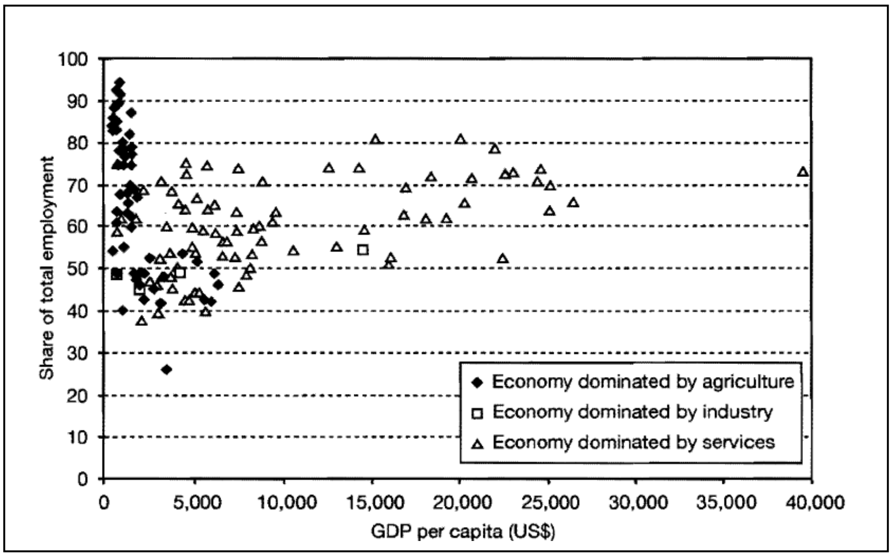


Figure 3.2 Relationship between share of employment by sector and GDP per capita, various world countries, 2009
Source: Service World; People, Organisations technologies by Bryson J. et al 2004 Page 11

Certainly, by looking at data related to service employment growth and its relationship in increasing the GDP of the country, the importance of services become even more highlighted, and this makes research on this topic very important.

3.5 Typology of services

By looking at some of services development literature, service sector can be disaggregated into consumer and producer segments. Examples of the consumer segment is the work of Gershuny and Examples of the self-service hypothesis and producer segment is the post-industrial model, three sector model and progressive and non-progressive services model. In practice, of course, the two are interdependent and some of the preceding discussion suggests that the relationship is not only dynamic and ever-shifting but also begs questions about whether economies at the start of the twenty-first century are service-driven, manufacturing-driven, or a combination of these. Therefore, rather than utilising the sorts of typology of services, it may be useful to think about a scheme that is built around the experience. The question is: what does the production or consumption of a service involve for the supplier or the user? This spans both the tangible and intangible aspects of a service that may arise from goods only, a service only or combined goods/service activity. A possible schema is suggested by Bryson et.al (2004), along with some examples (Table3.1). He believes however that, as with other typologies of services, it is not very difficult to find examples that do not fit easily into the scheme. The point here is that the suggested typology may be appropriate in the context of a service world and the way of viewing the role of service activities in that world.

This typology is of course only indicative. It is also the case that the activities used to illustrate each 'experience' are not necessarily exclusive to one category. The point about this is that there are many different types of services and each performs a different function that contributes either to the reproduction of the labour force, for example schools and hospitals, or the capitalist production system. The diversity of service types and functions makes this sector an interesting one to research as each service type has its own, sometimes very distinctive, geography as well as socio-economic dynamics in that the conditions and types of employment differ between sectors (Bryson et. al., 2004)

Core service experience	Commentary
Creative	Incorporate, represent or present ideas that are used to shape production, encourage consumption or interpret culture, identity, etc. (advertising services, design services, art galleries, museums, theatres, film production)
Enabling	Many services act as intermediaries in the sense that they enable other tasks or objectives (telecommunications services, public transport facilities, executive search consultants, employment agencies, contract lawyers)
Experiential	Requires presence of the customer or user who expects to experience something tangible or intangible (ballet or opera performance, massage, haircut, cordon bleu meal at a restaurant, visit to a theme park)
Extending	Tasks intended to extend product life, to maintain reliability, to encourage customer loyalty and repeat transactions (full replacement warranties for specified times or levels of use, other after-sales services, consumer satisfaction services, installation and updating services, 'health' checks (people. equipment, products such as certain personal financial services) and follow-on advice)
Entrusted	Undertaken on behalf of customers or clients at their request or as part of a contractual arrangement, usually without the need for the customer to be present (car servicing, watch or camera repair, financial portfolio management, return-to-base warranties)
Information	Decision-making on a wide range of personal and corporate matters is facilitated by access to information; some is freely available, some can be accessed for a fee, some is privileged (news agencies, data mining services, real estate agents, stockbrokers, travel agents, Internet search engines, electronic data base services, broadcasting)
Innovation	Highly dynamic and rapidly changing as yesterday's innovations are replaced by today's innovations (digital interactive sports services, shopping and related services via television, WAP mobile telephone services, research and development services)
Problem solving	Individuals and firms are constantly confronted with financial, management, restructuring, staffing, infrastructure and many other problems. Specialists are often used to address these (management consultants, tax consultants, marriage counselling, Citizens Advice Bureau, IT consultants, engineering and planning consultants)

Quality of life	Services that reflect availability of increased leisure time, opportunities to counteract illness, or threats to things such as the environment (adult education services, health services, sports and recreation services, tourism services, waste disposal services, security services)
Regulation	Much of the economy (and indeed society) operates within a framework of rules and regulations that apply at all levels ranging from the local to the global (police services, patent agents, legal services, planning services, environmental services)

Table 3.1 A typology of services in the twenty-first-century economy

Source: John R. Bryson (2004) in "Service Worlds: People, Organizations, Technologies" PP.33

Since this research is about how services can increase the quality of life of a community and how it can promote sustainable development, therefore, this research looks at the core services experience of quality of life as Bryson typology of services or as Daniel bell's government services group (services that are not for personal nor business reasons as mentioned before). Seven urban services is selected for Shiraz case study, these services are:

- Parks and forest
- Schools
- Public transportation
- Health and Medical Centres
- Post office
- Local shopping centre
- Security centres

Thus, whenever the term service is mentioned in this research, it is related to services mentioned above that are provided directly or indirectly (through the private sector) from the government to the community to enhance the quality of life and promote sustainable development. It is also essential to emphasise that in this research, services that are being discussed are assumed to be sustainable themselves in terms of standard utilities, eco related themes, management and other required parts that it are essential to run these services.

3.6 Importance of Community Resources on Residents QoL

Landscape and Urban Planning has served as a key source of insights regarding the importance of the natural environment in human QoL. With the world ever more urbanized, a focus on meeting human needs in the urban context is vital. With urbanization evermore threatening the availability of urban services, a focus on the vital role that these services plays in human well-being is urgent. As mentioned before, the themes that emerge from this analysis provide important mandates for city planning, landscape design, and environmental decision making. These themes are central to a very important aspect of what Landscape and Urban Planning has been about.

Implicit in the provision of public amenities such as parks, recreational facilities and social and cultural services, is a belief that they are beneficial to residents' well-being. They provide venues for health-promoting activity as well as informal meeting-places, outside home and work, where social relationships can be formed and maintained (Baum, 1999; Warin et al., 2000; Oldenburg, 1997). Material and social deprivation encompasses a lack of access to material goods, facilities and amenities and/or a lack of access to the customs, activities and relationships of an ordinary social life (Townsend, 1987). Characteristics of the material and social landscape vary by area of residence and may or may not be associated with an individual's access to personal material and social resources.

Macintyre et al. (1993) drew attention to the impacts of socioeconomic forces on the environment and the interactive effect between the material resources in particular places and the accepted routines of daily life.

As opportunity structures vary across different localities, so too do residents' perceptions of their neighbourhood, their satisfaction with the social and physical attribute of place and the nature of the social relations that occur in different places (Macintyre et al., 1993). People's feelings about residential housing, and the market value of housing, are affected by proximity to valued public amenities.

Mapping the physical manifestations of opportunity structures across urban environments enables contextual effects of place to be measured and also provides a way to the geographical location of most public resources is determined by resource allocation decisions based on local body conventions, equity and efficiency considerations, and lobbying. From a policy and planning perspective, the spatial distribution of public services and facilities is one area where social inequities can be mitigated or at least offset by compensatory distribution. Badcock describes the net effect of changing public transport routes as to "quietly redistribute real income according to where households live and work within urban systems" (Badcock, 1984, p. 233). Access or lack of access to such environments and facilities could potentially have greater impact on the health and well-being of residents in low socioeconomic neighbourhoods compared with higher socioeconomic neighbourhoods because of cost and mobility barriers to the use of private or non-local services and facilities (Talen, 1998).

A number of locality-based studies, both quantitative and qualitative, have contributed to an understanding of the relationship between community infrastructure and health (Halpern, 1995, Dalgard and Tambs, 1997; Sampson et al., 1999). Various pathways have been suggested for this relationship including enhanced opportunities for physical activity associated with access and satisfaction with parks and recreational facilities (Sharp et al., 1999; MacDougall et al., 1997), the direct health effect of close proximity to amenities such as health services and public transport (Dalgard and Tambs, 1997; Taylor et al., 1997) and the opportunities community amenities provide for social connections (Warin et al., 2000). Residents' perceptions of their local environment and self-reported health also varied systematically across the neighbourhoods, with more positive neighbourhood perceptions and better health reported by residents in the more socially advantaged areas (Sooman and Macintyre, 1995). The importance of residential area characteristics for the health of local people was also apparent in an 11-year follow-up from the Alameda County study (Yen and Kaplan, 1999). Mortality risks were significantly higher in neighbourhoods rated low on a social environment scale, after taking account of a range of individual-level socioeconomic and health status variables.

Understanding the factors and forces that contribute to the isolation and hardship faced by groups of people living in particular places is recognised as a major challenge for urban planning: exclusion from the customs, activities and relationships of an ordinary social life (Townsend, 1987) can be improved or exacerbated by spatial planning (Turok et al., 1999; Barton, 1998). In addition to disadvantage and social exclusion relating to personal education, income and employment histories, groups of people can be excluded from access to public spaces or consumer goods and services as a consequence of the investment decisions of public and private agencies.

Development of the Community Resources Accessibility Index (CRAI) responds to calls for the inclusion of measures of the physical environment, access to services and the social environment in area-level indices (Noble et al., 1999; cited in Kearns et al., 2000). For households with limited mobility and personal resources, the availability and quality of local services, facilities and amenities is likely to be of heightened importance. As noted by Kearns et al. the

> *"Quality of the local environment, incorporating aspects of amenity, appearance and services and facilities, not only has a direct impact upon the ease or difficulty of daily living, but also affects community morale and the quality of local social interaction in the context of that environment…This domain is the most significant absence from an index of area disadvantage (Kearns et al., 2000, p. 1554)."*

This is not to say that no work has been undertaken in this area. In the 1980s, location-allocation models were developed to determine the optimal location of services, such as health services (Ayeni et al., 1987; McLafferty and Broe, 1990; Askew, 1983) and libraries (Cole and Gatrell, 1986). Advances in GIS have prompted a number of investigations into the contributions such systems can make to community and resources planning (Bullen et al., 1996; Gatrell and Bailey, 1996). Analyses of accessibility to local amenities are now available to an extent that was not previously possible, incorporating a diverse array of facility data and using network models (such as roads and public transport routes) to determine accessibility. Studies of accessibility to primary health care services in Britain, based on estimations of network distances and travel times, provide important examples of utilization of new technologies (Lovett et al., 2000; Parker and Campbell, 1998).

Accessibility refers to locational access by parents/caregivers of young children to commonly available services, facilities or amenities to meet the functional, social, educational, health and recreational needs of parents and children.

The quality of a community resource will almost certainly influence its use; however, for most of the resources included in the index, quality measures were either unavailable or to ascertain a quality measure was beyond the scope of the study.

Community resource provision reflects the regional, suburban and neighbourhood nature of various services, facilities and amenities. For example, in an urban area, parks and primary schools are perceived as 'local' or neighbourhood amenities; whereas a hospital is perceived as a regional service. In general, people would expect to travel further to a regional than a local resource. To account for the varying spatial scales of service and amenity provision, community resource accessibility should be defined in different scale, however, the distances should be consistent with the range of distances used by local government for access to local neighbourhood resources.

Valuing changes in access to and the quality of services has long been the domain of resource economists (see (Bockstael *et al.*, 1991; Braden and Kolstad., 1991; Freeman, 1993)). The notion of accessibility and the efficient allocation of services that has merged from the economic theory is a powerful idea. Economist have devised and refined methods for measuring the value of having access to services. Measurement is an essential part of the approach because it allows the idea of efficiency and equity to be applied to an array of services and it serves as the basis for decisions that can improve services allocation and increases neighbourhood environmental quality (Haab and McConnell, 2002). To meet the demands for measurements, economists have devised a variety of empirical tools for estimating the benefits and costs of public goods. These tools are typically called valuation methods. There are different methods to be used for valuing services as a non-market good. In the following pages a description of the urban services used in this study and their role as a community resources in quality of the urban neighbourhood is provided.

3.6.1 Parks and Green Space

Parks, country parks, landscaped, open space and generally green open spaces provide an important contribution to QoL. Such spaces act as peaceful retreats from the city, recreational resources, attractive backdrops to urban development, safe and exciting play areas for children and reserves for urban wildlife. Increasing empirical evidence indicates that the presence of natural areas contributes to the quality of life in many ways. Parks reflects a variety of ways in which humans can incorporated natural elements, and qualities of nature, including views of such settings and/or experiences with them terms of concerns such as emotional, mental, and physical health, as well as the sense of satisfaction with and liveability of one's social and physical environment. The broad range of ways in which contact with nature contributes to improved quality of life, even if the encounter is only a brief opportunity to escape the urban bustle, relax, and possibly contemplate or enjoy the time in nature (Chiesura, 2004; Jim and Chen, 2006a; Oguz, 2000; Ozguner and Kendle, 2006). Urban parks and open green spaces are of a strategic importance for the quality of life of our increasingly urbanized society.

Urban parks and open green spaces are of a strategic importance for the quality of life of our increasingly urbanized society. Increasing empirical evidence, in fact, indicates that the presence of natural assets (i.e. urban parks and forests, green belts) and components (i.e. trees, water) in urban contexts contributes to the quality of life in many ways. Besides important environmental services such as air and water purification, wind and noise filtering, or microclimate stabilization, natural areas provide social and psychological services, which are of crucial significance for the liveability of modern cities and the well-being of urban dwellers. A park experience may reduce stress (Ulrich, 1981), enhance contemplativeness, rejuvenate the city dweller, and provide a sense of peacefulness and tranquillity (Kaplan, 1983). The hypothesis about the restorative function of natural environments has been tested in many empirical studies. Ulrich (1984), for example, founded that hospital patients who could look out on trees and nature from their windows recovered more quickly than those whose views where restricted to buildings. Later studies have led to similar results, strengthening the assumption that natural environments have a positive influence on psychological and mental health. Contemporary research on the use of urban parks and forests, for example, verifies beliefs about stress-reduction benefits and mental health (Hartig *et al.*, 1991; Conway, 2000). In a survey among park's visitors a significant relation was found between use of the parks and perceived state of health: those who used local parks frequently were more likely to report good health than those who did not (Godbey *et al.*, 1992). Schroeder (1991) has shown that natural environments with vegetation and water induce relaxed and less stressful states in observers compared with urban scenes with no vegetation. Beside aesthetic, psychological and health benefits, natural features in cities can have other social benefits. Nature can encourage the use of outdoor spaces, increases social integration and interaction among neighbours'(Coley *et al.*, 1997). The presence of trees and grass in outdoors common spaces may promote the development of social ties (Kuo *et al.*, 1998). Kuo et al. (1998) also found out that greenery helps people to relax and renew, reducing aggression. Natural environments can also be seen as a domain of active experience providing a sense of challenge, privacy and intimacy, aesthetic and historical continuity. Beside the social and psychological benefits mentioned above, the functions of urban nature can provide economic benefits for both municipalities and citizens. Air purification by trees, for example, can lead to reduced costs of pollution reduction and prevention measures. Furthermore, aesthetic, historical and recreational values of urban parks increase the attractiveness of the city and promote it as tourist destination, thus generating employment and revenues. Furthermore, natural elements such as trees or water increase property values, and therefore tax revenues as well (Tagtow, 1990; Luttik, 2000). Beside positive effects, parks may play a negative role on people's perceptions. Some surveys have reported residents' feelings of insecurity associated with vandalism, and fear of crime in deserted places (Melbourne Parks, 1983; Grahn, 1985; Bixler and Floyd, 1997). However, far larger is the empirical evidence of the positive functions of green areas; a study by Kuo and Sullivan (2001) even shows that residents living in "greener" surroundings report a lower level of fear, fewer incivilities, and less aggressive and violent behaviour.

Chiesura's (2004) work confirmed that the experience of nature in urban environment is source of positive feelings and beneficial services, which fulfil important immaterial and non-consumptive human needs.

Many research has been conducted to value urban green space, for example the work of Bullock (2008) on valuing urban green space using choice modelling approach that concluded that small local parks quality is enhanced by the presence of play facilities and by attributes such as 'a mix of quiet and more busy areas'. For larger parks, an 'adventure play park' and ample walking and seating facilities attract the highest coefficient values. He also found that large size green spaces attract positive coefficients. Kong et.al (2007) found that Hedonic Pricing model can be employed to quantify monetary value of environmental amenities such as green spaces in China. Results from that research revealed that proximity to urban green space amenities has positive impact on house price and highlighted the preferences of homeowners in Jinan City. In addition, among the three indicators of the existence of views of a park or a public garden, the distance from the dwelling to its nearest green area, and the size of that open space, that Morancho (2003) used in evaluating the urban green areas using the hedonic approach, only the distance from a green area is statistically significant.

3.6.2 Schools

Schools as centres of learning are closely linked with communities. They employ residents, and they connect neighbours with one another. Schools have access to a numerous of local resources including funding, land, and political concerns. Given the central role that schools play in communities, community development practitioners are beginning to consciously include them in neighbourhood building and economic development efforts. As place-based institutions, they are part of a neighbourhood's physical fabric, impacting local housing markets and influencing the aesthetic character of a community. It is well known that the quality of the local public school system is a crucial determinant of the demand for housing in a neighbourhood. Any change in the perceived quality of the local public school system is likely to have an important impact on housing demand and therefore housing prices in an area. The relation between school quality and house prices is especially salient when school district realignments are considered. One of the most important causes for realignment has been the ongoing attempt to racially integrate the public schools. Another cause for realignment is a change in demographics, as the number of school children and their geographical distribution within a city vary over time.

Public schools can play a valuable role in sustainable development efforts. Infill strategies can be employed to curb what smart growth advocates have termed “school sprawl” the trend to build new schools in outlying areas that are disconnected from existing neighbourhoods. It is a common saying that individuals’ attitudes are strongly influenced by their school days. Burgess et. al (2005) studied the extend of ethnic segregation experienced by children across secondary schools and neighbourhoods. They found that relative degree of segregation is analysed and it is shown that high population density is associated with high relative school segregation. One interpretation of this is that greater density allows greater choice of school and that this in turn is associated with greater segregation.

Quantity and quality of schools can lead to an uneven distribution of minority groups across neighbourhoods and result in segregation of that group (Massey and Denton, 1988, Duncan and Duncan, 1955). Therefore, neighbourhood effects do have a significant impact on segregation. Rivkin (2000) investigated the equality of educational opportunity and the availability of schools in neighbourhoods and he found that raising the accessibility of schools has more impact on their outcomes than reallocating students across schools. Frankenberg et al. (2003) identify three areas where accessibility to school in a neighbourhood can affect the quality of young adults’ life. He believes it can enhanced learning, higher educational and occupational aspirations, and positive social interaction among members of different racial and ethnic backgrounds. The segregation of students by socio-economics status, race or ethnicity raises concerns about the extent of equality of opportunity in our society. These concerns may be increasing in importance, as a number of studies have documented growing levels of segregation in American public schools, e.g. Clotfelter, Ladd and Vigdor (2003), Reardon and Yun (2003), and Frankenburg and Lee (2002). More generally, the impact of school on social segregation and interaction between different ethnic groups has certainly been identified as cause for concern.

Additionally, the pressing demand for new school facilities, especially in the inner city, makes a school a desirable candidate for the redevelopment of a brownfield or other underutilized site. Also schools can be promoted to share use of facilities between schools and other community services such as library, parks. This offers an effective solution in urban areas where land for other community facilities is not readily available. One joint-use strategy that has received considerable attention is the use of public schools as community centres. Often referred to as the “schools-as-canters-of-the-community” concept, the idea is to create new public service facilities, such as a health clinic, gym, or senior centre on a school site. The concept also promotes the use of existing school facilities for community activities during off-school hours.

There is a lot of subjective evidence to suggest that parents are prepared to move house to try to secure admission to a good school, and that they are prepared to pay a high premium on property prices. Good schools are typically in neighbourhoods that are better in other ways: lower crime rates, quieter neighbours, cleaner streets, better local amenities. But some component of any premium paid for a re-location from a bad-school neighbourhood to a good-school neighbourhood may well be attributable to the price of an improvement in school quality.

Again for valuing schools, scholars have mainly used hedonic pricing approach. For example the first empirical evidence for the UK primary schools on property price by Gibbons and Machin (2002) shows that a one percentage point increase in the neighbourhood-proportion of children reaching the target grade pushes up neighbourhood property prices by 0.67%. In addition from the 2000 property prices evaluated, they calculate the social valuation of a sustained 1% improvement in primary school performance to be up to £90 per child per year. Latter in 2008 they argue that research on housing values based on careful research designs can offer credible estimates of the social value of place-specific attributes and amenities (2008). Earlier works on valuing schools quality using hedonic pricing approach has been accomplished in USA concluding that school quality has a very large impact on real constant-quality house prices (see(Downes and Zabel, 2002) and(Haurin and Brasington, 1996a).

Downes and Zabel (2001) studied the impact of school characteristics on house prices and found a positive relationship between school expenditures and house values this result can be used as evidence in support of Tiebout’s (1956) assertion that individuals make their residential location decisions in response to inter- or intra-jurisdictional differences in taxes and public services provision, an interpretation which has since been widely criticized.

Work of Bogart and Cromwell (1997) suggests that accurate estimates of the value of good schools can only be produced if adequate controls for neighbourhood quality are included. In their study, Bogart and Cromwell consider the sales prices of houses in regions in the Cleveland area that extend across school-district boundaries but otherwise have uniform taxes and public services. By comparing the sales prices of houses on either side of the school-district boundary, they develop estimates of the value of better schools. Their data do not, however, allow the authors to determine which specific attributes of schools consumers' value. Further, while the areas they consider are contiguous, Bogart and Cromwell cannot rule out the possibility that some of the sales price variation is attributable to differences in neighbourhood quality rather than to differences in school quality.

In separate regressions, they show that up to 7.5% of the sales price variation could be attributable to neighbourhood quality variation.

While Black's (1999) analysis is similar in spirit to that of Bogart and Cromwell, her data allow her to estimate the value that parents place on elementary school quality as measured by test scores while still controlling for neighbourhood quality. Specifically, she uses data on 22,679 house sales from 1993 to 1995 for three counties in Massachusetts. She controls for unobserved factors by estimating a "boundary fixed effects" model that includes dummy variables for houses located near attendance zones. This allows Black, in her preferred specification, to control not only for district-level factors like taxes and local public goods but also for neighbourhood characteristics that are common to houses within the boundary areas. One of these neighbourhood characteristics for which Black controls is quality of the public high school serving the community, since this is common to boundary areas. Thus, in this preferred specification, the coefficient on test scores is measuring the value that home owners place on elementary school quality.

Black compares this coefficient, which implies an elasticity of house prices with respect to test scores of 0.45, to the estimated elasticity of 0.9 produced using a standard house price hedonic. She claims that this difference arises from the omitted variable bias that plagues the latter model. But it should also be noted that the standard hedonic does not control for quality of the high school so the test score coefficient is a measure of district-level (including high school) school quality. Thus the difference in the estimates can also be explained by the fact that they are measuring school quality at different levels.

Like Bogart and Cromwell (1997) and Weimer and Wolkoff (2001) use data in which houses are linked to local elementary schools in the Rochester, NY, area. They find that even when school-district level fixed effects are included, house price variation is explained by school-quality variation. In other words, the results appear to confirm the need to control for within-district variation in school quality. In addition, Weimer and Wolkoff find that the estimated value of higher public school test scores is sensitive to the inclusion of characteristics of students in the public schools. However, since Weimer and Wolkoff have only one observation on each house, they are not able to control for temporally-stable, unobserved attributes of houses and neighbourhoods as is possible in a repeat sales or panel data setting.

3.6.3 Public transportation

With the increase in the population growth, automobile use and number of motorised vehicles has increased. However, the number of people in the world who do not own a car increased even more. Consequently, the well-being of growing and expanding urban regions is closely connected to the provision of adequate and appropriate transportation services.

An expanding urban population requires access to business activities, education, employment and recreational opportunities. The location of these services and the provision of adequate transportation infrastructure, such as freeways, mass transit, and parking accommodation, is the essence of urban planning. The transportation system has a great influence and impact on regional patterns of development, economic viability, environmental impacts, and on maintaining socially acceptable levels of quality of life.

Public transportation contributes in a specific but very useful way to the greater efficiency of movement in cities. The quality of public transit, and the degree it is integrated into a community, significantly affects travel activity. As service quality improves and communities become more transit-oriented, residents tend to own fewer vehicles, drive less and rely more on alternative modes (walking, cycling and public transit) than they otherwise would. Through its intrinsic characteristics, public transportation generates complex, but very important, economic benefits. Public transportation reduces the unit cost of user trips, decreases the travel time, increases the pool of workers and consumers for companies, and mitigates the harmful effects of transportation such as less pollution, fewer accidents, less energy consumption and finally less space use. These benefits tend to increase quickly with the size of an area. The more populated the area, the greater the benefits.

Interrelated issues to be addressed in providing public transportation are access and accessibility to this mode of travel. Access is the opportunity for system use based upon proximity to the service and its cost. If the distances or barriers to access a service are too great at either the trip origin or destination, then it is unlikely to be utilized as a mode of travel. Similarly, if the cost is either too expensive (i.e. cheaper modes exist) or unaffordable then utilization of the service is also unlikely. Accessibility is the suitability of the public transport network to get individuals from their system entry point to their system exit location in a reasonable amount of time. Thus, accessibility encompasses the operational functioning of a system for regional travel. Access greatly impacts the public transportation system and complements service accessibility.

The development of an adequate public transportation system is critical for achieving regional sustainability. The performance of a public transport system will be affected largely by the proximity of public transport stops to the regional population (Murraya et al., 1998).

Access to public transportation is the opportunity to use the service. This may be interpreted in terms of proximity to and the cost of using transport services. Ensuring suitable service coverage is a worthwhile objective as the time taken to reach a public transport stop has a major impact on total travel time, which influences potential patronage. The interpretation of the amount of coverage distance or threshold is that it represents a comfortable walk for most people under normal conditions. The distance criterion could be dynamic to suit specific circumstances or terrain. Unfortunately, many long term strategies, goals and policies, such as providing suitable coverage, are often more representative of political desires rather than thorough and detailed analysis. What is important, however, is that such goals and policies be properly assessed and monitored in a rigorous and replicable fashion.

Despite the importance of public transport system on life conditions and environment qualities, very few attempts has been made to value this significant service. Examples of valuing public transportation can be seen by the works of Phanikumar and Maitra (2006) on estimating the willingness-to-pay for various qualitative and quantitative attributes of travel with reference to the bus transportation system in Kolkata City, India using a stated choice experiment approach or Al-Mosaind et. al (1993) research on effects of proximity to light-rail transit stations on the value of single-family homes showing that proximity of 500m or less to light-rail transit have a positive influence on property price.

3.6.4 Health and Medical Centre

Social disparity in the spatial distribution of healthcare providers in urban areas is a recognized problem. Distance to provider has been recognized as a significant barrier to healthcare access. Many attempts have been made to measure spatial accessibility to health service locations, identify areas of provider shortage, and reveal social disparities in spatial accessibility in both urban and rural areas (Elesh and Schollaert, 1972; Morrill et al., 1970; Shannon and Alan Dever, 1974; US Public Health Service and Antonio Ciocco, 1954; Wennberg and Gittelsohn, 1973). Later the focus of measure changed to Health Manpower attributed mal-distribution of healthcare professionals to their preference for affluent neighbourhoods (Connor et al., 1995; Fortney et al., 2000; Fryer et al., 1999; Goodman et al., 1997; Joseph and Bantock, 1982; Luo and Wang, 2003; Shi et al., 1999). Concern about spatial access to healthcare providers in urban areas has not abated (Council on Graduate Medical Education, 1998; Heinrich, 2001; Smedley et al., 2002).

Access to healthcare varies across space because of uneven distributions of healthcare providers and consumers (spatial factors), and also varies among population groups because of their different socioeconomic and demographic characteristics (non-spatial factors). Accordingly, spatial access emphasizes the importance of geographic barriers (distance or time) between consumer and provider, whereas a spatial access stresses nongeographic barriers or facilitators such as social class, income, ethnicity, age, sex, etc. (Joseph and Phillips, 1984).

Health centres contribute in significant ways to the growth and stability of neighbourhoods in a city. The benefits that health centres deliver to communities reach well beyond their core purpose of improving access to essential health services. The health outcomes they achieve increase worker productivity, which can lead to poverty reduction. Further, health centres provide direct employment to local residents. Health centres purchase goods and services from local businesses, thus spreading indirect benefits more broadly through the multiplier effect. The facilities constructed by health centres bring capital investment to underserved communities and anchor commercial revitalization.

Healthcare is important for all, young and old, rich and poor. It is therefore important to make affordable health care available to all. Understanding the benefits of improvements in access to and quality of health care services is important in allocating resources among alternative means of delivering health care services to residents. The benefits of improving the quality of or access to health care at a given location depend upon what other substitute sites are available and the quality at each of those sites. As in the recreational literature, the individual's decision regarding health care can be logically partitioned into whether to seek medical care for a given health care need and the choice among quality differentiated options for this care. For this reason Capalbo S. M. and Christine N. Heggem (1999) researched on valuing rural health care focussing on issues of access and quality using discrete choice demand modelling believing that nonmarket valuation can improve the applied policy analysis. Other types of valuation with regards to health and medical services has been established all showing the importance of having this services in best quality with reasonable accessibility (for more information, see (Sloan Frank A, 1995; Johannesson, 1996; Drummond and McGuire, 2001)

3.6.5 Post office

When the first public mail routes were started in Britain, ornate cast iron poles were erected at intervals along the routes. The mail coaches would hang sacks of mail for the surrounding villages from the hooks and each village would designate someone to go and collect the mail from the "post" and he became known as the "post-man." From this humble beginning we now have Postmen, Post Offices and the Postal Service. The establishment of a formal department to handle postal packages enabled cheap and widespread communication between the far corners of the country. Pioneers that went to claim new territory could send news back home. The service even helped the military that were taking over new land. Entrepreneurship blossomed because people could communicate with each other and businesses could contact their clients on a regular basis. The postal service helped bring people together.

Post office is a very important building in a city as it is the centre of all postal activities as one of the most widely used mode of communication and every locality in a town or a city should have access to this service. It provides services such as carrying letters and parcels, arranging remittance of money, accepting deposits of money and many other such services. This service can help the economy in terms of high and stable level of employment. The productivity of workers and the level of employment are the main determinants of economic growth and therefore of living standards and quality of life for citizens. Improving productivity in the postal sector would help the productivity of firms in the economy (Richard et al., 2008). It also helps in terms of social cohesion by linking rural communities with more densely populated areas of the country, and ensures that older people and those with disabilities have an accessible, reliable means of communication and the capacity to send and receive physical goods. In a recent survey[2], the UK was found to have the most positive attitudes towards the postal service. No fewer than 96% of respondents said that receiving mail was an important part of their everyday life, and more important than telephones or holding a current bank account. Some 89% attached importance to sending letters. The existence of a post office in a neighbourhood can also increase the physical activity. This was significant in Lee and Moudon (2008) work that investigated the relationship levels of physical activity and demographic, attitudinal and neighbourhood design variables.

White et. al.(1997) Studied the changing levels of post office provision and access to those services in rural areas. He argues that recent years have witnessed moves towards a privatisation of the postal industry and this, together with increasing automation of basic transactions, has threatened the viability of the small remote post office. They used a Geographical Information System (GIS) technology to the evaluation of changes in post office provision in rural mid Wales and allows for an assessment of the impact of these

[2]Special Euro barometer 2007, Survey 260: *Consumers' Opinions of Services of General Interest.*

changes on the accessibility of rural communities to post office services. The results from this study suggested that dwindling levels of post office provision are, in the main, weakly related to socio-demographic indicators and post office closures do not appear to have impinged more severely on disadvantaged groups.

These can be used as evidence to highlight the significance of having a post office situated in every locality in the city and reinsuring a reasonable accessibility to this service, helps increasing the quality of life in the neighbourhood. In addition, the value of having access to this service can be measured using a hedonic pricing approach (Garrod and Willis, 1992; Garrod, 1994)

3.6.6 Local shopping centre

A range of small shops of a local nature serving a small catchment which may include small supermarket, post office, sometimes a pharmacy, a newsagent, launderette and hairdresser etc. is very important in making the day to day needs of many people in the district while reducing the need to travel. They fulfil an important role in meeting local needs, particularly for those without access to a car. In the mid-1930, Christaller was first researcher to formally model the spatial behaviour of retailers and explained the clustering of disparate retailers in one location, by recognizing that shoppers combine several shopping tasks into one trip. This referred to in the literature as multipurpose shopping, researchers could provide empirical support for multipurpose shopping behaviour. Subsequent findings reveal that the massing of retail stores in one location reduced total shopping costs for the consumer.

Handy et. al (2001) evaluated the possibility that providing local shopping opportunities will help to reduce automobile dependence by exploring how residents of existing neighbourhoods make use of the local shopping opportunities currently available to them. Results showed that local shopping may not do much to reduce driving but it does give residents the option to drive less and this option is something residents clearly value. Not only do local businesses provide convenience and the opportunity to walk, they often play an important role in fostering a sense of community in the neighbourhood. Local shopping does not show great promise as a strategy for reducing automobile use, but it does show promise as a strategy for enhancing quality of life in neighbourhoods, at least partly by making driving once again a matter of choice.

Shopping centres reflect the trend for modernization of retailing throughout the world – including middle- and low-income countries. They bring together a large number of food and non-food retailers, as well as leisure and entertainment options. This results in a wider selection of merchandise under one roof and increased competition among retailers. Price reduction and improvements in quality, range of products and service levels follow. There is also the convenience aspect: a pleasant, safe, comfortable, year round shopping environment with protection from the elements. Additional benefits range from temporary employment during construction to permanent jobs in the stores as well as employment growth in service and support industries, such as distribution and logistics, security, and training.

Therefore, access to local shopping facilities may be a consideration when buying house. A shopping centre can exerts attraction on households' location choice depending on the relative level of convenience gained from easy access to shopping and entertainment facilities as well as from travel costs savings, It also can have repulsion effects from negative externalities such as pollution, noise and congestion which too great a proximity normally generates. The impacts of proximity to shopping centre has been cited by many scholars such as Tse and Love (2000) Dunse and Jones (1998) Rosiers, F et al. (1996) and Willis et al. (1995) and it has been valued using Hedonic Pricing method.

3.6.7 Security centre

Security is vital to communities. Without it, everyday life is nasty, rough and brutish[3]. Fear of crime can affect the use of urban space and make them less accessible. Places that have potential of movement and presence of people are perceived to have better security, and affect the choice of path to be followed by the pedestrian, since people try to avoid deserted spaces. In a wider context, crime and insecurity can also decreases the quality of the neighbourhood, creating an environment that people prefer to avoid as a place to live, and decreasing the quality of life for those that are already living in that environment. Thaler's (1978) work was the first estimation of the cost of crime with an implicit price model (cited in (Lynch and Rasmussen, 2001)) finding that the average property crime lowered house price by approximately $1930 in 1995. Clark and Cosgrove (1990) found that a 10% increase in the index of public safety increases monthly rents by 1.3% for single family dwelling and working in the CBD. This shows that people are willing to pay more for public safety in order to achieve a better quality of life.

[3]Thomas Hobbes, *The Leviathan*. For a contemporary account of a community that has far too little order and the security it can produce, see Kotlowitz (1991)

Security, or more precisely a lack of it, is increasingly identified as a key social problem. Leading politicians, academics and senior figures across the public services have all recently suggested that managing a growing sense of insecurity and its corrosive effects on the wider social fabric is among the most pressing concerns for public policy. For example, in a speech in 2004, the then Home Secretary David Blunkett identified the provision of increased security as a cornerstone of the New Labour project and as pivotal to achieving broader civil renewal. He said:

> *Security is the key to everything we are doing … by building a safer society we are strengthening communities, making them more confident and better able to take on responsibility for their own lives and wellbeing. (Blunkett, 2004)*

In addition, in two broad-based quality of life surveys reported in Michalos (1996) and Michalos and Zumbo (1999) it was reported that the reduction of crime ranked second and third, respectively, as things to change to improve the quality of life of two random samples of residents of Prince George, British Columbia. Moller (2001), reported that if residents live in acceptably serviced neighbourhood they will enjoy a generally high quality of life and one of the major services mentioned was safety and security. It is evident, that safety and security is playing an important role in neighbourhood quality and can influence local house prices.

3.7 Urban Segregation and its Relation with Urban Service Distribution

Having explained the types of services that this study is focusing in the previous sections, it is important to highlight the neighbourhood segregation concept from the literature that can occur while distributing the services among neighbourhoods.

Neighbourhood segregation is an enduring feature of cities and despite recognition that neighbourhood environments are important contexts shaping social outcomes and behaviours (Sastry 2012), we know very little about how existing neighbourhoods got to be the way they are, and how they stay that way or change.

Studies on neighbourhood segregation covered different areas such as racial segregation, income segregation, environmental attribute and housing prices etc. A recent study in US showed that, across all metro areas in 2010, 59% of black households and 48% of Hispanic households would need to move to have an even distribution of households relative to whites (Logan, 2011). Income segregation is less pronounced than racial segregation, although it has significantly increased in recent years. The proportion of families living in affluent and poor neighbourhoods more than doubled between 1970 and

2009, while the percentage of families living in middle-income neighbourhoods decreased from 65 to 42 over the same time period (Bischoff and Reardon 2013). Study of distribution and availability of urban services and urban transformation in neighbourhood development and housing price is another topic that neighbourhood segregation literature has focused on in the last decade. The outcome of these studies show that the economic structure of the city and the kind of restructuring that is going on are frequently seen to be among the most powerful forces (Mustered and Ostendorf, 1997) behind neighbourhood segregation which can transform the quality of public life (Caldeira P., 1996). Caldeira (1996) monitored spaces for residence, consumptions, leisure and work and argued that by abandoning the traditional public sphere due to insecurity, fear of violence and lack of urban services it is very difficult to maintain the principles of environmental quality and quality of life which have been among the most significant organizing values of modern cities. Caldeira (1996) continued and mentioned that as a consequence, the character of public space and of citizens' participation in public life changes.

Given that 15% of the population moves each year (Ihrke, Faber and Koerber 2012), residential mobility is a key factor driving these segregation patterns. Although there have been efforts to study the linkages between individual-level residential mobility patterns and macro-level changes in spatial inequality and segregation (e.g., Bruch and Mare 2006; Bayer, McMillan, and Rueben 2004), such studies use implausible behavioural models of how people decide whether, when and where to move. This hampers both our understanding of the individual process of residential mobility and neighbourhood attainment, as well as the inferences possible from simulations linking individual mobility with macro-level outcomes.

Over the past several decades, sociologists and demographers have devoted considerable attention to describing patterns of residential choice. In the 1990s this work mostly took the form of "locational attainment" models (e.g., Logan and Alba 1993), which regress socio-demographic attributes of Census households onto univariate measures of neighbourhood composition (e.g., median income, proportion black, etc.). In the 2006, Crowder and colleagues used more explicit measures of mobility from the Panel Study of Income Dynamics to examine correlations between respondents' wealth, income, and race/ethnicity and the probability of moving into or out of a neighbourhood characterized by its economic composition (Crowder, South, and Chavez 2006; South, Crowder, and Pais 2011).

People attach meanings to the spaces where they live in flexible and varying ways and the factors influencing these readings and uses are endless. However, urban services with relative stability and rigidity are materials in neighbourhood environment that shape and bound people's lives and determine the types of encounters possible in public space. Contemporary urban segregation is complementary to the issue of urban service distribution and environmental quality. On the one hand having access and be approximated to the services and on the other hand the quality of these services becomes the context in which different neighbourhood stereotypes are generated. The discussion and comparison of urban services availability in a neighbourhood and its quality can influence different important topics in a society and residents quality of life. For example it can affect the neighbourhood position in the housing market, school participation, labour market, low security or even restricted socio-cultural integration (Mustered and Ostendorf, 1997). It would be possible to argue that local participation among the government and residents is increasingly necessary to make urban services available and make those neighbourhoods liveable and to improve the quality of life of the population.

Gaskin et al (2012) conducted a study on Residential Segregation and Disparities in Healthcare Services Utilization. They used office based location and accessibility as one of the five measures of health care use and used the zip code to control for residential segregation. The finding suggested that disparities in health care utilization are related to distance and proximity to health care services. Therefore, efforts to improve access to healthcare services and to eliminate healthcare disparities for the population should not only focus on individual-level factors but also include community-level factors. A complementary study was conducted by Dinwiddie et al (2013) on residential characteristics influence opportunities, life changes and access to health services in United State. They explored the role of residential segregation in different access and mental health services utilization. The finding from this study suggests as well as the availability of mental service in the neighbourhood, the segregated neighbourhoods itself can influence access and utilization of mental health services. Same type of study was conducted for schools. Burgess et. Al (2005) studied the schools segregation in different neighbourhoods and they also suggest that having schools in neighbourhood especially with high quality can cause different level of segregation between neighbourhoods.

Most recently, a line of work has advocated using discrete choice models that allow the neighbourhood to be characterized based on multiple attributes including urban services, median income, Neighbourhood attribute and housing prices (Mare and Bruch 2003; Bruch and Mare 2006).

3.8 Conclusion

In this chapter, the definition of services has been explored and defined, the importance of services in countries economics has been explained, the increase of employment in service sector has been highlighted and finally a possible schema for categorizing service suggested by Bryson et.al (2004) is given. To narrow down the topic of this thesis, it is mentioned that this research is looking at those services that can influence the quality of life and promote SD, assuming that they are benefiting from a standard level of sustainability themselves. Therefore, 7 services have been chosen that can help the quality of life and improve the neighbourhood's quality.

From the explanations provided for each service the following effects can be extracted: Economically, services can help to provide a reliable and firm economy in order to be able to manage the financial requirements of any social, environmental and also economic improvements for the city. However, services can have social effects on QoL and SD through providing equal accessibility to the residents, equity among all the users from different income groups. It helps people to participate in society and increase their social relations. It also increases the level of knowledge and understanding of different life domains. It provides places for entertainments, leisure, sports, enhance the hygiene and health level in the community and promotes a longer life expectancy. Conservation of cultures, values and beliefs of a community are also provided, including the opportunity to become familiar with other nations culture, believes and values, and also to present one's own to visitors (services that attract tourists).

Service have an important role in the *environment* quality, limiting the city's pollution level by producing more green areas and providing public transport for example, to minimize carbon emissions. These green areas and other environmental friendly services create a better environment for the citizens and produce aesthetic landscapes in the city. However, urban segregation is complementary to the issue of urban service distribution and environmental quality. On the one hand having access and be approximated to the services and on the other hand the quality of these services becomes the context in which different neighbourhood stereotypes are generated. The discussion and comparison of urban services availability in a neighbourhood and its quality can influence different important topics in a society and residents quality of life.

There is a consensus that **services** play an important role in cities economy, residence social interaction and cities environmental quality and make this research more essential and necessary towards this understanding.

In addition from the explanation of each services, much of the research that has been carried to value the importance of services as a non-market good, has used economic evaluation techniques such as hedonic pricing and choice experiments. This research will also use these techniques to measure the value of the existence of these services in a neighbourhood. In the next chapter an explanation of the economic evaluation techniques is provided.

Chapter 4: Economic Valuation Methods

4.1 Introduction

Decision-making with respect to the management of environmental or a city is complex, commonly involving multiple objectives which could be competing and conflicting. As a result, appropriate evaluation tools or techniques to assist decision-making will be limited to those that have the capacity to incorporate information from a number of disciplines and that can identify an outcome that offers a compromise solution. An efficient urban management system should employ the appropriate approach to find the gaps between *What is* and *What should be* and sufficiently deliver useful organizational results for different planning elements, policy or decision making procedures. One general strategic approaches that the management system have used is the Holistic planning approach where the city development goals are processed through the proper management of resources, however psychometric analysts argue that natural landscapes, places and space in a city are more than containers of resources and staging areas for enjoyable activates. They believe it is a location filled with history, memories, and emotional and symbolic meaning and in order to enhance land managers ability to address deeper landscape meaning and place-specific symbolic values in decision making, they measure the place attachment or the spirit of the place (Williams & Vaske, 2003). However the specifications of concepts subsumed under sense of place, particularly place identity, place attachment and sense of community, have not been clearly articulated. There is considerable overlap between factors such as emotional bonds, affiliation, behavioural commitment, satisfaction and belonging which are loosely associated in theoretical descriptions. For example, Cuba and Hummon (1993) describe emotional ties and affiliation with place as aspects of identity, whereas Altman and Low (1992) use these same factors to define attachment. Attachment is also described in terms of behavioural commitment and emotional bonding (Brown & Perkins, (1992), which is similar to the emotional connection and fulfilment of needs components of sense of community (McMillan & Chavis, 1986). Shamai (1991) distinguishes between belonging and affiliation, and bonding, however, Puddifoot (1995) identifies these as common aspects of community identity without distinguishing between them. In the sociological literature, there is a similar lack of specificity in definitions of attachment and identity (Goudy, 1990; Stinner, VanLoon, Chung, & Byun, 1990; O'Brien et al., 1994). The theoretical quagmire reflected in this blurring of conceptual boundaries is also evident in the lack of precision of the operational definitions that are used to study these sense of place dimensions. On the other hand, assigning money values to the outcomes of choices about policies, projects and programmes has become an approach that many politicians and authorities have employed recently due to its simplicity in understanding whether the benefits outweigh the costs. One of the most important contexts for these choices is that of cost benefit analysis (CBA) or benefit analysis or damage analysis. CBA Seeks to measure the benefits and costs of a policy measure, such as setting a new environmental quality or food standard; or the benefit and the cost of an investment such as a new road, park or release of a new drug. Benefit or damage analysis might be used simply to demonstrate that a policy secures major public gain or to determine cost in the case of liability for a major accident. In addition the CBA has long history in welfare economic foundations as well as measuring quality of environment such as water quality, wildlife, air quality, human health aesthetics, travel cost and, etc.

This thesis uses economic valuation techniques to answer the research objectives. Economic valuation techniques is the standard tool used by economists to establish the economic efficiency of investment. It provides a theoretically sound and consistent approach to evaluate investment decisions using the sole criterion of economic efficiency. In addition, a problem faced by decision-makers required to make a choice about resource use or resource management, is the lack of information about the value the community or stakeholders place on the environment. Where there is no obvious market for environmental resources, then surrogate or simulated market information is required. Approaches to non-market valuation can be broadly divided into those that attempt to estimate a demand curve for each of the resource's uses and non-uses, and those that estimate a production function linking environmental quality to changes in production relationships or estimate the cost of various regulatory or preventative actions. In continue this technique is described in details and different categories of economic valuation methods are presented.

4.2 The Nature of Economic Valuation and Economic Efficiency

Three Broad categories of economic valuation methods are distinguished; revealed preference (RP), state preference (SP) and benefit transfer (BT), which relies on estimates from SP and /or RP studies. Some applications are far more developed in some countries than in others. Thus, monetised green national accounts exist for a number of developing countries, the US and Japan, but not for the UK. The use of economic valuation has been standard in the US for damage assessment but less so in UK. Some use of valuation has been made in the context of water abstraction licensing decisions and in valuing the damage from air pollution and noise (EFTEC, 1998). In the US many federal regulations require a CBA. In the UK, Monetary valuation is used whenever feasible in Regulatory Impact Assessment (RIA) of national and European community directives. The UK appears to be unique in using economic valuation techniques to inform decisions about the rate for potential environmental taxes. Using valuation techniques to help determine policy priorities has some history in the UK but has been used fairly widely by the World Bank in guiding environmental action plans, and has played a role in the European Commission's deliberations on the 6th Environmental Action Plan. Therefore, economic valuation has a very wide potential application.

The foundation of economic valuation		
Context	Comment	Type of valuation likely to be relevant
Cost benefit analysis: projects and programmes	This is the context in which CBA was originally developed. Usually public investment projects in public or quasi-public goods	RP,SP,BT
Cost benefit analysis: Policies, including regulations	A more recent focus in the UK but RIA now required for all regulations. Traditional for mainly RIA in the US	RP,SP,BT
'Demonstration' of the importance of an issue	Usually used to estimate economic damage from some activity, e.g. behaviour towards health, pollution, noise	Usually BT only
Setting priorities within a sectorial plan	Used for priorities road investments	Usually BT only
Setting priorities across sector	Rare	Mainly BT
Establishing the basis for an environmental tax or charge	Recent UK experience appears to be unique, e.g. landfill tax, possible pesticides tax, aggregates tax	Mainly BT but can include original RP and SP
'Green' national income accounting	Only utilised in a minor way in the UK	Usually BT only
Corporate green accounting	A few studies exist, but even fewer are public	BT only
Legal damage assessment	Not used in UK but extensively used in the US	RP,SP,BT
Estimating discount rates	Used in health literature and to derive discount rates in developing countries	SP
Notes: RIA= Regulatory Impact Assessment RP = Revealed preference SP = Stated preference BT = benefits transfer		

Table 4.1 Applications of economic valuation techniques

Table 4.2 shows the potential use and the questions that are being answered through the use of valuation techniques. Policy analysts emphasise the need to establish at the outset some framework for the comparison of the criteria of a ‘good’ policy (project, programme and so on). A typical example of accessibility to a park is given below, which reveals the nature of trade-offs in all choices. For example in a policy different distance for a residential place to have access to a park is recommended. These distances can be 800m, 1200m and 1500m. The, desirability of changes in accessibility to a park could be judged, by its effect on air pollution, health cost and maintenance cost. Air pollution and health cost will be reduced with increase in number of parks, but the maintenance cost will increase, there is a trade-off between the criteria. What is required is some mechanism for trading-off the air pollution, health and maintenance against the opportunity cost (development value of the land), that is, what is required the rate at which the benefits of health increase and pollution decrease can be traded for increased cost in maintenance and cost development values. Economists adopt preferences, as revealed through willingness to pay (WTP), as the means of making the trade-off.

Potential use of valuation techniques	**Questions that are being answered through the use of valuation techniques**
Cost-benefit analyses of projects, programmes and policies; The demonstration of the importance of an issue; Priority-setting within a sector; Priority-setting across sector; Determining marginal damages as the basis for an environmental tax or charge; Green national income accounting; Legal damage assessment (liability); and Determining discount rates;	Investment and policy expenditure issues Is Project A, policy B, or programme C ‘worthwhile’? How might a choice be made between alternative policies and projects? How might compatible projects and polices be ranked in order of ‘worth’? How might the constituent parts of a programme be chosen so as to maximise net benefits? How large should a given project or a programme be? On what scale should a policy be implemented? Or, what is an appropriate standard or target for a policy measure? Taxation issues How large should a given environmental tax be? Prioritisation issues How important is a given issue?

Table 4.2 the potential use and the questions that are being answered through the use of valuation techniques.

(Ian J. Bateman *et al.*, 2002)

In the UK government Treasury guidance is explicit that ‘non-marketed goods are generally best valued in terms of people willingness to pay for marginal changes in supply’ (HM-Treasury, 1997). Benefit and costs are defined in terms of individual’s preferences. An individual receives a benefit whenever he receives something in return for which he is willing to give up something else that he values. To measure how large that benefit is, we measure how much he is willing to give up to obtain it. Conversely, an individual incurs a cost whenever she gives up something that she would willingly give up only if she was given something else that she value as compensation. To measure how large that cost is, we measure how much would just compensate her for incurring its loss.

These formulations define benefits and costs in terms of one another. The measure of any benefit is that cost which, in the preferences of the individual who benefits, would exactly offset it. In addition, conversely, the measure of any cost is that benefit which, in the relevant individual's preference, would exactly offset it. This is not circularity. It reflects a crucial feature of economic valuation. There is no absolute measure of value, there are only equivalence of value between one thing and another. By not claiming that any particular dimension of any particular dimension of human life – health, material wealth, happiness, achievement or whatever – has absolute value, economic valuation avoids taking any substantive position about what is good for people. It simply uses whatever relative valuations are revealed in people's preferences.

This approach allows all costs and benefits to be measured in a single dimension if, as a matter of convention, we choose one particular type of benefit to use as standard. We can then express all other benefits and costs in terms of that standard, using individuals' own preferences to determine equivalent value.

If we are to use the same standard of measurement for all individuals, the standard has to be a good that everyone prefers to have more of rather than less, and that individuals treat as a potential substitute for the array of benefits and costs that we want to measure and it has to be finely divisible. In economics, the usual convention is to use money as the standard of measurement. Money, obviously, is finely divisible. It represents general purchasing power that is, the power to buy from vast range of goods that are sold on markets. Because money can be put to so many different uses, it is a safe generalisation that most people prefer more money rather than less, irrespective of their specific preferences among goods. For the same reason, money is a particularly effective substitute good.

If money is used as the standard to measure welfare, the measure of benefit is willingness to pay (WTP) to secure that benefit, or willingness to accept compensation (WTA) to forgo the same. Similarly, the measure of cost is WTA to suffer that cost, or WTP to avoid the same. These measures of benefit and cost underlie the concept of economic efficiency. A reallocation of resources increases economic efficiency if the sum of the benefits to those who gain by that reallocation exceeds the sum of the costs to those who lose. In other words, there is an increase in economic efficiency if the sum of WTP for the gainers could compensate the losers without becoming the loser themselves. This test is the efficiency criterion (or compensation test). CBA typically uses this criterion to appraise specific proposals.

4.3 Willingness to Pay and Willingness to Accept

Economic theory does not tell us what people care about or how they care. As Simon (1986) puts it, 'neoclassical economics provides no theoretical basis for specifying the shape and content of the utility function'. These are empirical matters, and they are likely to vary from one individual to another. In the notation used below, where the item being valued is denoted q, economic theory does not tell us how much a person likes q or, why. It does not tell us, either, about the units in which a person effectively perceives q; these may be entirely different from the units in which the item is measured by the researcher. Thus, economic theory cannot tell us whether the individual sees 3 units of q, say, as any different from 4, or whether he considers a change from 3 units to 12 a larger change or a small one. Therefore, while economic theory can show the implications of particular assumptions about the utility function, whether people actually have those preferences is an empirical question (Ian J. Bateman and Willis, 1999).

As mentioned, cost-benefit analysis uses money values as weights, because they express people's willingness to pay (WTP) or willingness to accept compensation (WTA). This produces the important characteristic that benefits and costs can be directly compared, and specific actions can be compared with doing nothing. Benefits are measured by WTP to secure the benefits. Costs may comprise WTA compensation for losses. CBA is therefore a decision procedure that is fully consistent with the use of WTP and WTA as measures of economic value.

The concepts of WTP and WTA, and the relationships between them, can best be explained by using indifference curves. Indifference curves analysis rest on certain fundamental assumptions about the nature of preferences, which are used almost everywhere in economics.

Figure 4.1 represents the preferences of a given individual. The vertical axis measures the individual's expenditure on private goods (y). This is measured in money units, on the assumption that prices are given, and it can be thought of as the quantity of a single composite good. The horizontal axis measures the quantity that exists of some public good (x).

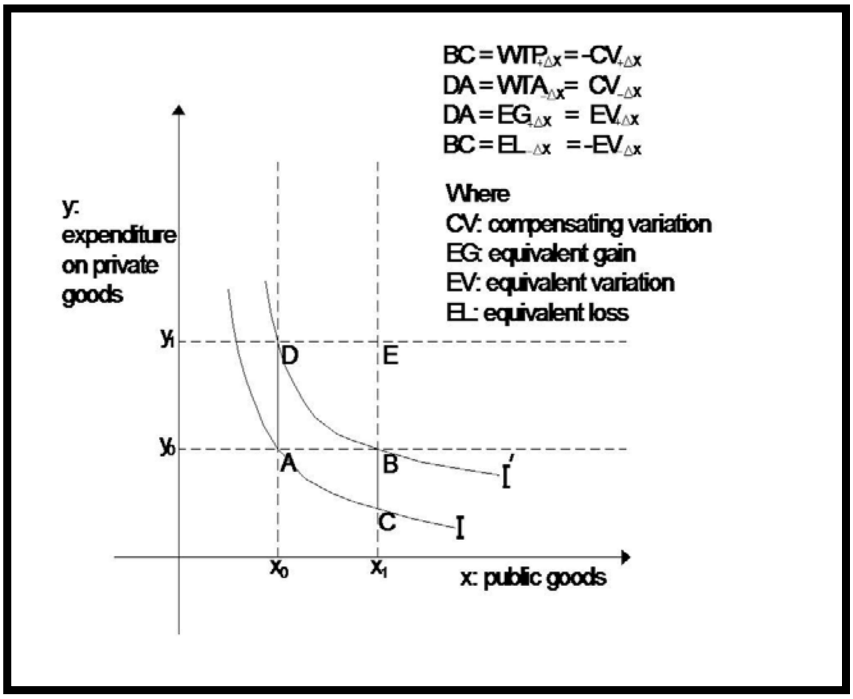


Figure 4.1 Measure of change in human welfare

The indifference curves I and I' link combinations of the two goods between which the individual is indifferent. Each curve be thought of as corresponding to a level of welfare, utility or well-being, with I' corresponding to the higher level. In this scenario, as the indifference curves move up and to the right, the welfare of the individual increases.

There are four measures of the value of a change in the quantity of a public good. First, consider the value to the individual of an increase in quantity of the public good x_0 to x_1. Suppose that initially the individual has y_0 private consumption, and so is at A. Compare point C. At C the individual can enjoy x_1 of the public good but his private consumption is less by the amount BC. Since A and C are on the same indifference curve I, we can infer that his WTP for the increase in the public good is BC. In welfare economics, the negative of this amount is called the compensating variation for the increase in the public good, since the loss of BC in private consumption exactly compensates for that increase.

Second, consider the opposite case, in which the individual, again starting with y_0 private consumption, faces a decrease in the public good from x_1 to x_0. Now the initial position is B. Compare point D. At D, the individual enjoys only x_0 of the public good, but his private consumption is greater by DA. Since B and D are on the same indifference curve I', we can infer that his WTA for the reduction in the public good is DA. This is the compensating variation for the reduction in the public good.

Third, it is usual to consider two other measures of the value to the individual of the increase in the public good from x_0 to x_1. Suppose that the individual starts off with y_0 private consumption and x_0 of the public good: he is at A. It may be asked what additional amount of private consumption would be just as preferable as an increase in the public good to x_1. This is the equivalent gain measure of the value of the change in the public good. Since D is on the same indifference curve as B, equivalent gain is equal to DA. In the language of the welfare economics, DA is the equivalent variation for the increase in the public good. Notice that equivalent gain and WTA are both equal to DA. The equality of these two measures is an implication of the standard economic theory of preference. In terms of stated preference questionnaires, however, equivalent gain and WTA are distinct concepts, elicited by different types of question. ('How much money would just compensate you for losing X?) The theory tells us to expect that these two types of question will yield the same answers.

To arrive at the fourth measure, suppose the individual starts off with y_0 private consumption and x_1 of the public good, that is, at B. It can be asked what loss of private consumption would be just as preferable as a decrease in the public good to x_0. This is the equivalent loss measure of the change in the public good; since C and A are on the same indifference curve, equivalent loss is equal to BC. In the language of welfare economics, the negative of BC is the equivalent loss and WTP are both equal to BC. As in the case of equivalent gain and WTA, this is a theoretical implication about the equivalence of what, in state preference terms, are two different methods of eliciting valuations.

These fine distinctions are significant only to the extent different measures yield different valuations. In the diagram, DA > BC. That is, WTA is greater than (and likewise, equivalent gain is greater than equivalent loss) It can be shown theoretically that this inequality holds whenever the indifferent curved are convex to the origin and the public good is 'normal', that is, if the good could be bought at a constant prices, the amount consumed would increase with income. It should be clear from the diagram that the ratio between WTA and WTP will tend to be greater, the more convex the indifference curves are, that is, the less substitutability there is between private consumption and the public good, and the greater the difference between x_0 and x_1(Hanemann, 1999).

4.4 Choosing Between Economic Valuation Techniques

The array of the economic valuation techniques ranges across revealed preference and state preference techniques as shown in figure 5.2. Which techniques are best studied to which problems? Some general guidelines are set out below.

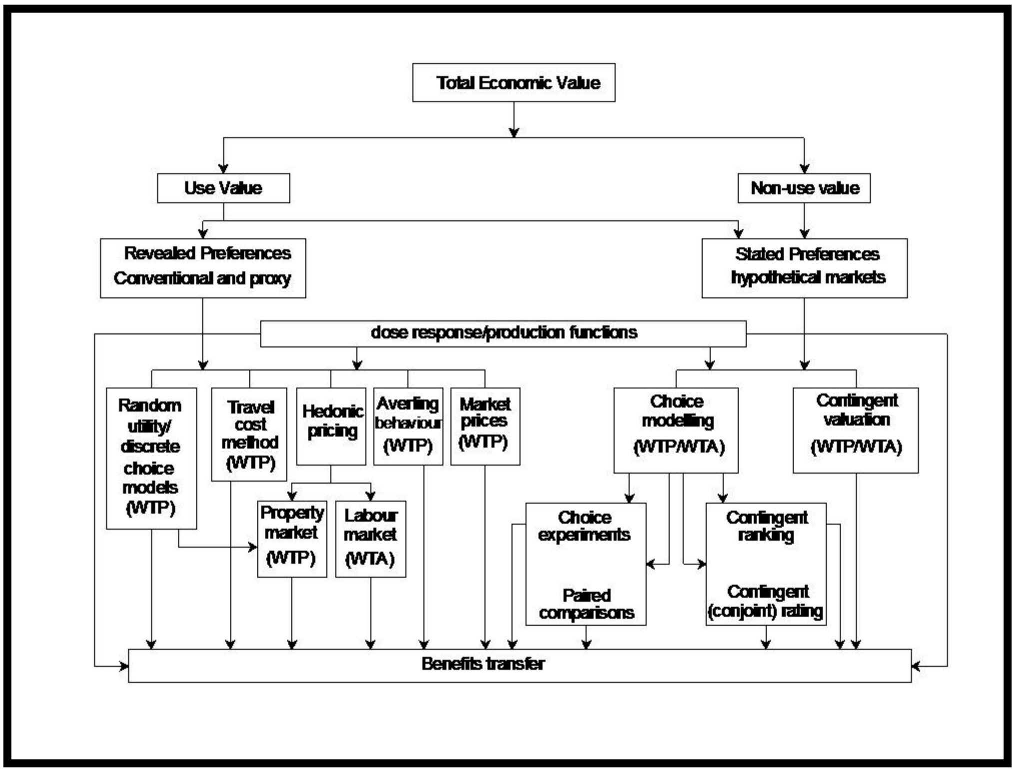


Figure 4.2 Economic valuation techniques

Impacts can be valued by using various approaches based on revealed preference, using direct observation of actual values for complementary effects:

- Discrete choice models work on the basis that choices between alternative options reflect the wellbeing (utility) that accrues from those options.
- Choices expressed in probabilistic form, i.e. in terms of the probability of choosing one option rather than another, define the random utility model which underlies travel cost approaches. Travel cost approaches are used to value recreational assets via the expenditures on travelling to the site.
- Hedonic pricing refers to the measurement of effects which show up in labour markets or property markets. Thus occupational risks may be reflected in wage premia, and disamenity effects such as noise may be inferred from house prices.
- Averting behaviour involves expenditures to avoid unwanted effects (e.g., smoke alarms, double-glazing, child-proof containers).

- Many effects do show up directly in markets (e.g. the effects of pollution on crops which have a market value).

When using stated preferences, the main choice is between choice modelling (CM) and contingent valuation (CV). It is important to take account of the following:

- Generally, CV should be chosen when the WTP for the environmental good or service in total is needed, and CM when WTP for individual attribute is required. CM is also useful if information is needed on relative values for different attributes of an environmental good. Also in theory, CM can be aggregated across attribute levels to derive a total value.
- The use of CM approaches in the context of environmental issues is more recent than that of CV. Therefore, more research needs to be concluded for this approach.
- Not all CM techniques are consistent with underlying welfare theory. If welfare-consistent estimates are needed, then choice experiment (or, to a degree, consistent ranking) are preferable to, say, contingent rating.
- Questions such as ‘What are you willing to pay?’ are thought by some critics of CV to present cognitive problems. CM does not explicitly ask about money values so it is argued that CM is easier for people to understand.
- CM offers a more ‘efficient’ means of sampling than CV since, typically, more responses are obtained from each individual with CM than with CV.
- Revealed preference cannot be used to estimate non-use values (NUV), as shown in figure 5.2. SP is the only approach that can uncover them. Contingent valuation and choice modelling have both been used to estimate non-use values.
- SP inclusion of policy variables.
- SP avoids multicollinearity in RP.
- SP techniques may nonetheless yield valuable data, especially if sub-samples of respondents can be provided with different levels of information about the good. An advantage of SP is therefore the ability to vary some of the features of the good in question. With RP, the analyst cannot necessarily determine fully what factors lay behind a given valuation. For example, a property price might vary with an environmental variable because of aesthetic concerns, health concerns, concerns about nuisance, and so on (although regression analysis can use dummy variables quite successfully to proxy for such concerns in hedonic price studies).Without surveys, the motives for preferences cannot be discerned.

SP and RP techniques can be used together. One may be used as a check on the other, a form of convergent validity. Analysis of combined studies suggests that contingent valuation produces, on average, WTP values just below those of RP techniques. But RP techniques cannot identify option and non-use values. SP techniques are the most widely used method for valuing non-market impacts in cost benefit analysis. SP will typically be chosen over RP because it provides for the inclusion of non-use values, and the necessary data may not be available for revealed preference techniques.

Clearly, choosing the right valuation technique is not straightforward. Certain rules of guidance may be discerned however. These are summarised in Table 4.3 (Ian J. Bateman *et al.*, 2002).

Issue	Choice of technique
Non-use value is likely to be important	SP (CV or CM)
Need to maximise credibility of results	SP and RP as checks on each other as far as use value is concerned.
Need to value characteristics of the good	CM likely to be preferable, as long as characteristics are not correlated and the proposed changes display trade-offs between characteristics. RP (for use values only) and CV are both possible, but CV likely to handle fewer characteristics than CM.
Markets function freely and flexibly	RP will pick up effects
Motives for valuation matter	RP can decompose values but SP produces detailed attitudinal and motivational analysis
Cognitive load (ability to comprehend nature of change) in doubt	All SP techniques may fail. But if the target effect is unknown to respondents and they thus have no preferences for or against it, then RP is also unlikely to succeed.
Effects of information on valuation need to be known	SP can vary information by sub-sample. RP cannot uncover informational issues

Table 4.3 General guidance on choosing between valuation techniques

4.5 Historical Development of RP and SP Techniques

Stated preference techniques are based upon the principles of utility theory and economic rationality. The following sections explain the origins of these principles within the field of economics and the development of revealed preference and then subsequently stated preference techniques.

4.5.1 The Concept of Utility and the Principle of Economic Rationality

In the field of economics, the theory of choice is described in terms of utility. This concept of utility originates back to Jeremy Bentham in 1789 (Hargreaves Heap *et al.*, 1992). Bentham's concept of utility is defined in hedonic terms, by a measure of pleasure that something produces (Kahneman, 1997). Others have interpreted utility as `wantability' (Fisher, 1918; Kahneman, 1997). Kahneman (1997) suggests that:

> *'Economic analysis is more congenial to wants and preferences than to hedonic experiences and the current meaning of utility, in economics and decision-making is a positivistic version of wantability: utility, is a theoretical construct inferred, from observed choices'.(p.197)*

Samuelson (1938) suggests that an individual's behaviour could be seen as a series of choices. By comparing observed behaviour with available alternatives, Samuelson suggests that an individual's preferences (or utility function) could be inferred. The underlying assumption made in the inference of these preferences is that individuals behave and make choices rationally', and that this rationality allows human behaviour to be predictable (Samuelson, 1938). It is important here to clearly define the meaning of economic rationality. Albin states (1998):

> *'For the economist, rationality has come to mean behaviour that can be viewed as maximising some consistent mathematical function of behavioural and environmental variables... in particular, the economist will try and infer the objective function (u) from the agents observed behaviour, and then predict that her actions in the face of a change in the environment will .follow the law x(a) '.(p.67)*

Within the field of utility theory and choice behaviour, individuals are assumed to maximise the level of utility (or expected utility) from a specified choice. The development of predictive behavioural models, from individuals' (agents) observed behaviour- is considered within the field of utility as revealed preference techniques (McFadden, 1978; Madden, 1993) The development of revealed preference techniques is explained within the following section.

4.5.2 Revealed Preference Techniques

The theory of choice presented by Samuelson (1938), which suggests that comparing, observed behaviour with available alternatives can allow preferences to be inferred, has been subsequently developed in order to allow choice models to be estimated, and so predicted (see McFadden 1973, Madden, 1993 for detailed discussions of the main developments). These observed choices that an individual makes are referred to as revealed preference data. Revealed preferences are gathered either through direct observation, or in surveys asking about actual behaviour.

Whilst revealed preference data has been used frequently to determine an individual's utility functions, the technique exhibits a number of severe limitations. The most prominent of these limitations are:

- Revealed preference techniques infer individuals' preferences from observed choices made within the market place. This means that responses can only be observed in response to current market conditions. It can be difficult to observe the effect of sufficiently large variations in the variables of interest using revealed preference data (Pearmain et al., 1991; Madden, 1993). Revealed preference data is typically restricted in the width of variation of current or past product/service attribute levels. As a result, researchers can only calculate accurately a small section of a consumer utility function.
- Given that revealed preference data is based on observed behaviour, the use of these techniques proves difficult when forecasting demand for new services or products (Pearmain *et al.*, 1991; Louviere *et al.*, 2000) It is not possible to observe individual's behaviour in response to market conditions that do not yet exist.

Clearly the use of revealed preference techniques for identifying consumer preferences and/or forecasting demand in some scenarios is difficult. It is largely as a result of these problems encountered using revealed preference techniques that researchers have developed alternative methods of estimating consumer utility functions, and so forecast demand. These alternative methods rely on the observed responses individuals make to hypothetical choices. The origins of these stated preference techniques are discussed in the following section.

4.5.3 Early Experiments Using Hypothetical Choice

An alternative method to examining observed behaviour to determine consumers' preferences is to examine consumers' responses to hypothetical choices. This section considers the origins of these alternative methods, to provide an understanding of why stated preference techniques are underpinned by the principles of economic rationality, held within the field of economics and utility theory. Researchers working within the field of utility theory were by the first half of the twentieth century trying to find ways of determining an individual's utility measure for goods and services and so establish consumer preferences. In 1941, Thurstone carried out research into how to determine individuals' indifference curves. Indifference curves show combinations of goods that provide a consumer with equal utility. He reported an experiment where individuals were asked to make hypothetical choices about different commodity bundles that consisted of hats and coats, hats and shoes, or shoes and coats. This is the earliest reported experiment asking respondents to make hypothetical choices such as those presented in stated preference experiments. Thurstone reported in detail the responses of one individual, and concluded that the trade-offs made could be adequately represented by indifference curves. However, this experiment is strongly criticised by Wallis and Friedman (1942). They state:

> *`It is questionable whether a subject in so artificial an experiment situation could know what choices he would make in an economic situation; not knowing, it is almost inevitable that he would, in entire good faith, systemise his answers in such a way as to produce plausible but spurious results ...for actual stimuli... Questionnaires or other devices based on conjectural responses to actual stimuli do not satisfy this requirement. The responses are valueless because the subject cannot know how he would react'.(p.41)*

Rousseas and Hart (1951) describe a later experiment that they carried out as a response to the work reported by Thurstone and the subsequent criticism made by Wallis and Friedman. They aimed to carry out a choice experiment that provided a more realistic choice by asking respondents to choose between different breakfast menus. Rousseas and Hart also conclude that individual's preferences can be successfully measured using hypothetical choice experiments. This conclusion is supported by research carried out by Mosteller and Nogee (Mosteller and Nogee, 1951) that looked at expected utility theory. They suggested that laboratory experimentation provides valuable opportunities to examine behaviour that is 'uncomfounded by other considerations'.

Despite the support of early experiments, research into individual choice that made use of responses to hypothetical choices (stated preference techniques) was not used for commercial application until the 1970s. Further developments within the field of utility theory, which led to a renewed interest in the use of experiments using hypothetical choices for commercial use, are discussed in the following section.

4.5.4 Stated Preference Techniques

Experiments using hypothetical choice were used in the first half of the twentieth century, as discussed earlier, in order to develop a greater understanding of utility theory. An extension to utility theory, which Salvatore (1997) describes as the 'characteristics approach to consumer theory' was pioneered by Lancaster (1966), and postulated that consumers demand a good according to its characteristics or attributes of the good, and it is these characteristics that give rise to its utility. This development led to the further development of experiments using hypothetical choices, where these choices were described in terms of the attributes of the goods or 'services that they described.

Examples of the early commercial use of these experiments were published in the early 1970s and were then commonly referred to as `conjoint analysis' (Davidson, 1973; Louviere *et al.*, 1973). In 1978, Green and Srinivasan (1978) formally defined these types of evaluation techniques as:

> *'Any decompositional method that estimates the structure of a consumer's preference given his/her overall evaluation of a set of alternatives that are pre-specified in terms of levels of different attributes'. (p.28)*

From the early 1980s, researchers were using the method more widely, and within Europe at least were commonly referring to the method as `stated preference techniques'. This has become a popular term, largely because of the clear contrast it portrays to `revealed preference techniques'. Sheldon and Steer (1982) provide an early publication outlining the use of the technique.

Prior to 1982, the emphasis of stated preference techniques had been on judgemental tasks, in which respondents were asked to rank or rate a number of attribute mixes associated with a particular choice context. However, it was not until the publication of a paper by Louviere and Hensher (1982) that stated preference techniques became better known. Louviere and Hensher's paper emphasised the use of stated preference techniques that incorporated choice experiments. Louviere (Louvicre, 1988) suggests that discrete choice presents a more realistic judgement for the respondent:

> *`One can design choice or allocation experiments to mimic real choice environments closely. This is important because individuals in real environments do not rank or rate travel alternatives; they choose one of them, or they choose not to choose any alternative'.(p.83)*

Louviere (1988) also suggests that choice experiments produce data that is easier to analyse: `Discrete choice tasks impose no order or metric assumptions on response data... ... choice experiments discussed by Louviere and Hensher (1982) and Louviere and Woodworth (1983) allow travel choice researchers to estimate choice models that are consistent with transport planning and, forecasting practice'.

As choice-based stated preference techniques are now probably the most commonly used (Pearmain *et al.*, 1991; Swanson, 1998; Louviere *et al.*, 2000). The performance of stated preference techniques when compared to revealed preference data was perceived as impressive, by the UK Department of Transport's Value of Time Project (MVA Consultancy *et al.*, 1987), and this resulted in the acceptance of the method by the Department of Transport. This influential acceptance had an important positive impact on the frequency of the method's usage in the UK. Since then, stated preference techniques have become widely applied within a variety of areas.

Whilst the techniques grew in their usage, some scepticism has remained about the reliance upon respondents' `stated intentions', rather than actual behaviour. Madden (1993) describes the scepticism that has been raised `concerning the application of analyses on `real world' policy':

> *'An important aspect of the risk is the concern that stated and revealed preferences may diverge systematically because of bias in subjects' responses or due to errors due to over complex experimental designs'.(p.69)*

In addition, further criticisms have been made of the underlying rational choice behaviour of respondents that is assumed in the design and analysis of stated preference experiments.

For this research from each economical valuation techniques one has been chosen. The Hedonic Pricing Model (HPM) from the revealed preference method and Choice Experiment (CE) from stated preference methods. Below each method is discussed individually.

4.6 The Hedonic Price Model (HPM)

In the endeavour to model the housing prices, one model that has been widely used is the hedonic price model. According to (Triplett, 1986), hedonic methods were developed and employed in price indices, long before their conceptual framework was understood. Bartik (1987) claimed that the first formal contributions to hedonic price theory were those made by Court in 1939, although there were other informal studies. Colwell and Dilmore (1999) claim that G. Haas (1922) and H. Wallace (1926) were the pioneers of the Hedonic Price method. Waugh in 1929 is also accredited by others (e.g. Palmiquist and smith, 2008) of being the first to establish the method, in his PhD thesis (Thanos 2008). Etymologically, the term “hedonics” is derived from the Greek word *hedonikos*, which simply means pleasure. In the economic context, it refers to the utility or satisfaction one derives through the consumption of goods and services.

Two main approaches which had a great contribute towards the theoretical work on hedonic prices are Lancaster's (1966) consumer theory and Rosen's (1974) model. They posit that a good possesses a number of attributes that combine to form bundles of utility-affecting attributes that the consumer values (Bartik, 1987; Willis and Garrod, 1992). Both of these approaches aimed to assign prices of attributes based on the relationship between the number of attributes and the observed prices of differentiated products.

HPM is a well-established technique that explains variation in a house price by differences in preferences for the attributes of properties in question. When the market is in equilibrium and consumers have perfect information about the goods available to them, the price which a potential consumer is willing to pay for a particular good may be attributed to the utility that they have for its component attributes. In the case of housing, the amount an individual is willing to pay (WTP) for a given property will depend upon the utility that he or she has for the various characteristics of the house (Willis *et al.*, 1997). The most common approach to HPM is to model house price directly as a function of the levels of various housing attributes and to assume that the coefficient of the estimated hedonic price function reflects buyers' WTP for those attributes. These coefficient values can then be used to derive the marginal WTP (implicit price) for a unit improvement in the level of that attribute. This is achieved by evaluating the partial derivative of the hedonic price function with respect to the attribute, while holding all other variables at their mean value. However, this approach will generally overestimate the benefits provided at the margin by the addition of further unit of an attribute (Harrison and Rubinfeld, 1978; Freeman, 1979; Freeman III, 1979).

A major empirical issue pertaining to the hedonic price model is the choice of the functional form. There are several basic functional forms such as linear, semi-log, and log-log forms that can be applied to the hedonic price model. An incorrect choice of functional form may result in inconsistent estimates (Goodman, 1978; Blomquist and Worley, 1981). Despite having a long history, the theory of hedonic pricing provides very little guidance on the choice of the proper functional form (Halvorsen and Pollakowski, 1981; Butler, 1982).

Rosen's (1974) model does not, *a priori*, specify a particular functional relationship between the attributes and commodities, although he adopted the "goodness-of-fit" criterion, and this was widely used in early empirical studies. The likelihood ratio test was used to compare the more restricted forms with the more complex forms derived from the Box-Cox transformation (Box and Cox, 1964). Many researchers prefer the Box-

Cox form, as the transformation process results in a better fit of the data (Rasmussen and Zuehlke, 1990). The flexible Box-Cox transformation can also be used to test the statistical validity of alternative hypotheses about functional form.

Cassel and Mendelson (1985), however, contended that the Box-Cox flexible form also has some shortcomings. For example, the many parameters estimated in the Box-Cox transformation reduce the accuracy of any single coefficient. Hence, the best fit criterion resulting from the likelihood ratio test may not lead to more precise estimates of the implicit marginal prices of housing attributes. Linneman (1980) found that the transformation cannot be applied to binary or dummy variables, because dummy variables are used with discontinuous factors.

Another controversial issue is that of market segmentation. Feitelson, Hurd, and Mudge (1996) noted that in theory, hedonic price studies do not require the segmentation of housing markets. However, in practice, several types of market segmentation are likely to exist in most markets. This is because housing markets are not uniform (Adair *et al.*, 1996; Fletcher *et al.*, 2000). Hence, it is unrealistic to treat the housing market in any geographical location as a single entity. Unfortunately, the definition, composition, and structure of sub-markets have not been given much attention in the hedonic-price literature, although it is an important empirical issue.

As a result, even though most studies have used location and political boundaries, or the demographic and socioeconomic characteristics of households such as race and income (Michaels and Smith, 1990), questions remain as to what characteristics best differentiate sub-markets, and how best to identify and measure these differences. This is because too broad a geographical definition of a housing market would result in biased estimates due to an improperly aggregated sample (Linneman, 1980). Conversely, if too narrow a definition (Straszheim, 1975; Schaffer, 1979) were used, it would give rise to imprecise estimates because the estimates were not based on all available information.

Another issue frequently associated with the hedonic price model is the misspecification of variables. Misspecification is the situation where an irrelevant independent variable is included (over-specification), or where a relevant independent variable (attribute of a product) is omitted (under-specification). As the hedonic price model deals with the implicit prices of quantities of attributes of a product, the problem of misspecification of variables is inevitable. Over-specification gives estimated independent variables that are both unbiased and consistent, but inefficient because of the inclusion of the irrelevant variable, whereas under-specification results in estimated coefficients that are both biased and inconsistent. Measurement errors may also arise if proxy variables are used in the hedonic price model when actual data are unavailable. Consequently, the results generated will be biased and inconsistent.

Concern about HPMs has centred on their ability to estimate the value of particular attributes rather than their ability to predict the overall price of the good. Follain and Malpezzi (1979) have shown that a simple specification of five to 10 structure variables (number of rooms, baths, etc.) produces about as good a fit as 40 variables. In other words, prediction of the dependent variable is not sensitive to the number of variables, given a reasonable reduced set and fit and an instrumental perspective on logic (Boland, 1979). This conclusion has also been demonstrated in a number of studies of British housing in which HPM estimates have been compared with the valuation of dwellings derived from other sources: estate agents estimates (Dodgson and Topham, 1990) and sale prices (Willis and Nicholson, 1991). However, when the focus is on individual implicit prices, specification is more critical (Butler, 1982; Ozanne and Malpezzi, 1985). The reasons for this include the assumptions in the theory, omitted variable bias, separability and the functional form of the model.

According to Butler (1982), since all estimates of hedonic price models are to some extent misspecified, models that use a small number of key variables generally would suffice. Mok et al. (1995) concurred that biases due to missing variables are small, and have negligible prediction and explanatory power on the equation.

A practical solution to the problem of missing variables, which may cause bias in the estimated coefficients, is to ensure that the data set used is homogeneous. When there is homogeneity, the use of the hedonic price approach is justified.

Another issue that Willis (1992) argues is that, although the theory of goods' characteristics or attributes has no logical flaws, its application is less than satisfactory, often involving deviations from model assumptions, and measurement and sampling errors in the data. The chief criticisms of the HPM centre on these assumptions and include:

- The conditions under which observed implicit prices can be assumed to reflect a household's marginal WTP for a particular level of environmental amenity; and
- The assumptions required to aggregate individual household's marginal WTP estimates to a market demand function (Harris, 1981).

The equality of the marginal WTP and the implicit price of that characteristic requires equilibrium in the housing market (Harris, 1981). Whether a competitive equilibrium exists is an empirical question. Given constraints on information, institutions and mobility of individuals, equilibrium cannot be realistically assumed at a point in time; but constraints may introduce random rather than systematic errors into WTP estimates (Freeman, 1979). Only systematic biases in estimates of WTP will produce erroneous hedonic price results.

HPMs will only reflect households' marginal WTP for a particular attribute if the measured level of the attribute corresponds to that perceived by the consuming household (Harris, 1981). This is more likely to affect the valuation of some attributes than others. In the case of chemical hazards, such as air pollution, radiation and water pollution, individuals are not likely to have full information on the physical levels of non-observable pollutants and their impacts on health. In such cases marginal WTP may under- or over-estimate (if biased perception exists) the true damage. However, for many attributes, such as pleasant views, this is unlikely to be the case, as the perceived attribute and its consequences are likely to be immediately apparent to the household.

HPM relies on the interpretation of a regression coefficient to represent WTP for any particular characteristic. This assumes the individual values the environmental characteristic independently of all other commodities he consumes (Price, 1990). This separability assumption, for example that the value of a block of green space is independent of topography, or that the amenity value of the size of a green space is independent of its shape, is clearly difficult to standardize for in practice (Pearce *et al.*, 1981). This renders the problem empirically difficult but not theoretically impossible.

4.6.1 The Hedonic Price Model an Application to the Housing Market

With regard to the empirical issues previously mentioned, the application of the hedonic price model to the housing market rests on several key assumptions. First, homogeneity of the housing product is assumed. This assumption, however, is arguable. It would be more accurate to view housing products as heterogeneous because they can be differentiated in terms of location, structural, neighbourhood attributes, or based on some other criteria as well, such as type of dwelling (bungalow, terrace house, high rise apartment, or condominium) and planning permission. In other words we can classify the attributes that relates to housing in to four categories, on which the potential consumer’s willingness to pay depends. These categories are:

- Physical characteristics: number of rooms, Bathrooms, utilities, age of the house, the condition of the structure, etc.

- Location and accessibility characteristics: access to public services, centres of employment, shops, etc.
- Neighbourhood and environmental characteristics: aspects, view, tree cover, road traffic, water frontage, etc.
- Property rights and planning characteristics: land with planning permission for higher value use, etc.

Another underpinning assumption is that the market operates under perfect competition, and there are numerous buyers and sellers. This assumption is justified as there are many buyers seeking housing in the market, and there are also many housing developers and individual sellers that supply the housing. Thus, no individual buyer or supplier can significantly affect the price of the properties because the purchases or sales of each individual unit constitute a negligible portion of the market.

Buyers, and developers and sellers, are deemed to have freedom to enter and exit the market. Unlike some other industries, such as the petroleum and aviation industries that may have to comply with certain requirements, there are neither constraints artificially imposed on the demand and supply of housing, nor restrictions on the resources used to produce the housing product. In practice however, there might be some budget constraints for the buyers. Likewise, for developers, only those with enough capital can contemplate property development.

The assumption that buyers and sellers have perfect information concerning housing product and price is quite reasonable, although one may still contend that perfect knowledge is impossible to achieve in reality. Buying a house involves a substantial capital outlay. Thus, buyers will endeavour to shop around to acquire as much information about the attributes of the units they desire before making the purchase. Most of the relevant information, such as availability of the housing unit, its price and attributes, is readily available in the newspapers, or can be obtained from brokers and real estate agents. As for suppliers, perfect knowledge of their core business and the market price enables them to increase their profits and utility, too. Also individual sellers have a choice of whether to put up their house for sale depending on their circumstances and market conditions at the time, to maximise their revenue from the sale. However, such perfect information may never be fully realized in practice.

Finally, the hedonic price model only works under the assumption of market equilibrium, and that there are no interrelationships between the implicit prices of attributes (Dusse and Jones, 1998). Market equilibrium is not plausible because there are imperfections in the real world property market. It is idealistic to assume that the price vector will adjust instantaneously to changes in either demand or supply at any point in time. The notion that there are no interrelationships between the implicit prices of attributes is also fallacious because it implies that the implicit price of an attribute does not vary throughout all areas and property types. It is not necessarily true that all attributes will give the same level of utility or identical levels of disutility to all buyers.

Despite these disputable assumptions, which involve substantial simplification and abstraction from a complex reality, the hedonic price model has been deployed extensively in housing market research (Ball, 1973; Freeman III, 1979; Leggett and Bockstael, 2000; Chau *et al.*, 2001). As astutely observed by Freeman, the data may be inadequate; variables are measured with error; and the definitions of empirical variables are seldom precise, but these do not render the technique invalid for empirical purposes.

The hedonic price approach does have its merits. Its main advantage is that one only needs to have certain information, such as the property price, the composition of housing attributes, and a proper specification of the functional relationships. The marginal attribute prices are obtained by estimating the parameters of the hedonic price function. It is a straightforward approach because only the coefficients of the estimated hedonic regression are needed to indicate the preference structure. No information whatsoever about individual characteristics or personal particulars of either the house buyers or the suppliers are required.

Ridker and Henning (1967) were credited as the pioneers who applied the hedonic price approach in residential properties. They investigated the relationship between air quality and property values, but it was Freeman (1979) who was noted for giving the first theoretical justification for the application of this technique to housing. Specifically, Freeman used the hedonic price equation to measure the marginal implicit prices and the willingness to pay for housing attributes, such as environmental quality.

Residential properties are multidimensional commodities characterized by durability, structural inflexibility, and spatial fixity (Chau et al., 2001; So et al., 1996).

Typically, the housing attributes are classified into locational attributes (L), structural attributes (S), and neighbourhood attributes (N). These attributes encompass both quantitative and qualitative attributes (Goodman, 1989; Williams, 1991).

The market prices (P) of the property can, therefore, be expressed as:

$$P = f\ (L, S, N) \qquad (5.1)$$

The partial derivative of the above hedonic function with respect to any attribute is the implicit marginal attribute price, *ceteris paribus* (Rosen, 1974). This implicit price of the housing attribute is revealed in the regression coefficient. All buyers perceive the amounts of attributes embodied in the housing product to be identical, but their subjective valuations of each component attribute may differ. The price of the house, then, is the sum of the implicit prices for the attributes that are contained in it. Thus, the hedonic price approach enables the possible influence of each of the many attributes on the house price to be tested and analysed.

A review of extant literature reveals that many past studies that employed the hedonic price model focused on locational, structural, and neighbourhood attributes. The following highlights these studies.

4.6.2 Locational Attributes

The location of a property has been conceived in most studies in terms of fixed and relative locational attributes. The fixed locational attributes (Follain and Jimenez, 1985; Orford, 1988) are quantified with respect to the whole urban area, and pertain to some form of accessibility measure. Relative locational attributes are quantified through surrogate measures such as socio-economic class, racial composition, aesthetic attributes, pollution levels, and proximity to local amenities (Dubin and Sung, 1990).

In the traditional view of location, accessibility is measured in terms of access to the Central Business District (CBD). Accessibility, in whatever form it has been measured, has some influence on housing prices (Ridker and Henning, 1967; McMillan *et al.*, 1992; Palmquist, 1992). Transport accessibility is frequently associated with the ease of commuting to and from amenities, and is measured by travelling time, cost of travel, convenience, and availability of different transport modes (So *et al.*, 1996; Adair *et al.*, 2000). Buyers tend to trade-off housing costs against transport costs, but this is not always true because Edmonds (1984) found that costs of commuting (fares) may not be capitalised into site value. His study in Japan found that it is customary for firms to reimburse employees for commuting. Thus, in that case, the only apparent “costs” of commuting were probably time and discomfort.

The positive influence of good public transport services on housing prices has also been empirically examined. So et al.’s (1996) study in Hong Kong on transport accessibility, measured by the distances to the nearest stations of the mass transit railway (MTR), buses, and minibuses, revealed a high dependence on public transport in the territory. Consequently, buyers were willing to pay more for properties with easy accessibility to work. Frequency of transport services is also important. Hence, minibuses were found to be the most influential determinant of house prices because they provide more frequent services than buses. Some even ply 24 hours on certain routes!

View is sometimes considered a residential amenity usually associated with the location of a dwelling site (Benson *et al.*, 1998). Numerous studies have indicated that buyers prefer sites with good views, such as lakes or golf courses, and are willing to pay a premium for such sites (Darling, 1973; Plattner and Campbell, 1978; Gillard, 1981; Cassel and Mendelsohn, 1985; Rodriguez and Sirmans, 1994; Mok, 1995).

Benson, et al. also noted that the view amenity may not be uniform; it varies by type (e.g., water view, mountain view, and valley view) and by quality (e.g., full view, partial view or poor partial view). Classifying the views as oceanfront, ocean view, partial ocean view, and no view, they discovered that, relative to no view, an ocean frontage adds 14.7 % to a property's selling price, an ocean view adds 32 %, and a partial ocean view adds 10 %.

So et al. (1996) found a strong correlation between view and floor level because higher floors have better views. Thus, apartment or condominium units on higher floors usually fetch a higher price compared to those on lower levels.

A review of some other studies reveals that the existence of a view is not always statistically significant, although there is generally a positive association of price and view (Brown and Pollakowski, 1977; Correll *et al.*, 1978). Brown and Pollakowski's study on the value of living near a lake in Seattle, Washington, found that a greater distance to the waterfront significantly reduces a property's selling price, but view was statistically insignificant. They justified this anomaly by the small sample sizes used. In Correll et al.'s examination of valley views, where views were classified as excellent, moderate, and no view, the relationship between view and price was statistically insignificant.

Not much research, though, has been conducted on cemetery views except for the works of Tse and Love (2000), who found that a cemetery view has a negative impact on a property's price in Hong Kong. Generally, dwellings that have a cemetery view are avoided. This is because the view of a cemetery is regarded by the Chinese as inauspicious as it connotes death and is definitely bad *feng shui* (geomancy).

Interestingly, there have been some studies that demonstrated the influence of *feng shui* beliefs in the power of “lucky” and “unlucky” properties. Bourassa and Peng (1999), who used sales transactions for 1989 to 1996, for example, found that lucky house numbers (e.g. 3, 6, 8, and 9) have significant positive hedonic prices and are capitalised into the sale prices of houses in Auckland, New Zealand. Chau, Ma, and Ho (2001) also found this to be true in the predominantly Cantonese society of Hong Kong. Their results, however, showed that lucky floor numbers (e.g. 8, 18, or 28) are sold at significantly higher premiums during periods of property boom than during property slumps

4.6.3 Structural Attributes

Prices of properties are frequently related to their structural attributes. As Ball (1973) pointed out, if a house had more desirable attributes than others, the valuation of these attributes would be reflected in higher market prices for this house. However, other researchers have noted that structural attributes preferred by buyers may not always be identical. Kohlhase (1991) found that the significance of structural attributes can change over time, and may vary between nations. While attributes relating to the number of rooms and floor area are relatively important across nations, other attributes change with the tradition of building style or the climate.

Numerous studies reveal that the number of rooms and bedrooms (Li and Brown, 1980; Fletcher *et al.*, 2000), the number of bathrooms (Linneman, 1980; Willis and Garrod, 1992), and the floor area (Rodriguez and Sirmans, 1994; Carroll *et al.*, 1996) are positively related to the sale price of houses. This is because buyers are willing to pay more for more space, especially functional space. Residential properties with bigger floor areas are desired by big families and buyers who can afford a better standard of living. For example, Garrod and Willis discovered that an additional room increases a property’s value by about 7 %, and an extra bathroom collecting twice that premium.

Researchers also surmised that building age is negatively related to property prices (Kain and Quigley, 1970; Straszheim, 1975; Rodriguez and Sirmans, 1994; Clark and Herrin, 2000). This is because *ceteris paribus*, older houses are worth less because they incur more costs in maintenance and repair, and also have decreased usefulness due to changes in design, electrical and mechanical systems (Clapp and Giaccotto, 1998). For example, Kain and Quigley’s study showed that a new structure sold for $3,150 more than an identical unit that was 25 years old. However, Li and Brown’s (1980) study found an opposite effect of age on some buildings. This increase in value was attributed to the historical significance or vintage effects of the buildings. This led Clapp and Giaccotto (1998) to conclude that there are two components to the age coefficient: a pure-cross sectional depreciation and obsolescence component, as well as a demand-side component that changes over time.

Other researchers claimed that lot size, the existence of a basement, garage (Forrest *et al.*, 1996), patio, water heating system, one or more fireplaces, and/or an air heating system are significantly related to the price of the dwelling (Li and Brown, 1980; Michaels and Smith, 1990; Willis and Garrod, 1992). For example, Garrod and Willis noted that a single garage adds a 6.9% differential and a double garage three times this amount, while central heating adds about 6.5% to the price of the house.

Although structural quantity has been well researched, there has been relatively little research on structural quality due to the difficulty in measuring objectively and precisely the physical and environmental quality of the properties (Kain and Quigley, 1970; Morris *et al.*, 1972). Morris et al. in their pilot study in San Juan, Puerto Rico, examined structural quality by using the dimension of availability of plumbing facilities and other service facilities such as cooking equipment, refrigeration, and lighting. They differentiated plumbing facilities into "inside, for exclusive use," "inside, shared," or "other." These measures, which reflected the quality of the dwelling without associating them with the locational or neighbourhood attributes, were found to be able to serve as proxies for measuring quality features. Kain and Quigley (1970) undertook the first major study to investigate the impact of housing quality on housing prices. They used measures such as condition of drives and walks, exterior structure, condition of floors, windows, walls, and levels of housekeeping. These quality features were found to have as much effect on the price of housing as the number of rooms, number of bathrooms, and lot size.

Chau et al. (2001) classified the physical conditions of the property such as size, floor level, age, and so forth as tangible attributes, whereas attributes such as accessibility, sea view, environmental quality, and developer's good will are regarded as intangible attributes. According to Chau et al., buyers are willing to pay about HK$416 more per square foot for properties constructed by large reputable developers. This is approximately 7% more than average housing prices.

4.6.4 Neighbourhood Attributes

Goodman (1989) argued that while neighbourhood attributes cannot be explicitly valued in the market place, they could be implicitly valued through hedonic pricing by comparing houses with differing neighbourhood qualities. Goodman's caveat that failure to model neighbourhood attributes can lead to substantive errors when valuing individual properties and the market in general, was validated by Linneman (1980). Linneman found that between 15 and 50 percent of the standardised variation in site valuations is attributed to neighbourhood attributes, and for structurally identical sites, as much as 100 percent of the differential in site valuations is induced by neighbourhood attributes. Kain and Quigley's (1970) study further demonstrated that higher income households with more education prefer to live in relatively high quality dwelling units located further away from the CBD.

In previous research, neighbourhood attributes have been variously classified as:

- Socio-economic variables (Willis and Garrod, 1992), e.g., social class of the neighbourhood (Richardson *et al.*, 1974) and the occupations of the inhabitants.
- Local government or municipal services, e.g., schools (Kain and Quigley, 1970; Jud and Watts, 1981; Clauretie and Neill, 2000), hospitals (Huh and Kwak, 1997), and places of worship (Carroll *et al.*, 1996).
- Externalities such as crime rates (Thaler, 1978), traffic noise (Williams, 1991), airport noise (Mieszkowski and Saper, 1978; Feitelson *et al.*, 1996; Espey and Lopez, 2000; Thanos, 2008), and shopping centres (Des Rosiers *et al.*, 1996).

For the socio-economic variables, Richardson et al. (1974) found that the social class of the neighbourhood has an impact on property values, although there may be other determinants. Ketkar (1992) observed that whites in New Jersey were inclined to be sensitive about the proportion of non-whites in their neighbourhoods. Other studies elsewhere have found that non-whites pay higher prices to purchase a house in white neighbourhoods (Ridker and Henning, 1967; Daniels, 1975)

In terms of local government services, the quality of public schools has been found to have a great impact on real house prices. School quality is more important to local residents (especially those with children) than either crime or environmental quality (Haurin and Brasington, 1996b; Clark and Herrin, 2000). The quality of schools has been measured in terms of school input variables, such as expenditures per pupil or average cost per student (Ketkar, 1992), student achievement levels or Standardised Aptitude Test (SAT) scores (Jud and Watts, 1981;Walden, 1990; Ketkar, 1992). Generally, higher test scores have a positive impact on property prices (Jud and Watts, 1981; Clauretie and Neill, 2000).

With respect to the hospitals, Huh and Kwak's (1997) study in Seoul revealed that hospitals exhibit a significant negative effect on property prices. The presence of a hospital is a liability in Seoul because of cultural norms in Korea. When someone dies in Korea, the corpse is placed in the hospital mortuary, and condolences are extended to family members and relatives for three days. Proximity to hospitals and health centres is not desirable due to the commotion that ensues including the nuisance value of ambulance sirens, the general congestion in the vicinity of hospitals, as well as superstitious beliefs.

Places of worship, such as churches, irrespective of denominations and size, are amenities that generally enhance the value of neighbourhood properties (Carroll et al., 1996). However, Do, Wilbur and Short (1994) reported an exception, and suggested that the presence of churches meant increased traffic and noise from church bells. Hence, property values in such "theocratic environments" were reduced.

Undeniably, buyers are wary of areas of high crime and vandalism. Using the percentage of persons aged between 16 and 21 years who are high school dropouts as a proxy measure for crime and vandalism, Li and Brown (1980) found that buyers do not favour areas associated with high rates of crime or vandalism. Clark and Herrin (2000) found that prices of properties in Fresno County, California are 7.28% lower in areas with each additional murder per 10,000 people. Crime has also been measured by other variables such as robbery, rape, aggravated assault, motor vehicle theft, and arson per 1,000 residents (Haurin and Brasington, 1996b).

There are also studies on the externality of noise from traffic and its effect on property values (Palmquist, 1992). However, the reaction towards noise, or quiet, is dissimilar among different groups of people. Palmquist provided evidence that in an upper middle class neighbourhood, property values were reduced by 0.48 % for each additional decibel of highway noise, whereas in a lower middle class neighbourhood, this value was 0.3 % per decibel. In the poorest neighbourhoods, the effect was even lower, only 0.08 % per decibel. This indicates that in the case of the very poor, their marginal willingness to pay for quiet is comparatively very low, or perhaps it is just due to their inability to pay.

Airport proximity can be both positive and negative. Tomkins, Topham, Twomey, and Ward (1998) found that the benefits of easy access to the airport and its associated transport infrastructure outweigh the costs. For instance, a standard dwelling located 2.5 km from the airport terminal commanded a price about 19% above one at the mean distance. Feitelson et al. (1996), however, found that beyond a certain "disturbance" level, buyers' willingness to pay declines to zero, as they are no longer interested in the properties. Espey and Lopez (2000) also found that there is a statistically significant negative relationship between airport noise and prices of properties in proximity to the Reno-Sparks airport, with houses where the noise level has been recorded at 65 decibels selling at $2400 less than homes in relatively quieter environments.

Proximity to shopping complexes and the size of shopping centres, have both been found to exert an influence on the value of the surrounding residential properties (Des Rosiers *et al.*, 1996). Proximity to a shopping centre could mean easy access to facilities, and reduced traveling costs, but this also might provide disadvantages in terms of noise pollution and congestion. Shopping centre size affects the utility of centres. Des Rosiers, et al. found that each additional shop adds about $27 to the market value of the properties in the vicinity of the shopping centre.

Not many of the previous studies have specifically examined the attribute of facilities on the valuation of properties. Only Mok et al. (1995) and Tse and Love (2000) indicated that the provision of facilities in large housing estates, such as a private clubhouse, swimming pool, landscaped garden, gymnasium, and various kinds of sports facilities tend to increase the prices of such properties. The reason could be recreational, since sports facilities are associated with quality living.

External benefits, including pleasant landscape, unpolluted air, serenity, quiet atmosphere, and the presence of urban forests have been empirically studied by Tyrvainen (1997) using apartment sales data for residents in North Carelia, Finland. On average, the results showed that the inhabitants appreciate green housing districts and accessibility to forested recreation areas. However, the effect of urban forests on prices of properties is non-linear, as nearby forests may lower housing prices when located too close, while their impact of increasing effect on price is dependent on their distance, size, and quality.

Chattopadhyay (1999), who conducted a study to gauge the willingness of buyers to pay for reduced air pollution, found that residents in Chicago were willing to pay for a reduction in the pollution level of particulate matter (PM-10) and sulphur dioxide. As for the quality of water, Leggett and Bockstael (2000) reported that water quality, which was measured based on the concentration of faecal coliform bacteria, has a significant effect on property values, too.

The significant negative impact of toxic waste sites on housing prices was validated by Ketkar (1992) and Kohlhase (1991). Ketkar, for example, found that if the number of hazardous waste sites in a municipality decreases by one, it leads to an increase in the median property value of $1255, or a rise of 2% in the property values.

4.7 Choice Experiment

Choice experiments are based on Random Utility Theory (RUT). RUT is derived from the work of Thurstone (1927) and states that decisions are based on paired comparisons of alternative goods and services. RUT also assumes that the respondent chooses the bundle of attributes or goods that yield the maximum utility (i.e., the respondent is a utility maximiser). However, RUT is versatile because it can account for individuals who appear to make variable choices in a decision making context through the inclusion of a random component. Lancaster (1966) expanded on this work and suggested that utility is derived by the bundle of attributes that goods consist of rather than just the overall good itself.

This method gives the value of a certain good by separately evaluating the preferences of individuals for the relevant attributes that characterize that good, and in doing so, it also provides a large amount of information that can be used in determining the preferred design of the good. In fact, choice experiments originated in the fields of transport and marketing, where it was mainly used to study the trade-offs between the characteristics of transport projects and private goods, respectively. Choice experiments have a long tradition in those fields, and they have only recently been applied to non-market goods in environmental and health economics. It is believed that applications of this technique will become more frequent in other areas of economics as well. Only recently has the aim of damage assessment in litigation shifted from monetary compensation to resource compensation. Therefore, identification and evaluation of the different attributes of a damaged good is required in order to design the preferred restoration project (Layton and Brown, 1998; Adamowicz *et al.*, 1998b). Choice experiments are especially well suited for this purpose, and one could expect this method to be a central part of future litigation processes involving non-market goods.

The first study to apply choice experiments to non- market valuation was Adamowicz et al. (1994). Since then there has been an increasing number of studies see e.g.(Boxall *et al.*, 1996; Adamowicz *et al.*, 1998a; Layton and Brown, 2000) for applications to environment, and e.g. (Ryan and Hughes, 1997; Vick and Scott, 1998) for applications to health. There are several reasons for the increased interest in choice experiments in addition to those mentioned above:

(1) Reduction of some of the potential biases of contingent valuation methods (CVM),

(2) More information is elicited from each respondent compared to CVM and

(3) The possibility of testing for internal consistency.

In a choice experiment, as well as in a CVM survey, the economic model is intrinsically linked to the statistical model. The economic model is the basis of the analysis, and as such, affects the design of the survey and the analysis of the data. In this sense, we argue that the realization of a choice experiment is best viewed as an integrated and cyclical process that starts with an economic model describing the issue to analyse. This model is then continually revised as new information is received from the experimental design, the statistical model, focus groups and pilot studies, etc.(Francisco *et al.*, 2001). More information about the design of a choice experiment, definition of attributes and levels, test of validity and sample and sampling strategy will be provided in the next chapter.

4.7.1 Design of a Choice Experiment

There are four steps involved in the design of a choice experiment: (i) definition of attributes, attribute levels and customisation, (ii) experimental design, (iii) experimental context and questionnaire development and (iv) choice of sample and sampling strategy. These four steps should be seen as an integrated process with feedback. The development of the final design involves repeatedly conducting the steps described here, and incorporating new information as it comes along. In this section, we focus on the experimental design and the context of the experiment, and only briefly discuss the other issues.

4.7.1.1 Definition of Attributes and Levels

The first step in the development of a choice experiment is to conduct a series of focus group studies aimed at selecting the relevant attributes. A starting point involves studying the attributes and attribute levels used in previous studies and their importance in the choice decisions. Additionally, the selection of attributes should be guided by the attributes that are expected to affect respondents' choices, as well as those attributes that are policy relevant. This information forms the base for which attributes and relevant attribute levels to include in the first round of focus group studies.

The task in a focus group is to determine the number of attributes and attribute levels, the actual values of the attributes, and respondents understanding of these attributes. As a first step, the focus group studies should provide information about credible minimum and maximum attribute levels. Additionally, it is important to identify any possible interaction effect between the attributes. If we want to calculate welfare measures, it is necessary to include a monetary attribute such as a price or a cost. In such a case, the focus group studies will indicate the best way to present a monetary attribute. Credibility plays a crucial role and the researcher must ensure that the attributes selected and their levels can be combined in a credible manner. Hence, proper restrictions may have to be imposed (see e.g. Layton and Brown, 1998).

Customisation is an issue in the selection of attributes and their levels. It is an attempt to make the choice alternatives more realistic by relating them to actual levels. If possible an alternative with the attribute levels describing today's situation should be included which would then relate the other alternatives to the current situation. An alternative is to directly relate some of the attributes to the actual level. For example, the levels for visibility could be set 15% higher and 15% lower than today's level (Bradley, 1988).

The focus group sessions should shed some light on the best way to introduce and explain the task of making a succession of choices from a series of choice sets. As Layton and Brown (1998) explain, choosing repeatedly is not necessarily a behaviour that could be regarded as obvious for all goods. When it comes to recreation, for example, it is clear that choosing a site in a choice set does not preclude choosing another site given different circumstances. However, in the case of public goods, such repeated choices might require further justification in the experiment.

A general problem with applying a choice experiment to an environmental good or to an improvement in health status is that respondents are not necessarily familiar with the attributes presented. Furthermore, the complexity of a choice experiment in terms of the number of choice sets and/or the number of attributes in each choice set may affect the quality of the responses; this will be discussed in Section 5.7.1.3. Basically, there is a trade-off between the complexity of the choice experiment and the quality of the responses. The complexity of a choice experiment can be investigated by using verbal protocols, i.e. by asking the individual to read the survey out loud and/or to think aloud when responding; this approach has been used in CVM surveys (Schkade and Payne, 1993). Thereby identifying sections that attract the readers' attention and testing the understanding of the experiment.

4.7.1.2 Experimental Design

Experimental design is concerned with how to create the choice sets in an efficient way, i.e. how to combine attribute levels into profiles of alternatives and profiles into choice sets. The standard approach in marketing, transport and health economics has been to use so-called orthogonal designs, where the variations of the attributes of the alternatives are uncorrelated in all choice sets. Recently, there has been a development of optimal experimental designs for choice experiments based on multinomial logit models. These optimal design techniques are important tools in the development of a choice experiment, but there are other more practical aspects to consider. We briefly introduce optimal design techniques for choice experiments and conclude by discussing some of the limitations of statistical optimality in empirical applications.

A design is developed in two steps: (i) obtaining the optimal combinations of attributes and attribute levels to be included in the experiment and (ii) combining those profiles into choice sets. A starting point is a full factorial design, which is a design that contains all possible combinations of the attribute levels that characterize the different alternatives. A full factorial design is, in general, very large and not tractable in a choice experiment. Therefore we need to choose a subset of all possible combinations, while following some criteria for optimality and then construct the choice sets. In choice experiments, design techniques used for linear models have been popular. Orthogonality in particular has often been used as the principle part of an efficient design. More recently researchers in marketing have developed design techniques based on the D-optimal criteria for non-linear models in a choice experiment context. D-optimality is related to the covariance matrix of the K-parameters, defined as

$$D - efficiency = \left[|\Omega|^{1/k}\right]^{-1} D - efficiency = \left[|\Omega|^{1/k}\right]^{-1} D - efficiency = \left[|\Omega|^{1/k}\right]^{-1}$$

$$D - efficiency = \left[|\Omega|^{1/k}\right]^{-1}$$

Huber and Zwerina (1996) identify four principles for an efficient design of a choice experiment based on a non- linear model: (i) orthogonality, (ii) level balance, (iii) minimal overlap and (iv) utility balance. Level balance requires that the levels of each attribute occur with equal frequency in the design. A design has minimal overlap when an attribute level does not repeat itself in a choice set. Finally, utility balance requires that the utility of each alternative within a choice set is equal. The last property is important since the larger the difference in utility between the alternatives the less information is extracted from that specific choice set. At the same time, this principle is difficult to satisfy since it requires prior knowledge about the true distribution of the parameters. The theory of optimal design for choice experiments is related to optimal design of the bid vector in a CVM survey. The optimal design in a CVM survey depends on the assumption regarding the distribution of WTP (Duffield and Patterson, 1991; Kanninen, 1993).

Several design strategies explore some or all of the requirements for an efficient design of a choice experiment. Kuhfeld et al (1994) use a computerized search algorithm to minimize the D-error in order to construct an efficient, but not necessarily orthogonal, linear design. However, these designs do not rely on any prior information about the utility parameters and hence do not satisfy utility balance. Zwerina et al. (1996) adapt the search algorithm of Kuhfeld et al. (1994) to the four principles for efficient choice designs as described in Huber and Zwerina (1996). In order to illustrate their design approach it is necessary to return to the MNL model. McFadden (1974) showed that the maximum likelihood estimator for the conditional logit model is consistent and asymptotically normally distributed with the mean equal to *b* and a covariance matrix given by:

$$\Omega = (Z'PZ)^{-1} = \left[\sum_{n=1}^{N}\sum_{j=1}^{j_m} Z'_{jn}P_{jn}Z_{JN}\right]^{-1}$$

$$Where\ Z_{jn} = X_{jn} - \sum_{i=1}^{j_n} X_{in}P_{in}$$

This covariance matrix, which is the main component in the D-optimal criteria, depends on the true parameters in the utility function, since the choice probabilities, in *P*, depend on these parameters.[4] Consequently, an optimal design of a choice experiment depends, as in the case of the optimal design of bid values in a CV survey, on the value of the true parameters of the utility function. Adapting the approach of Zwerina et al. (1996) consequently requires prior information about the parameters. Carlsson and Martinsson (2000) discuss strategies for obtaining this information, which includes results from other studies, expert judgments, pilot studies and sequential designs strategies. Kanninen (1993) discusses a sequential design approach for closed-ended CVM surveys and she finds that this approach improves the efficiency of the design. A similar strategy can be used in designing choice experiments. The response data from the pilot studies and the actual choice experiment can be used to estimate the value of the parameters. The design

[4]- This is an important difference from the design of linear models where the covariance matrix is proportional to the information matrix, i.e. $\Omega = (\mathbf{X'X})^{-1}\sigma^2$.

can then be updated during the experiment depending on the results of the estimated parameters. The results from these estimations may not only require a new design, but changes in the attribute levels as well. There are other simpler design strategies which do not directly require information about the parameters. However, in all cases, some information about the shape of the utility function is needed in order to make sure that the individuals will make trade-offs between attributes. An early choice experiment in environmental valuation that has adopted a D-optimal design strategy was that by Carlsson and Martinsson (2001). In a health economic application by Johnson et al. (2000) a design partly based on D-optimal criteria is applied.

Kanninen (Kanninen, 2001) presents a more general approach to optimal design than Zwerina et al. 1996). In her design, the selection of the number of attribute levels is also a part of the optimal design problem. Kanninen (2001) shows that in a D-optimal design each attribute should only have two levels, even in the case of a multinomial choice experiment, and that the levels should be set at the two extreme points of the distribution of each attribute.[5]Furthermore, Kanninen (2001) shows that for a given number of attributes and alternatives, the D-optimal design results in certain response probabilities. This means that updating the optimal design is simpler than updating the design presented in Zwerina et al. (1996). In order to achieve the desired response probabilities the observed response probabilities from previous applications have to be calculated, and a balancing attribute is then included. This type of updating was adopted by Steffens et al. (Steffens *et al.*, 2000) in a choice experiment on bird watching. They found that the updating improved the efficiency of the estimates.

There are several problems with these more advanced design strategies due to their complexity, and it is not clear whether the advantages of being more statistically efficient outweigh the problems. The first problem is obtaining information about the parameter values. Although some information about the coefficients is required for other design strategies as well, more elaborate designs based on utility balance are more sensitive to the quality of information used, and incorrect information on the parameters may bias the final estimates. Empirically, utility balance makes the choice harder for the respondents, since they have to choose from alternatives that are very close in terms of utility. This

[5] -The design is derived under the assumption that all attributes are quantitative variables.

might result in a random choice. The second problem is that the designs presented here are based on a conditional logit model where, for example, homogeneous preferences are assumed. Violation of this assumption may bias the estimates. The third problem is the credibility of different combinations of attributes. If the correlation between attributes is ignored, the choice sets may not be credible to the respondent (Layton and Brown, 1998; Johnson *et al.*, 2000). In this case, it may be optimal to remove such combinations although it would be statistically efficient to include them.

4.7.1.3 Experimental Context, Test of Validity and Questionnaire Development

In the previous section, we addressed optimal design of a choice experiment from a statistical perspective. However, in empirical applications there may be other issues to consider in order to extract the maximum amount of information from the respondents.

Task complexity is determined by factors such as the number of choice sets presented to the individual, the number of alternatives in each choice set, the number of attributes describing those alternatives and the correlation between attributes for each alternative. Most authors find that task complexity affects the decisions (Adamowicz et. al., 1998a; Bradley, 1988). Mazotta and Opaluch (Mazotta and Opaluch, 1995a) and Swait and Adamowicz (1996) analyse task complexity by assuming it affects the variance term of the model. The results of both papers indicate that task complexity does in fact affect the variance, i.e. an increased complexity increases the noise associated with the choices. Task complexity can also arise when the amount of effort demanded when choosing the preferred alternative in a choice set may be so high that it exceeds the ability of the respondents to select their preferred option. The number of attributes in a choice experiment is studied by Mazotta and Opaluch (1995) and they find that including more than 4 to 5 attributes in a choice set may lead to a severe detriment to the quality of the data collected due to the task complexity.

In complex cases, respondents may simply answer carelessly or use some simplified lexicographic decision rule. This could also arise if the levels of the attributes are not sufficiently differentiated to ensure trade-offs. Another possibility is 'yea' saying or 'nay' saying, where the respondent, for example, always opt for the most environmentally friendly alternative. Finally, lexicographic orderings may be an indication of strategic behaviour of the respondent. In practice, it is difficult to separate these cases from preferences that are genuinely lexicographic; in which case the respondents have a ranking of the attributes, but the choice of an alternative is based solely on the level of their most important attribute. Genuine lexicographic preferences in a choice experiment are not a problem, although they provide us with little information in the analysis compared to the other respondents. However, if a respondent chooses to use a lexicographic strategy because of its simplicity, systematic errors are introduced, which may bias the results. One strategy for distinguishing between different types of lexicographic behaviour is to use debriefing questions, where respondents are asked to give reasons why they, for example, focused on only one or two of the attributes in the choice experiment. Another strategy is to analyse responses across choice sets. However, in a thoroughly pre-tested choice experiment using focus groups and pre-tests, these problems should have been detected and corrected.

An issue related to task complexity is in the stability of preferences. In choice experiments the utility function of each individual is assumed to be stable throughout the experiment. The complexity of the exercise might cause violations of this assumption, arising from learning and fatigue effects. Johnson et al. (2000) test for stability by comparing responses to the same choice sets included both at the beginning and at the end of the experiment. They find a strong indication of instability of preferences. However, there is a potential problem of confounding effects of the sequencing of the choice sets and the stability of the preferences. An alternative approach, without the confounding effect, is applied in Carlsson and Martinsson (2001) in a choice experiment on donations to environmental projects. In their exercise, half of the respondents receive the choice sets in the order {A, B} and the other half in the order {B, A}. A test for stability is then performed by comparing the preferences obtained for the choices in subset A, when it was given in the sequence {A, B}, with the preferences obtained when the choices in subset A were given in the sequence {B, A}. This can then be formally tested in a likelihood ratio test between the pooled model of the choices in subset A and the separate groups. A similar test can be performed for subset B. By using this method Carlsson and Martinsson (2001) find only a minor problem with instability of preferences. Layton and Brown (2000) conduct a similar test of stability in a choice experiment on policies for mitigating impacts of global climate change; they did not reject the hypothesis of stable preferences. Bryan et al. (2000) compare responses in the same way, but with the objective of testing for reliability, and find that 57 percent of the respondents did not change their responses when given the same choice set in a two-part choice experiment. Furthermore, in an identical follow-up experiment two weeks after the original experiment, 54 percent of the respondents made the same choices on at least eleven out of twelve choice situations.

Another issue to consider in the development of the questionnaire is whether or not to include a base case scenario or an opt-out alternative. This is particularly important if the purpose of the experiment is to calculate welfare measures. If we do not allow individuals to opt for a status quo alternative, this may distort the welfare measure for non-marginal changes. This decision should, however, be guided by whether or not the current situation and/or non-participation is a relevant alternative. A non-participation decision can be econometrically analysed by e.g. a nested logit model with participants and non-participants in different branches (Blamey *et al.*, 2000). A simpler alternative is to model non-participation as an alternative where the levels of the attributes are set to the current attribute levels. Another issue is whether to present the alternatives in the choice sets as generic alternatives (A, B, C) or as labelled forms (National Park, protected area, beach). Blamey et al. (2000) discuss advantages of these two approaches and compares them in an empirical study. An advantage of using alternative specific labels is familiarity with the context and hence the cognitive burden is reduced. However, the risk is that the respondent may not consider trade-offs between attributes. This approach is preferred when the emphasis is on valuation of the labelled alternatives. An advantage of the generic model is that the respondent is less inclined to only consider the label and thereby focus more on the attributes. Therefore, this approach is preferred when the emphasis is on the marginal rates of substitution between attributes.

In the random utility model, unobservable effects are modelled by an error term and, in general, we assume that respondents have rational, stable, transitive and monotonic preferences. Also, we assume they do not have any problems in completing a choice experiment, and that there are no systematic errors, such as respondents getting tired or changing their preferences as they acquire experience with the experiment, i.e. learning effects. Internal tests of validity are designed to check these standard assumptions. These tests can be directly incorporated into the design of an experiment. There have been several validity tests of choice experiments in the marketing and transport literature, for example Ben-Akiva et al. (1992) and Leigh et al.(1984). The evidence from a large proportion of studies is that choice experiments generally pass these tests of validity. However, it is not obvious that these results carry over into choice experiments done in an environmental or health economic context. The reason is that these non-market goods in many respects differ from, for example, transportation, which is a good that most respondents are familiar with. It is therefore of importance to test the validity of choice experiments in the context of valuation of general non-marketed goods. Since there are few applications of choice experiments in valuation, few tests of internal validity have been performed.

In order to test for transitive preferences, we have to construct such a test. For example, in the case of a pair-wise choice experiment we have to include three specific choice sets: (1) Alt. 1 versus Alt. 2, (2) Alt. 2 vs. Alt. 3, and (3) Alt. 1 vs. Alt. 3. For example if the respondent chooses Alt. 1 in the first choice set and Alt. 2 in the second choice set, then Alt. 1 must be chosen in the third choice if the respondent has transitive preferences. Carlsson and Martinsson (2001) conduct tests of transitivity and they do not find any strong indications of violations. Internal tests of monotonicity can also be implemented in a choice experiment and in a sense tests of monotonicity are already built-in in a choice experiment as the level of an attribute changes in an experiment. Comparing the expected sign to the actual sign and significance of the coefficient can be seen as a weak test monotonicity. Johnson et al. (2000) discuss a simple test of dominated pair, which simply tests if a respondent chooses a dominated alternative.

4.7.1.4 Sample and Sampling Strategy

The choice of survey population obviously depends on the objective of the survey. Given the survey population, a sampling strategy has to be determined. Possible strategies include a simple random sample, a stratified random sample or a choice-based sample. A simple random sample is generally a reasonable choice. One reason for choosing a more specific sampling method may be the existence of a relatively small but important sub-group which is of particular interest to the study. Another reason may be to increase the precision of the estimates for a particular sub- group. In practice the selection of sample strategy and sample size is also largely dependent on the budget available for the survey.

Louviere et al. (2000) provide a formula to calculate the minimum sample size. The size of the sample, n, is determined by the desired level of accuracy of the estimated probabilities, $p\hat{}$. Let p be a true proportion of the relevant population, α is the percentage of deviation between $p\hat{}$ and p that can be accepted and a is the confidence level of the estimations such that: $Pr\ (|\ p\hat{}-p\ | \leq ap) \geq \alpha$ for a given n. Given this, the minimum sample size is defined as:

$$n \geq \frac{1-p}{pa^2}\ \Phi^{-1}\left(\frac{1+\alpha}{2}\right)..$$

Note that n refers to the size of the sample and not the number of observations. Since each individual makes r succession of choices in a choice experiment, the number of observations will be much larger (a sample of 500 individuals answering 8 choices sets each will result in 4000 observations). One of the advantages of choice experiments is that the amount of information extracted from a given sample size is much larger than, for example, using referendum based methods and, hence, the efficiency of the estimates is improved. The formula above is only valid for a simple random sample and with independency between the choices. For a more detailed look at this issue, see e.g. Ben-Akiva and Lerman (1985). In a health economic context, the availability of potential respondents can in certain cases be limited and hence the equation above can be used to solve for *a*, i.e. the percentage deviation between $\hat{p}$ and *p* that we must accept given the sample size used

4.8 Conditional logit model

The individual's utility function can be specified as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \qquad [1]$$

Where U_{ij} is the utility individual *i* obtains from alternative choice set *j*. This utility is known to the individual but not the researcher. The individual is assumed to choose alternative *j* over alternative *k* if $U_{ij}>U_{ik}$. The researcher observes attributes of the alternatives considered by the individual, and specifies a function, V_{ij}, relating these observed factors to the individual's utility. Since there are aspects of utility the researcher does not observe, ε_{ij} captures the factors that affect utility but not included in V_{ij}.

In the conditional logit model, if the *i*th consumer is faced with *J* choices, the utility of *j* is:

$$U_{ij} = \boldsymbol{\beta}'\mathbf{x}_{ij} + \varepsilon_{ij} \qquad [2]$$

Where $\mathbf{x}_{ij}$ includes characteristics of the good (*j*), and the characteristics of the individual (*i*), and ε_{ij} is a random component. It is assumed that the consumer (*i*) maximises his utility by selecting the choice set *j* from the set of choices *K* which provides the greatest utility. The conditional logit (CL) model estimates the probability that an individual chooses an alternative *j*, in relation to all other alternatives available.

4.9 Life Satisfaction approach; from classical economists to behaviour economists approach

Neighbourhood environmental quality and accessibility to services are important determinant of individuals' wellbeing and an important policy issue. Many countries are implementing policies and regulations to improve poor environmental conditions and equity in distribution of quality services. However, how do individuals value the services provided in a neighbourhood environment?

Life satisfaction approach (LSA), represents a new nonmarket valuation technique that has builds on the recent development of subjective well-being and quality of life research in economics. A common understanding in this field is that subjective well-being can serve as an empirical approximation to individual welfare. If this interpretation of subjective well-being measures is accepted, it becomes straightforward to value environmental goods: Environmental conditions, along with income and other covariates, can be taken into account in micro-econometric life satisfaction functions. The estimated coefficient for the environmental good offers, first, a direct valuation in terms of subjective well-being. Second, the estimated coefficients for the environmental good and income can be used to calculate the implicit willingness to pay (WTP) for the environmental good or constant trade-off ratios between the environmental good and income. In other words, the increase in income that would be necessary to compensate an individual for a given decrement in environmental conditions can be calculated.

This newly emerged approach stands in a long tradition and debate of research trying to measure individual welfare. Classical economists such as Bentham and Edgeworth believed that measurement of utility not only is possible but also could be used to improve the rationality of policy decisions. In contrast, today's mainstream economics completely abandoned this idea. Preferences are inferred from behaviour, above all from market behaviour. This poses obvious problems for environmental goods and other public goods for which no markets exist and for which individuals have limited incentive to disclose their true demand. Therefore, for a long time, economists have been very pessimistic as to whether it is possible to assess people's preferences for public goods: "The very essence of the public goods problem is that there is no way these preferences can be determined" (Due & Friedlaender 1973, p. 53).

In defiance of this negative view, economists developed ingenious ways to value environmental and other public goods. Essentially, two avenues have been pursued: Either people are asked to state their preferences in hypothetical contingent markets, or the preferences are inferred from behaviour as they are revealed in markets for private goods that are complements to or substitutes of the environmental good. Stated preference methods such as the choice experiment (CE) and revealed preference methods such as the hedonic method (HM) have been widely used in practice, both in the regulatory process and in litigation (Palmquist & Smith 2002, Carson et al. 2003). However, these methods suffer from well-known problems. The hypothetical nature of CE surveys may entail superficial answers and strategic behaviour. The HM, in contrast, yields biased results if housing markets are not in equilibrium because, for example, people are not fully informed or mobility is not costless.

The LSA aims at obviating several of these problems inherent in the standard methods or at least at offering a complementary approach. Importantly, the approach does not rely on an equilibrium assumption. Furthermore, individuals are not asked to value the environmental good directly but to evaluate their general life satisfaction. This is presumably a cognitively less demanding task, and there is no reason to expect strategic behaviour.

Although the LSA avoids some of the difficulties of previous valuation approaches, it depends on its own preconditions for a successful application. In particular, the validity of measures of subjective well-being, their inclusiveness, and their reference to the present situation are important. Moreover, reports of life satisfaction should have small measurement errors, should be interpersonally comparable, and should be available at a sufficiently large scale (at a sufficiently low cost).

4.9.1 The Basic Concept

The measurement of individual welfare, using data on reported subjective well-being, has made great progress and has led to a new field of subjective well-being research in economics. The LSA rests upon this new field of research and has begun to build an important pillar of its fruitful policy-relevant application.

In received economics, utility is what is maximized in consistent choice, a representation of preferences that are simply choice-connected rankings of outcomes. According to the axiomatic approach, individuals' choices provide all the information required to infer the utility of outcomes. Subjectivist experience captured by surveys is rejected as being not objectively observable and unscientific. However, this position restricts the questions that can be addressed. Most importantly, conceptions about individuals' preferences or utility functions remain vague, and the valuation of public goods is hampered. Revealed preference methods cannot be applied in all cases of interest, and non-use values leave no behavioural trace. It is, therefore, no coincidence that nonmarket valuation is a field in economics in which surveys have been widely used.

In recent economic research, new ways have been proven to approach individual welfare. Utility is again related to the original, Benthamite meaning of utility as the hedonic quality of experience, broadly construed to include satisfaction as well as pleasure. In many situations, the choice-based concept and the experience-based concept of utility coincide, but evidence also indicates that they may systematically diverge in some situations (Kahneman et al. 1997). Empirically, utility based on judgments of satisfaction and pleasure can be captured by measures of subjective wellbeing.

4.9.2 The Valuation Procedure

Granted that reported subjective well-being can serve as an empirically adequate and valid approximation for individual welfare, it is an obvious and straightforward strategy to directly evaluate public goods in welfare terms. Moreover, by measuring the marginal utility of a public good or the marginal disutility of a public bad, as well as the marginal utility of income, one can calculate the trade-off ratio between income and the public good.

The respective relationship can be stated in a simple, subjective well-being function:

$$SWB = f(x, y, \theta' z) \qquad (1)$$

Individual welfare in terms of subjective well-being depends on some good *x*, i.e., the environmental condition to be valued, income *y*, and a set $\theta' z$ of other individual-level and macro-level determinants of subjective wellbeing. Roughly speaking, a change in the nonmarket good of Δx is valued by Δy (corresponding to an implicit WTP) if this holds individual well-being constant. For a marginal change of *x*, the marginal WTP (MWTP) can be derived from totally differentiating Equation (1) and setting $dSWB = 0$:

$$\text{MWTP} = -dy = dx = (\delta f / \delta x)/(\delta f / \delta y). \qquad (2)$$

MWTP is invariant to any monotonic transformation of the subjective wellbeing function, i.e., no cardinal utility function is required. For the valuation of inframarginal changes of a nonmarket good x, two measures exist: First, the compensating variation is the amount of income necessary to keep the individual at the original or ex ante level of subjective well-being when a change in environmental conditions occurs. Second, the equivalent variation is the change in income necessary to attain the level of subjective well-being as if a change in environmental conditions occurred, i.e., the ex post level for a hypothetical change in environmental quality.

To calculate the relevant welfare measures, a subjective well-being function such as Equation 1 can be estimated as an ordered discrete-choice model applying ordered logit or ordered probit regressions. Although the estimated coefficients from these models have no meaningful interpretation (as they refer to an underlying latent variable), ratios between any two coefficients can be interpreted. Therefore, the coefficients for the nonmarket good x and income y can be employed to calculate the marginal rate of substitution or the MWTP and welfare measures for inframarginal changes. Thus, it is not necessary to assume cardinality.

For applications with individual panel data, ordinary least squares (OLS) estimations that allow one to control for individual-fixed effects are attractive. There is some evidence that assuming cardinality and using OLS make little difference for estimating ratios between coefficients (whereas taking into account individual heterogeneity makes a large difference) (Ferrer-i-Carbonell & Frijters 2004).

A common specification of an empirical subjective wellbeing function is the following:

$$LS_{i,j,t} = \beta_0 + \beta_1 x_{j,t} + \beta_2 \log(y_{i,t}) + \beta' z_{i,j,t} + \rho_j + \tau_t + I_i + \varepsilon_{i,j,t} \qquad (3)$$

In this specification, $LS_{i,j,t}$ stands for reported life satisfaction as a specific measure of subjective well-being of individual i in location j in time t. Equation 3 is a linearized version of Equation 1 up to the log of income term $\ln(y_{i,t})$. A log of income specification presumes that the monetary value of change in environmental conditions is measured as a fraction of an individual's income. This implies that people with a higher income are prepared to give up more income in absolute terms for some improvement in environmental quality. This is equivalent to imposing a decreasing marginal utility of income. Vector z again captures other individual-level and macro-level determinants. Finally, ρ_j is a set of region or location-fixed effects taking into account unobserved time-invariant factors, τ_t is a set of time-fixed effects capturing unobserved location-invariant factors, I_i are individual-fixed effects, and $e_{i,j,t}$ is an error term.

So far, the LSA is presented without any interaction between the quality of the environment and other determinants of subjective well-being that are taken into account in the empirical analysis. In particular, market forces are expected to lead to upward wage pressure and a downward pressure on rents for housing in locations where the environmental quality is bad. These are the two most fundamental channels through which people are compensated for adverse environmental conditions. Accordingly, Equation (1) would need to be extended to include income as a function of x, i.e., $y(x)$, and rents as one of many other factors in z to depend on x, i.e., $z(x)$. Obviously the aspect of (partial) compensation is relevant for the interpretation of measured partial correlations between environmental conditions and subjective well-being.

4.9.3 Comparison with Standard Methods

In economics, environmental valuation is typically based on preferences stated in hypothetical markets or on preferences revealed in the demand for marketed goods (e.g., Freeman 2003). In this section, we discuss the two most prominent methods—the CE and the HM—and their inherent problems, in particular those that the life satisfaction approach obviates.

4.9.3.1 Stated Preference Methods: The Choice Experiment Method

The CE is a survey-based technique of nonmarket valuation. Respondents are asked directly what they would be willing to pay for a change in an environmental amenity. This is often an unfamiliar situation and gives rise to problems of strategic responses. Therefore, the credibility, validity, and reliability of results based on the CE are the subject of heated controversy in economics. Scepticism is based largely on the empirically observed embedding effect (Kahneman & Knetsch 1992), which refers to several interrelated regularities in CE surveys, i.e., the insensitivity of expressed WTP to the scale and scope of the public good, as well as sequencing and subadditivity effects. Critics see the embedding effect as evidence for the nonexistence of individual preferences for the public good; individuals receive positive feelings from expressing support for good causes, and accordingly the survey process creates the values it seeks to reveal (Diamond & Hausman 1994). However, meta-analyses find significant sensitivity to scale and scope (Smith & Osborne 1996), and according to proponents, the sequencing and the subadditivity effects can be explained in terms of substitution effects and diminishing marginal rates of substitution (Hanemann 1994, Carson et al. 2001). Furthermore, a number of guidelines have been developed to assure credibility, validity, and reliability. Most important among these guidelines are the presentation of adequate information, the choice of a credible (hypothetical) method of public good provision and payment mechanism, and the use of the referendum format (or alternative discrete-choice methods) (Hanemann 1984, Arrow et al. 1993, Portney 1994).

Nevertheless, the two basic problems of the CE are difficult to overcome. The hypothetical nature of the questions asked and the unfamiliarity of the task often entail superficial answers and symbolic valuation in the form of attitude expression (Kahneman et al. 1999b). Similarly, the problem of strategic behaviour can be addressed only to a limited extent. The LSA is not affected by either of these problems. It does not rely on respondents' ability to consider all relevant consequences of a change in the provision of a public good. In fact, people may not even consciously notice a relationship between environmental conditions like fine particulate matter in an urban region and their subjective wellbeing. It suffices if they state their own life satisfaction with some degree of precision. This considerably reduces subjects' cognitive burden and costs of information processing. Moreover, there is no reason to expect strategic behaviour because the researcher makes an ex post connection between life satisfaction and the environmental good. One might argue that a respondent exposed to a negative externality, anticipating that his or her reported life satisfaction is used to value the externality, strategically reports an overly low life satisfaction. Although theoretically possible, this problem is most likely to be of minor importance in practice. Life satisfaction data are usually collected for a multitude of purposes, and the same data can be used to value a wide array of (environ- mental) goods. This multiplicity of purposes effectively prevents strategic biases.

4.9.3.2. Revealed Preference Methods: The Hedonic Method

The HM invokes the assumption of weak complementarily between an environmental good and a private good such as housing and can be used if the former is a qualitative characteristic of the latter. In such a situation, the housing market functions as a market for the environmental good, and information on environmental-good demand is embedded in the prices and consumption level of housing. House price differentials between locations with different environmental conditions serve as implicit prices for the environmental good. In equilibrium, they correspond to the individuals' MWTP for the environmental good (Rosen 1974, Roback 1982).

The main problems of the HM arise from its dependence on the equilibrium assumption. This assumption is met only if there are a sufficiently wide variety of houses, if prices adjust rapidly, if households have full information, and if transaction and moving costs are zero.

These conditions are often violated, and consequently WTP estimates are biased. For example, if mobility is costly, the true value of a change in an environmental amenity is greater than the house price effects imply. Consider the case of an exogenous improvement in service accessibility in a particular region. The accessible services attract new residents, and as a consequence, costs of housing rise until a new equilibrium are reached. Without mobility costs, the change in the costs of housing fully reflects the value of accessible services. However, if migration is costly, a person will move to the region with improved services only if the services compensates him or her for both the higher rents and the cost of moving. To estimate the full WTP in the presence of migration costs, Bayer et al. (2009) developed an alternative discrete-choice approach that models household decisions directly and does not rely on the equilibrium condition. They used their approach to value air quality [total suspended particulate (TSP)] in U.S. metropolitan areas in 1990 and 2000. The estimated annual MWTP for the median household income amounts to between $309 and $384 (in 2007 U.S. dollars). By comparison, the MWTP estimated with the conventional hedonic model is only $114. Their results thus suggest that conventional hedonic models underestimate the WTP for clean air by a factor of approximately three. In contrast to the HM, the LSA explicitly captures individual welfare in the absence of market equilibrium. In the case of public goods, for which it is useful to distinguish between expected benefits and materialized benefits and for which the effects on life satisfaction are identified on the basis of the latter, the LSA can recover the full utility consequences independently of the degree of capitalization in the housing and labour market. For all other public goods, compensating variation in the private markets has to be accounted for. If they are not, the LSA captures only the residual effect. Anticipating one of the main conclusions, the discussion suggests that, if anything, the LSA works best if there is no market equilibrium.

As with mobility costs, incomplete information of households are likely to bias the hedonic estimates downward. To correctly anticipate the effect of an environmental disamenity such as service proximity at a particular location, a prospective house buyer or renter requires adequate knowledge of type of service and adequate information about quality of it. Distorted risk perceptions may bias hedonic estimates in either direction because people may underestimate or exaggerate the risk of low quality. In contrast, incomplete information about prevailing pollution levels invariably attenuates price gradients toward zero (Pope 2008b). Several studies suggest that individuals' information void on location-specific amenity levels and the resulting downward bias in hedonic estimates may be large. Brookshire et al. (1985) and Troy & Romm (2004) find no price discounts for properties in areas with elevated risks of earthquakes and flooding before laws that require sellers of property to disclose information on earthquake and flood risks have been passed. However, these researchers find large and significant price discounts after the passage of such laws. Similarly, Pope (2008a) finds the introduction of mandatory disclosure requirements to increase the marginal valuation of airport noise by 37%.

Distorted perceptions are of particular importance for the capitalization of health effects. Smith & Huang (1995) provide evidence consistent with the notion of incomplete capitalization of health effects. Benefit estimates for improvements in air quality in selected U.S. cities based on dose-response functions and value-of-statistical-life estimates are at least four times higher than benefit estimates based on hedonic studies. Smith & Huang (1995, p. 223) conclude that "hedonic models are more likely to reflect aesthetics, materials and soiling effects, and, to some degree, perceived health effects, but the latter may well be incomplete."

A conceptual problem of revealed preference methods is that individuals' behaviour in private markets always reflects expected future risks (even if expectations are based on current or past risks). In contrast, in most applications of the LSA, the welfare consequences of risks are identified primarily on the basis of actual events, i.e., when the risk materializes. The LSA is, therefore, less affected by distorted risk perceptions. As mentioned above, the LSA can also capture effects of externalities that affect individuals' life satisfaction through a process unnoticed by the individuals themselves. For example, it can capture the welfare consequences of health effects, even if individuals are ignorant about the causes. Moreover, most survey respondents are long-term residents in a particular location, and they are arguably better informed about prevailing pollution levels than are prospective house buyers and renters who consider moving to that location. This is not to say that perceptions are irrelevant for the LSA. To the extent that perceptions of local pollution levels enter into individual welfare judgments, distorted risk perceptions affect life satisfaction estimates as well. However, the above discussion suggests that distorted perceptions are more important for the HM than for the LSA.

4.9.4 Utility Miss-prediction and Valuation

The systematic divergence of two basic concepts of utility also challenges the standard methods. The traditional axiomatic approach in economics holds that the choices made by individuals provide all the information required to infer the utility of outcomes. People, on average, correctly predict how they value some outcome. This first concept of utility is the basis for the revealed preference methods for valuing the environment. The same presumption with regard to the accurate prediction of utility also underlies stated preference methods. There is now more evidence in both hypothetical and real markets that individuals miss-predict their future feelings (Kahneman & Thaler 2006, Frey & Stutzer 2008). This finding undermines a tenet of the revealed preference approach. Utility miss-prediction is due to a combination of incorrect intuitive theories about the determinants of happiness, incorrect beliefs regarding the speed and degree of adaptation, a difference in saliency of various aspects between the moment of prediction and the moment of experience, and a focusing illusion (for a discussion of these effects in the specific context of the CE, see Loewenstein & Schkade 1999, Kahneman & Sugden 2005, and Dolan & Kahneman 2008). Moreover, these deviations and discrepancies are most likely in complex decisions with long-term trade-offs (Camerer et al. 2005), i.e., nearly all decisions of policy relevance. Therefore, the second utility concept underlying the LSA emphasizes individuals' judgments of experiences ex post, for example, as reflected in measures of reported life satisfaction. With this concept, systematic prediction errors are expected to bias valuations of alternatives less.

4.9.5 Relationship between the Hedonic Method and the Life Satisfaction Approach

There is some disagreement in the literature about the relationship between the HM and the LSA and about what effects of environmental quality can be identified with the LSA. Whereas some economists compare estimates based on the HM with estimates based on the LSA and, thus, implicitly or explicitly see the two methods as substitutes that measure the same thing (e.g., Dolan & Metcalfe 2008), others argue that the methods are complementary and that the estimates from the two methods have to be combined (van Praag & Baarsma 2005, Luechinger 2009). The intuitive explanation underlying the second position is that—according to the premise of the HM—people exposed to negative externalities are compensated in the housing market. The markets compensate people for the costs of self-protection measures, for the costs of locally financed public measures as well as for any direct utility costs associated with these measures, for higher-risk premiums for insuring themselves against damages, and for all non-insurable and non-avertable losses. Therefore, this compensating variation has a countervailing effect on individual welfare. In the market equilibrium, rents must adjust to equalize utility across locations otherwise; some individuals would have an incentive to move (Roback 1982). If the equilibrium assumption held and people were fully compensated, we would find no effect of an environmental disamenity on life satisfaction in a life satisfaction regression with the environmental disamenity as an explanatory variable. However, as discussed above, migration costs and informational asymmetries may prevent full capitalization, in particular in the short run. The LSA captures these residual shadow costs of environmental conditions.

So far, the discussion refers to cross-section analyses, but the same argument can be made for panel analyses. Utility is equalized across regions at every point in time but not necessarily across time. However, changes over time are usually captured by time-specific effects. Thus, panel data capture only the residual effect. Of course, in a panel setting, the focus is on changes in environmental conditions. Compensation of these changes is likely to be less pronounced, and the residual effect may capture a great part of the overall effect. Nevertheless, conceptually, it is still a residual effect, and the two methods remain complements.

An exception is environmental conditions for which it is useful to distinguish between expected benefits or costs and materialized benefits or costs, i.e., environmental risks such as the risk of flooding. In the case of risks, compensating variation in the housing market is based on expected risks. If the underlying probabilities are stable, the compensating variation is captured by region-specific effects. By the same token, the fixed effects reflect all utility costs of insurance, protection measures, and self-protection measures. In applications of the LSA with panel data, the effect of risks is accordingly identified on the basis of actual events, i.e., if the risk materializes. Therefore, the full utility losses or, more precisely, the full non-insurable and non-avertable losses, can be recovered. In this situation, the HM and the LSA are substitutes.

4.9.6 Applications

The LSA can be used to value a wide range of different public goods and bads and negative and positive externalities. For example, the LSA has been used to value climatic conditions (Frijters & van Praag 1998, Rehdanz & Maddison 2005, Becchetti et al. 2007, Brereton et al. 2008), airport noise nuisance (van Praag & Baarsma 2005), proximity to infrastructure (Brereton et al. 2008), urban regeneration schemes (Dolan & Metcalfe 2008), droughts (Carroll et al. 2009), floods (Luechinger & Raschky 2009), crime (Cohen 2008), and terrorism (Frey et al. 2010).

4.10 Advantages and disadvantages of HP, LS and CE

4.10.1 Advantages of the HP

- The method's main strength is that it can be used to estimate values based on actual choices.
- Property markets are relatively efficient in responding to information, so can be good indications of value.
- Property records are typically very reliable.
- Data on property sales and characteristics are readily available through many sources, and can be related to other secondary data sources to obtain descriptive variables for the analysis.
- The method is versatile, and can be adapted to consider several possible interactions between market goods and environmental quality.

4.10.2 Disadvantages of HP

- The scope of environmental benefits that can be measured is limited to things that are related to housing prices.
- The method will only capture people's willingness to pay for perceived differences in environmental attributes, and their direct consequences. Thus, if people aren't aware of the linkages between the environmental attribute and benefits to them or their property, the value will not be reflected in home prices.
- The method assumes that people have the opportunity to select the combination of features they prefer, given their income. However, the housing market may be affected by outside influences, like taxes, interest rates, or other factors.
- The method is relatively complex to implement and interpret, requiring a high degree of statistical expertise.
- The results depend heavily on model specification.
- Large amounts of data must be gathered and manipulated.
- The time and expense to carry out an application depends on the availability and accessibility of data.

4.10.3 Advantages of LS

The LS approach to environmental evaluation yields several advantages over standard valuation methods (Welsch, 2002). Compared two revealed preference techniques the happiness framework does not rely in perfectly functioning housing and labour markets as the hedonic model and it is not restricted to capturing recreational values as the travel cost model (Ferreira and Mirko, 2010). In comparison to stated preference methods, the advantages of the life satisfaction approach relate to the non-hypothetical nature of the happiness data, the relative ease of the cognitive task and the fact that values are measured implicitly and independently of a valuation scenario. These features allows the life satisfaction approach to overcome hypothetical bias and sensitivity to survey context and framing problems which are strong caveats questioning the validity of stated preference techniques (Schläpfer and Nick, 2006). Finally, contrary to standard approaches that assume individuals have knowledge and preferences over different states of the environment, happiness data are capable of revealing all the factors that may affect individual utility, even those that respondents are not consciously aware of.

4.10.4 Disadvantages of LS

The life satisfaction approach is nevertheless based on a series of assumptions regarding the nature of the happiness data on which the method's credibility critically relies. Specifically, the approach assumes that subjective well-being data provide information regarding the individual's global evaluation of her life and that this evaluation is comparable across individuals (Frey *et al.*, 2009). An additional concern is that variables such as income, employment and marital status that are commonly included as exogenous variables in a life satisfaction equation may in fact be endogenous.

4.10.5 Advantages of CE

The main advantages of CE in relation to other SP techniques include:

- It is useful to see CE as a natural generalization of a binary discrete choice contingence valuation (CV). A binary discrete choice CV study (change or no change) cannot value the attributes of the change (or the attributes of the policy or project leading to the change). The only way that a CV study can estimate these attributes is to design different valuation scenarios for each level of each attribute. This is clearly very costly. Choice experiments, because they look at more than two alternatives, provide a natural way to do this.
- CE does a better job than CV in measuring the marginal value of changes in the characteristics of environmental goods. This is often a more useful focus from a management/policy perspective than focussing on either the gain or loss of the good, or on a discrete change in its attributes. 'Useful' here might mean more generalizable, and therefore more appropriate from a benefits transfer viewpoint For example, a

forest may be described in terms of the value of its species diversity, recreational facilities, age diversity and shape. Given that forest management decisions are often concerned with potential changes in these attributes, then knowing the marginal value of these attributes is beneficial. Whilst CV can be applied to estimate attribute values, it is clumsier and generates values which are less easily generalised. Since CE models are based on the attribute theory of value, they are much easier to pool with either site choice travel cost models or hedonic price models than is CV. CE designs can reduce the extreme multicollinearity problems in models based on variations in actual attribute values across sites which troubles revealed preference analysts, where for example water quality, expected fish catch and scenic beauty might all move together. In CE designs, in contrast, attribute levels are usually designed as orthogonal (that is, independent). CE also has advantages over travel cost approaches in that whilst the latter is restricted to modelling choice over existing attribute levels, CE can be used to study preferences for attribute levels beyond the existing. This could include species re-introductions, water quality improvements beyond maximum existing level and changes in access prices beyond the range currently observed. It is for this reason that CE has been used in transport research to look at new modes, infrastructure and service levels that may not currently exist.

- CE may avoid some of the response difficulties in CV. For example, dichotomous choice designs in CV may still be subject to yea-saying despite improvements in design standards (Blarney *et al.*, 1999). There are two views on why yea-saying occurs. First, there is the classically defined survey research yea-saying: that is, saying yes because one sees it as the socially desirable response. The second view on yea-saying relates to strategic behaviour, for example, if an individual has a valuation of £20 and is asked if he would pay £100, then he may still say yes, since that is the only way he can register an environmental vote and he knows that the £100 will not be collected from him. (Note that a typical double-bounded design would not avoid this problem). CE does avoid this problem, since respondents get many chances in the interview to express a positive preference for a valued good over a range of payment amounts. Open-ended CV designs avoid the yea-saying problem, but are viewed as facing respondents with a mental task which may be very difficult. This leads to item non-response or random responses. CE face respondents with a much easier problem: do I prefer A, B or neither?

4.10.6 Disadvantages of CE

CE has been very widely applied in the fields of transport and marketing, but experience in environmental and other related contexts is still fairly limited. Several problem areas seem to be important:

- In order to estimate the value of an environmental good, as distinct from a change in one of its attributes, it is necessary to assume that the value of the whole is equal to the sum of the parts. For example, Hanley *et al.* (1998) calculate the· value of the Environmentally Sensitive Areas programme, with a linear utility function, as the sum of the values of its component parts. This clearly raises two potential problems. First, there may be additional attributes of the good not included in the design which generate utility: in practice, these are captured in the constant terms in the estimated model. Second, the value of the 'whole' is indeed additive in this way. Elsewhere in economics, objections have been raised about the assumption that the value of the whole is indeed equal to the sum of its parts. In order to test whether this is a valid objection in the case of CE we need to be able to compare 'whole' values from CE with values obtained for the same resource using some other technique (such as CV). In the transport field, research for London Underground and London Buses among others has shown clear evidence that whole bundles of improvements are valued less than the sum of the component values, all measured using CE (Gleave, 2000). It is now common to include a CE exercise in questionnaires designed to estimate the 'capping' value of such bundles and to use ad hoc methods to re-scale individual valuations when valuations are being applied in appraisals. This has become known as the ' packaging problem'.
- As is the case with CV, welfare value estimates obtained with CE are sensitive to study design. For example the choice of attributes, the levels chosen to represent them, and the way in which choices are relayed to respondents (for example, through the use of photograph pairs) may all impact on the values of estimates of consumers' surplus and marginal utilities.
- Choice/rank complexity can be a problem for the respondents. Swait and Adamowicz (1996) found an inverted V-shaped relationship between choice complexity and variance of underlying utility amounts; whilst Mazotta and Opaluch (1995b) found that increased complexity leads to increased random errors. Bradley and Daly (1994) have found that respondents become fatigued the more choices they are presented with, whilst Hanley et al. (2000) found that value estimates for outdoor recreation changed significantly when respondents were given eight rather than four choice pairs. Ben-

Akiva and Morikawa (1990) and Foster and Mourato (1998) found evidence of inconsistent responses that increase as the number of rankings increase. This implies that, whilst the researcher might want to include many attributes, and also interactions between these attributes, unless very large samples are collected, respondents will be faced with daunting choice tasks. This may lead them into re lying on short-cuts to provide answers, rather than solving the underlying utility-maximisation problem.

- It is more difficult for CE (or any other CM approach) than for CV to derive values for a sequence of elements implemented by policy or project. Hence, valuing the sequential provision of goods in multi-attribute programmes is probably better undertaken by CV.
- CV and CE can both generate results that are consistent with welfare theory. Contingent ranking can also generate welfare theory-consistent results, if 'do-nothing' is included as an option so that the respondents are not forced to rank the other options. On the other hand, contingent rating is not widely used in economic valuation mainly due to the dubious assumptions that need to be made in order to transform ratings into utilities. These assumptions relate either to the cardinality of rating scales or to the implicit assumption of comparability of ratings across individuals.

4.11 Concluding Remarks

In this section it was mentioned that an efficient urban management system should employ the appropriate approach to find the gaps between What is and What should be and sufficiently deliver useful organizational results for different planning elements, policy or decision making procedures. economic evaluation techniques have been have been found a more reliable approach over the Holistic planning approach and other alternative approaches such as place spirit and place emotional attachment where due to the ambiguity of the specifications of concepts in these approaches. Different categories of economic valuation methods were distinguished and it was mentioned that both stated and revealed preference techniques can be used for welfare analysis of environmental quality changes (Adamowicz et al., 1994). The techniques can be employed to the welfare economic proposition derived from the random utility model to estimate the economic value of the improvement in environmental quality. Because the stated preference and revealed preference are both based on random utility model, results can be compared from the approaches.

However, the LSA as a complementary approach aims at obviating several of these problems inherent in the standard methods or at least at offering a complementary approach. Importantly, the approach does not rely on an equilibrium assumption. Furthermore, individuals are not asked to value the environmental good directly but to evaluate their general life satisfaction. This is presumably a cognitively less demanding task, and there is no reason to expect strategic behaviour.

The LSA emphasizes public goods and externalities as determinants of individual welfare and thus complements our understanding of people's preferences as derived from research on subjective well-being in economics. Subjective well-being data can be used to value public goods and hence that the LSA expands economists' toolbox in the area of nonmarket valuation. This same approach also allows researchers to test the underlying assumptions of the standard nonmarket valuation techniques. For example, the negative relationship between life satisfaction and air pollution indicates that air pollution is incompletely capitalized. Thus, the HM understates the value of clean air. However, the problem of undercapitalization is likely to be more severe for externalities that are rapidly changing and that have important indirect effects than for stable and salient risks. Having said that it was concluded that LSA overcomes the problem of CE strategic behaviour problem and respondents' ability problem in considering all relevant consequences of a change in the provision of a public good. In addition LSA overcomes the conceptual problem of revealed preference methods in future risk of individuals' behaviour in private markets in addition LSA in contrast to the HM explicitly captures individual welfare in the absence of market equilibrium. Therefore, this thesis will use each method to evaluate accessibility to urban services. This will provide a valid base to compare the outcomes and validate the results.

Chapter 5: Methodology

5.1 Introduction

This chapter describes and explains the methodology deployed in this study. It starts with a clarification of the focus and objectives of this study and what has been mentioned in the previous chapters, followed by research questions and sub-questions. Later, the Chapter provides an overall methodological approach and justification. It explains the data collection instruments, design objectives, and the data collection procedures, including the sampling issues and pilot study. Finally, the validity and reliability of the methods is argued, followed by discussion of methodological issues and problem for this research.

In Chapters 1, I argued that **rapid growth** in urban population is the cause of many problems such as neighbourhood degradation, increased road traffic socio-economic deprivation and inequities in health, well-being and health care accessibility etc. especially for large cities. I also discussed that how these problems can affect the QoL **and the issue of SD** in that communities and emphasised on developing countries and how urbanization in these countries is different compared to developed countries and that preventive policies are doomed to failure in controlling the urbanization process. I also indicated that, there is a consensus that, to confront this problem in under developing countries, **efficient urban management** is required to tackle and solve the problems of urbanization, especially for mega cities in these countries.

In Chapter 2, I explained that so far, science has **not** advanced a **comprehensive framework** to address the issue of QoL and SD in an integrated manner, to enable an evaluation of physical, spatial and social indicators. However, this research suggests that **UEQ** and QoL are very much **related** to each other and a better understanding of the meaning of UEQ can be studied within the context of QoL research **using objective and subjective** measures. Therefore, by understanding UEQ a better understanding of QoL is not far-fetched. It was also mentioned that **UEQ is SD's objective** in the steering of societal change, especially through changes in the way the economy functions; therefore UEQ is the key common point between SD and QOL. Therefore, by studying UEQ not only we can reach to level of understanding but also we can explain the **connection between QoL and SD**. Having said that, it is the research hypothesis that **urban services** are the key to enhance UEQ, which leads to the issue of better QoL and the promotion of SD in a city.

In chapter 3, it was explained how services entered into cities development through **theories of regional development** (with more economical base) and its effect on **economic growth** and increase of **employment opportunities**. Alternatively, due to complexity and extensively of the service sector, and to narrow down the discussion, it was mentioned that this research is looking at those services that can influence the **quality of life** and promote SD, assuming that they are benefiting from a standard level of sustainability themselves, as Bryson et. al (2004) categorised.

Finally in chapter 4. I have explained the importance of using economic valuation techniques providing adequate information about the different approaches and mentioned which techniques are being used in this study.

Having summarized and explained the highlights of the previous chapters, the conceptual framework for this research can be concluded in Figure 5.1.

As was explained previously, this conceptual framework is based on the findings from the literature. Understanding this framework facilitates the process of choosing the relevant methodology for this research. The conceptual framework is described as the system of concepts, assumptions, expectations, beliefs and theories that supports and informs the topic of the research (Miles and Huberman, 1994). Therefore, the conceptual framework, or so called "theoretical framework" or "idea context", in a broader sense includes the actual ideas and beliefs about the studied phenomena. It shows the plan of study and helps to refine and access the research goals and objectives, develop realistic and relevant research questions and select appropriate methods. Sometimes the conceptual framework can be referred as *research theory,* however tentative or incomplete it may be.

The "research problem" or the "research question" is a part of the conceptual framework (although it is often treated as a separate component of a research design). The research questions function to justify the importance of the study and clarify the problem that is going on in the world. It helps to understand and adequately know how to deal with this problem.

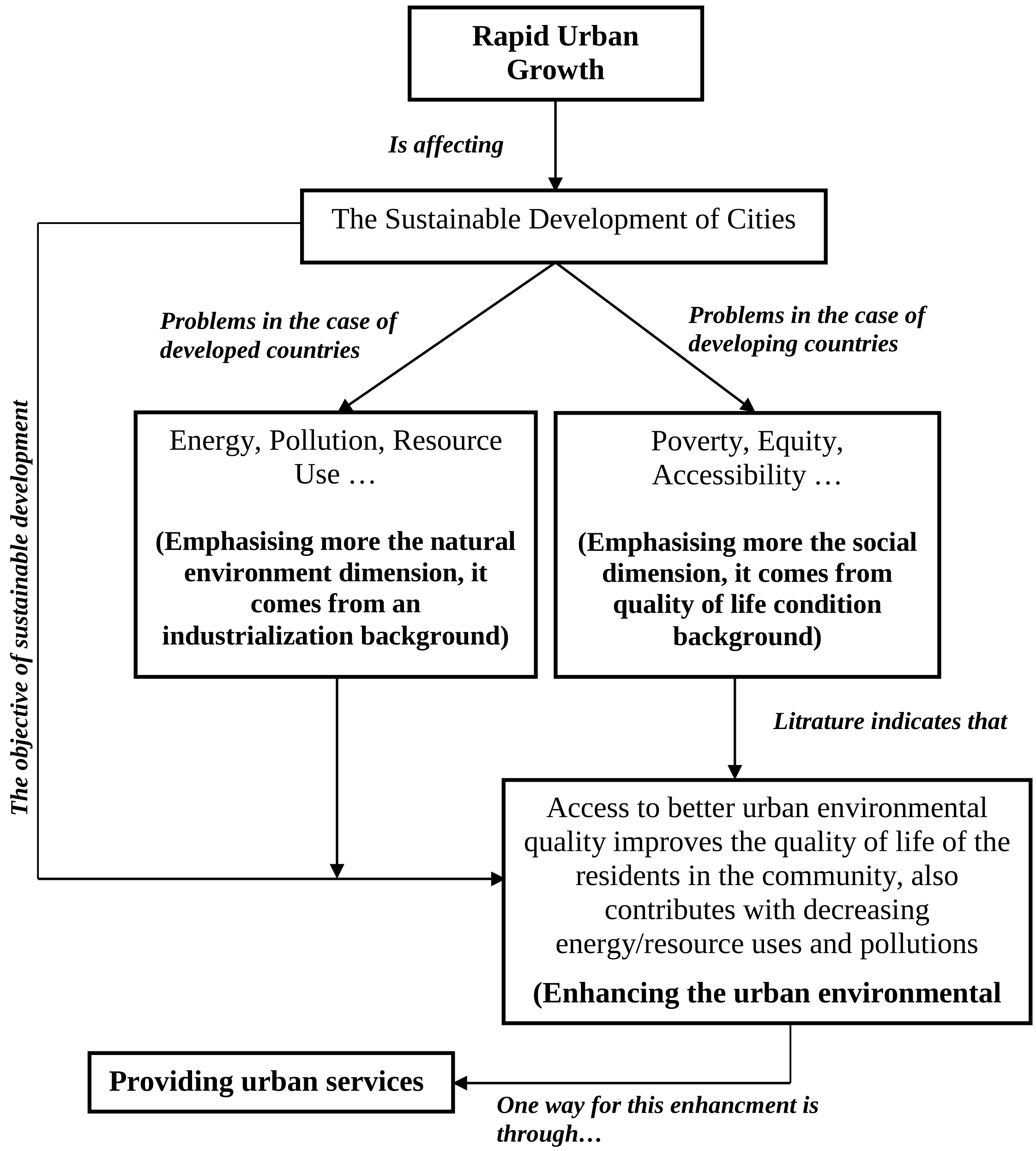


Figure 5.1 Research Conceptual Framework

However, the main research question is followed with two sub-questions mainly related to the hypothesis and the role of urban services, which by answering them, solving the main question well become less problematic. These sub-questions are:

These questions can be summarized as questioning three different sequence of time, starting from the Past phase, knowing and understanding the current situation in Shiraz and the policies that have been taken into account, towards the topic of this research. Present phases, assessing the value of urban services in promoting UEQ in Shiraz. Finally, the Future phase, identifying the role and responsibilities of Shiraz residents and governments in making the right policies and required participation in cities improvement and promotion towards a sustainable development which requires knowing the answers of the previous phases.

5.2 Methodological Approach

Carrying out a successful evaluation is very much dependent on choosing the methodology to go about doing it. Different methodologies represent a different approach towards evaluation of the research. There are three main forms of research types;

- Exploratory research, which helps to define and identify a problem or a question, it is commonly used to answer “what” questions.
- Constructive research, which tests theories and proposes solutions to a question or a problem
- Empirical research, which tests the feasibility of a solution and gaining knowledge by means of direct and indirect observation or empirical experience.

Choosing the most appropriate method depends on the type of research question. With a clear question in mind, it is possible to start working out which methodology to choose. Whereas, in this research the issue of rapid population growth and its effect on QoL and SD is something that have never been experienced in the past, therefore this research can be categorised as a form of *empirical research*.

Essentially, empirical studies use two types of indicators to evaluate the QoL research (as the case of this research) (Seik 2000; Pacione 2003). One type is that of quantitative indicators (objective indicators), which are used to measure concrete aspects that relate to environmental, economic or social conditions of a specific urban services or centre, based on statistical data. An important strand in this kind of study uses singular indexes to summarise the evaluations of a defined set of characteristics of urban services or an area (Giannias 1998; Burnell and Galster 1992). The other type of empirical study that should be mentioned comprises qualitative data (subjective indicators), obtained from field surveys, where citizens are asked their subjective “opinion” regarding the various fields of quality of life. Many researchers combine the two qualitative and quantitative forms to gain better results and outcomes.

In order to answer this research sub-question, different methods will be used. A combination of qualitative and quantitative methods is applied accordingly for each phase. In addition this research will use primary and secondary data as required data sets to analysing each section. The following pages describe the type of methodology and data required for this research.

5.3 Past phase: Social, Economic and Environmental Status of Shiraz City and its Current policies toward them.

Planning for the future requires some observation on past. Understanding large areas of human behaviour requires measuring socio-economic and environmental status when conducting an empirical research. In the next chapter this research will look inclusively on some economic, environmental and social indicators of Shiraz city and observe their strength and weakness of current and past policies. During this process, necessary data are obtained from different sources and then efficiently and comprehensively analysed and the results are presented in an easily understandable form. Wang and Hofe mentioned that:

> *"The rationale for such a process is that public policy and decision makers derive their decisions based on the anticipated future from knowledge about the present and the past of a community. The three-step procedure—data collection, analysis, and presentation have the goal of accurately presenting the information to reflect what has happened and what may happen. (2007)P.11*

They continue and argue that information is the interpretation of the data. Data should be summarized into a form that people can easily understand what they represent. Wang and Hofe illustrated in their book "Research Methods in Urban and Regional Planning" the process of converting data into information that is shown in Figure 5.2. There are large quantities of data. Each data value describes one feature of the object which we are interested in. Data aggregation summarizes data into groups in order to reduce the data quantity to manageable categories. Data analysis explores and describes the distribution patterns within a category and the relationships between the categories to generate information. Finally, the presentation process applies various forms of media and formats to inform the analytical results to the audience.

Data can be divided into two types—quantitative and qualitative. We can simply interpret the two data types as numeric and nonnumeric data (Babbie, 2004). The characters of the object of interest are described as Qualitative data, also called categorical data. Quantitative data are numerical values, which can be further divided into continuous and discrete data (Robert and Kuby, 2004). Continuous data have decimals and discrete data are integers. Continuous data are measures of certain features, such as the amount of residential land in a county measured in square kilometres. Discrete data normally are related to counts, such as the female population in a county. Different data types represent the variations of a variable with different detail levels, which is called level of measurement. There are four different levels of measurement, nominal, ordinal, interval and ratio, respectively from lowest to highest and different extents of measuring variation is required for each level.

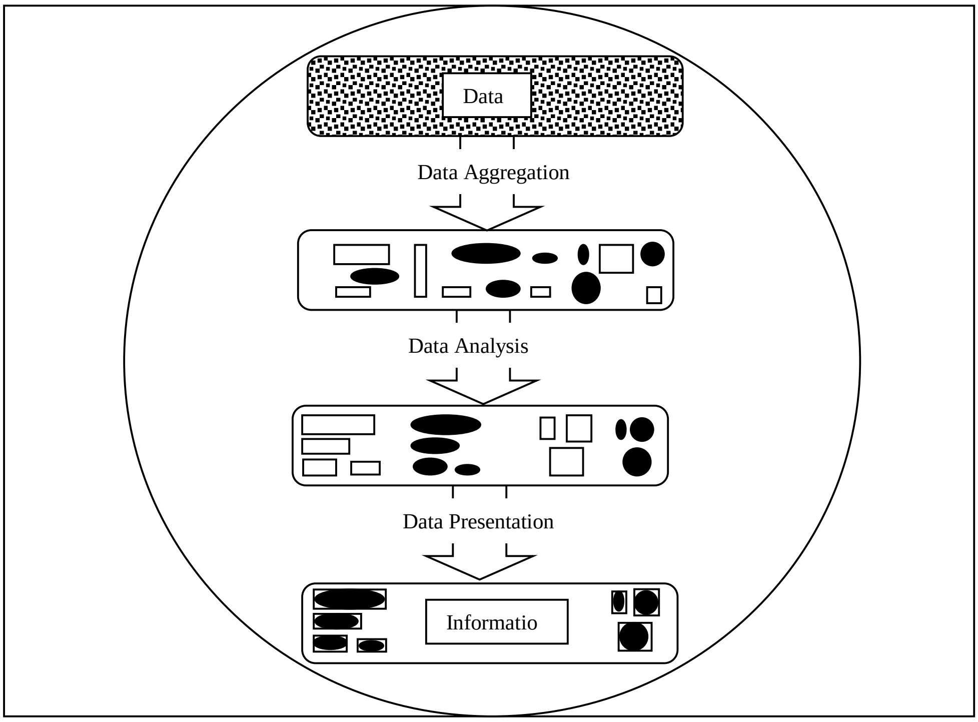


Figure 5.2 The process of converting raw data into information

Source: The book "Research Methods in Urban and Regional Planning" By Xinhao Wang and Rainer vom Hofe P. 12

This phase will use a combination of primary data available such as number of services in the city, area per capita of each service, maps of service areas of walking distance of 500, 800 and 1200 meter to services available in the city etc. and some secondary data using questioners and interviews that are extracted from individuals to assess their QoL and life satisfaction.

By emphasizing individual analysis, subjective approaches to urban quality of life tries to measure the satisfaction level of citizens regarding their life framework, and collect a "perception" based on the personal and introspective experience of each person. With respect to methodology, the assessment of the level of satisfaction of individuals is made based on the conducting of interviews and surveys, which directly collect subjective opinions. Interpretations are made through a cognitive mental exercise in which each individual expresses his/her level of satisfaction or dissatisfaction with respect to references and implicit or explicit standards in terms of welfare and conditions of his/her life (Dissart and Deller, 2000; Lever, 2000).

For many authors, the use of this type of subjective measure presents serious limitations. Veenhoven (2002) has systematised some of the main arguments which often are invoked to explain their limited use:

(a) These are unstable measures. The perceptions of individuals vary substantially in time and this variation cannot by any means be explained by the change of actual conditions.

(b) These are incomparable measures. Criteria, values, life experiences, the very mental scales vary from person to person and this, results in an obvious impossibility to compare subjective evaluations.

(c) These are unintelligible measures. Since the process which determines the evaluation that each individual makes about his/her global or relative quality of life in a certain area is very complex and involves, as proved by studies carried out in the field of psychology, mechanisms of a cognitive/rational nature, but also mechanisms of affection and emotions, it is not possible to support these evaluations.

(d) Besides this type of limitations, it frequently happens that the perceptions of individuals are not directly related to the objective situation upon which they base their perception. A good example is personal income. The level of satisfaction concerning their financial condition does not have a direct relationship to their actual income, but is rather mainly determined by their aspirations and their courses of life (Cummins, 2000)

Notwithstanding the validity of this type of reasoning, the idea that has been gaining ground is that the combination of both approaches (objective and subjective) is the most promising perspective for a more complete evaluation of urban quality of life. An initial advantage mentioned by those who value the participation of citizens is that the acquisition of information about the importance which they give to the different fields concerning quality of life represents an important support for policy definition and for the establishment of long term goals shared by the community. Additionally, concerning the evaluation of the impact that certain policies and interventions carried out aiming at promoting a better quality of life may have generated, it is becoming more certain that the thorough review of objective indicators does not abrogate the importance of collecting a direct feedback from the recipients of those measures, who are the citizens. Besides this type of added value, it is important to highlight the relevance of using subjective measures in the cases where the objective indicators are limited in their ability to capture the realities intended for evaluation. An interesting example is the global measure of housing quality, which can be rendered easier by the degree of satisfaction expressed by the very residents than by means of one or even several numerical parameters. In a general way, these surveys concerning the perception of the individuals look for answers to the following kind of questions:

– Which are the aspects and the fields that should be considered for the subjective evaluation of the quality of life? Which is the relative importance of each one in terms of its capacity to influence life conditions?

– Which is the level of global satisfaction with the quality of life? And which is the appreciation made concerning the different aspects and fields? Normally, the answers to these questions are crossed with demographic and social indicators in order to better interpret and understand the opinions of the citizens and, in particular, to permit some conclusions to be associated with specific groups (age, professions, ethnic background) of residents or users of an urban centre. (Santos *et al.*, 2007)

5.4 Present phases, assessing the value of urban services in promoting UEQ in Shiraz

In almost every city, some neighbourhoods are more pleasant to live in than others. Different consideration such as *safety,* adequate *street lightning*, the presence of *green spaces*, access to public *transportation, educational* and *health* facilities, etc. exemplifies this assessment. This phase calls attention to how different urban services affect overall urban environmental quality and QoL with the ultimate goal of developing operational indexes to measure the effect on urban life. Praag and Carbonell (2010) have argued that an index can be used to compare the amenities offered by different neighbourhoods within a city and their contribution to citizen's QoL. Then a better understanding of the type of urban policies that are most favourable for citizen's QoL can be differentiated. Such amenities and dis-amenities that are not bought directly on the market, but presumably are important for life quality, range from air quality to safety and include aspects of environmental quality. Praag and Carbonell (2010) point out that:

> *"Under certain assumption, those and other urban features should be reflected in* ***housing prices****" (p.66)*

The sale or rental prices of housing in a city are a synthesis of how the market values certain characteristics or attributes, not only those of a house itself but those of its surroundings. **Housing prices** therefore are a good synthetic measure of the quality of urban life that residents may enjoy, provided that those prices reflect all of the city's characteristics that have an effect on well-being and QoL. In addition home and city satisfaction are two of many dimensions that people may implicitly take into account when they evaluate their overall QoL. Here is where life satisfaction comes into play. Although life satisfaction cannot be measured as the price of house, it can be fairly well estimated using a simple QoL survey. Life satisfaction is a synthetic measure of the recognition that each person gives to all aspects of their live including the home and the city in which they live. Life satisfaction depends on different factors, such as income, health, family situation, and working conditions. It is also influenced by the quality of *urban environment*. Until recently economists focused mainly on private variables such as health satisfaction (Ferrer-i-Carbonel Ada and Bernard M.S. van Praag, 2002; Oswald Andrew and Nattavudh Powdthavee, 2007), relative income (Easterlin Richard A., 1995; Ferrer-i-Carbonel Ada, 2005; Clark Andrew E. *et al.*, 2008), and life satisfaction impact of one's own income or work conditions (van Praag Bernard M.S., 1971; Clark Andrew E. and Andrew J. Oswald, 1994; Di Tella Rafael *et al.*, 2001). However, economists have often excluded other highly relevant factors that are difficult to measure and frequently are not included in data sets at hand. These factors which cannot be bought on the market have been ignored on the grounds that traditionally they are within the research field of other behavioural sciences. Nonetheless, these factors have an undeniable effect on QoL. Although this is a very new field of study, particularly in Iran, different methodologies are proposed to researchers, however looking at a similar work by Lora et al., (2010a) that has recently been published by The Inter-American Development Bank and World Bank. The combination of the Hedonic Pricing (HP) and Life Satisfaction (LS) approach is proposed as a methodological framework for interpreting this study, the results of which will be compared to a second approach using a Choice Experiment (CE) method. An explanation of each approach and its relation to one another is now provided.

5.4.1 Hedonic Pricing Method (HPM)

As explained in the previous chapter, the hedonic approach has a long tradition in placing monetary values on the welfare impact of city amenities and public goods. The location in which a family decides to live reflects their preference regarding to a set of characteristics pertaining to the house purchase or rented, the neighbourhood where the house is located, and the amenities and services that are offered in that neighbourhood. A reasonable public transportation system can increase the accessibility of a location although it may be far from the destination. Parks and green areas can form the aesthetic aspect of the matter; they can also decrease pollution as well. This examples show the relation between the locational attribute and urban services. Thus, a good neighbourhood will be perceived as a desirable place to live when it provides peace tranquillity and security for it residents. This happens when police station is nearby or other daily urban services (e.g. parks, schools, banks, post office, etc.) are in reasonable proximity to the residential location. Therefore the HPM is a suitable method to assess the role of urban services in the housing price in order to observe the pros and cons of public service and their location in a city; to make the city a more sustainable place and environment in which to live.

Having said that, a feature of the hedonic approach is that it only assumes an ordinal utility function. Using the ordinal assumption only does not allow for translating an income gain into a utility gain; nor does it allow for interpersonal comparison of level of QoL and wellbeing.

Here is where the life satisfaction (LS) approach comes into play. That approach does not assume that the individual is at any time observed in his optimum in a perfect market. Moreover, the LS approach allows for both ordinal and cardinal satisfaction measurements.

5.4.2 Life Satisfaction Approach

The term LS was coined by Clark and Oswald (1994), with predecessors in van Praag (1971), Easterlin (1974) and so-called Leyden School. The approach asks individuals how *satisfied* they are with their life or how *happy* they are. The rationale for this approach is evidence that each individual evaluates their satisfaction from life as a whole. For these evaluations, questions can be from verbal categories, such as “unsatisfied”, “acceptable” and “very satisfied”; or it may use an ordinal scale for example 0 as worse conceivable situation to 10 as conceivable situation. Demonstration has been provided that these measurements are well correlated with various aspects of behaviour related to happiness. Individuals that are happy according to this measurement also are measured happy by their friends and families and express positive emotions more frequently and are more optimistic, social and extroverted.

So far no uniformity exists on how to phrase satisfaction questions. Respondents may be asked how happy or satisfied they are with life in general or they may also be evaluated by asking about other aspects of their life domains, such as financial situation, housing, health etc. Although there are different wordings of satisfaction questions, in practice the results are fairly well comparable.

LS evaluation depends on a set of variables explaining the individual's situation such as age, marital status, income, employment, family size, health, travel distance to work etc. in short, a vector of X of K different variables $X_1,\ldots,X_K$. These can be called dimensions or aspects of an individual's life situation. Some of these aspects or dimensions can be influenced by the respondents themselves for example number of working hours and travel time to work. Others, like gender, age… cannot be changed by the individual. In addition, urban and environmental features like safety, climate and cleanness variables can be included in LS evaluation.

LS is a relatively new method of placing a value on public goods. This method corresponds more closely to stated-preference approach. The method uses the marginal utility of a public good as well as the marginal utility of income to calculate the trade-off between income and public goods such as urban services (the implicit price).

LS has certain advantages over hedonic pricing. First, because the LS approach is not based on observed behaviour, the underlying assumptions are less restrictive and non-use values can be measured to some extent. Furthermore, individuals are not asked to value the public good directly, but to evaluate their general subjective satisfaction. Arguably, this task is less cognitively demanding and does not allow for strategic behaviour - two issues that have been critical and problematic in affecting contingent valuation methods.

In the basic empirical analysis of the LS approach, a micro econometric happiness function is estimated in which an individual's utility is approximated by self-reported subjective well-being. Income and socioeconomic variables are the explanatory variables. Proximity to different neighbourhood and city services and amenities (or dis-amenities) could be included. The typical regression has the following form:

$$LS_{ij} = a + b\,y_{ij} + c\,age_{ij} + d\,age_{ij}^{\,2} + e\,fs_{ij} + g\,H_{ij} + h\,Z_{ij} + v_{ij} \qquad (1)$$

Where *y*, *age*, and *fs*, respectively, represent income, age, and family size of individual *i* living in neighbourhood *j*. H and Z, respectively are two vectors of housing and neighbourhood characteristics. The error term $v_{ij} = n_i + z_j$ is a composite error term that combines a neighbourhood-specific error component,z_j and a house-specific error component, n_i. Empirical applications of this approach consistently have found that income has positive effect on life satisfaction (*b* positive) and that age has a negative but decreasing impact (*c* negative and *d* positive).

Table 5.1 summarizes significant factors that influence LS in Latin American cities published by the World Bank and the Inter-American Development Bank (Lora *et al.*, 2010a).

Characteristics	Factors
Housing Characteristics	Numbers of rooms, Quality of Floors, Satellite TV services, Quality of Floors
Neighbourhood Characteristics	Security during the day, Sidewalk condition, Cultural and sports activities, Amount and quality of green areas, Robbery, Condition of streets, Safety, running water, Street lights, Traffic, Evaluation of neighbours, Quality of garbage collection, quality of telephone services, Average education in the neighbourhood, Distance to main or connector street.
Socioeconomic Characteristics	Income, Age, Marital status, Family size, Health variables

Table 5.1 Significant factors that influence LS in Latin American cities

Apart from judging which housing and neighbourhood characteristics are particularly important, the LS approach can be used also to place a value on living in a neighbourhood or on a particular house or neighbourhood characteristic. Because income influences life satisfaction along with certain characteristics (say, the condition of street) the trade-off between greater income and 'better street' can be used to estimate the value of improving streets. At no point do interviewed people actually express how much they are willing to pay for these characteristics. The LS approach is particularly helpful, therefore, because it can be used to value amenities that do not yet exist or for which no market price is available.

The LS approach then provides one possible route to determining which amenities actually are considered valuable, to placing values on those characteristics, and to monitoring the valuation over time to see if they change as socioeconomic developments occur and as the characteristics of cities change.

5.5 The Relationship between the Hedonic and LS Approaches

Van Praag and Baarsma are the first authors to suggest the complementarities between the two methods in 2005. In order to explain the relationship between the two methods, an example is provided for convenience. Consider two individuals who are identical in all respects (including their incomes and houses). These individuals live in neighbourhoods that are very similar in all respects, except that, one has green areas and one does not. If the assumptions of competitive housing markets and market mobility in the hedonic approach hold, housing rents in the neighbourhood with green spaces should be higher by exactly the amount that compensates for the additional utility produced by having greenwood areas. Consequently, the first individual (with green spaces in the neighbourhood) should report the same level of satisfaction as they second individual because both have the same means and are free to move to the other neighbourhood if they wish to do so. This finding implies that both would be placed on the same satisfaction indifference curves, but that their locations on that curve would differ: the first would be "consuming" more green areas (implicitly paying for them through higher rents) but spending less on other goods than the second. The level of satisfaction *W* can thus be represented as a function of income *y* and housing rents *p*, which depends on the existence of green areas in the neighbourhood (denoted by *z*):

$$W(y, p(z);z). \tag{2}$$

If the hedonic price assumptions hold, the satisfaction levels of the two representative individuals are necessarily equal:

$$W(y, p(z_1);z_1)= W(y, p(z_2);z_2) \tag{3}$$

Notice that, because the two neighbourhoods have a different rent price due to access to green space, equation (6.4) is reduced to:

$$W(y,z_1)=W(y,z_2), \tag{4}$$

This shows that the equal level of satisfaction will be perceived by the two individuals, irrespective of whether they have access to green areas. Therefore, when hedonic price assumptions hold, neighbourhood features do not have any *additional* influence on satisfaction when income is controlled for. The intuitive reason is that the satisfaction derived from access to green space is captured already in the satisfaction derived from income, because access to the green areas is implicitly paid for in housing rents.

More often than not, however, neighbourhood features such as green spaces, recreational areas, or safety conditions do have an influence on life satisfaction after controlling for income; that is,

$$W(y,z_1)\neq W(y,z_2), \tag{5}$$

Or, in other words, two individuals in identical circumstances and with equal income, but living in houses with different rents, may be at different levels of satisfaction. This inequality implies that the standard hedonic price assumptions do not always hold. In some cases, neighbourhood features do not have any influence on housing rents. In other cases, however, there may be some difference between rent in neighbourhoods that have some feature, such as a better security, and those that do not. This suggests that the housing market is frequently unable to achieve equilibrium: other things being constant, those people who have live in safe neighbourhoods manifest more life satisfaction, even though they may be paying rents that are higher because of that factor.

In that case the slope of the price curve cannot equalize with the subjective trade-off ratio. However, the trade-off ratio, derived from the estimated indifference curve can be used to calculate the compensation that would be required to equalize the satisfaction levels of the two groups of individuals. If one dimension in the satisfaction indifference map is income and the other is security, the subjective trade-off ratio $-\alpha_1/\alpha_2$ would be the ratio between the marginal utility (or satisfaction) of income and the (additional) marginal utility (or satisfaction) of security (where the word additional refers to the fact that part of the utility already may be captured in the income coefficient, as explained above). The value of that ratio is the monetary compensation needed to equalize the satisfaction between individuals in more-secure (z_1) and less-secure (z_2) neighbourhoods.

Notice that this monetary compensation is additional to what individuals in the more-secure neighbourhood pay as extra rent, which is measured by the coefficient of the security variable in the hedonic price. Therefore, the total value of security or, in more technical terms the total shadow cost of any neighbourhood feature *z* is

$$(p(z_1)-p(z_2))+\Delta y, \qquad (6)$$

Where housing rent *p* depends on whether the neighbourhood has the feature *z* and Δy is the monetary compensation obtained from the subjective trade-off ratio of the LS approach.

As the previous discussion shows, the hedonic and LS approaches are complement. Taken separately and using only rather stringent assumptions, neither approach provides an adequate measure of the value of neighbourhood features. The hedonic approach requires that housing markets function perfectly for the feature in question. The LS approach estimates the residual shadow cost, if prices are not equilibrium prices; and, consequently, rent differences do not completely compensate for the differences between houses. The hedonic approach may be sufficient to value most of the characteristics of the dwelling- such as the number and size of rooms, the quality of floors, and the availability of some domiciliary services- because these are mostly private, excludable goods with competitive markets. By itself, the LS approach may be adequate to find the “value,” – that is, the equivalent income that would provide the same satisfaction of things that money does not buy, such as trust in others or friendship (see (Lora, 2008), ch.4). But most neighbourhood features and amenities do not fall clearly into either the market or the nonmarket category. The reason is simply that housing market may operate only to some extent as intermediate markets for access to such features as transportation, green areas or recreation places, safety, and quiet, among others. Therefore, it is left to empirical analysis to establish the market and nonmarket components of the values of neighbourhood characteristics and amenities. An approach that can be used for evaluating these amenities and services is Choice Experiment (CE) method that as explained in the previous chapter, is one of the stated preference techniques. This method gives the value of a certain good by separately evaluating the preferences of individuals for the relevant attributes that characterize that good, and in doing so, it also provides a large amount of information that can be used in determining the preferred design of the good.

5.6 A Work plan for this study

A work plan for studying an economic evaluation study is required prior to any research. In this work plan the following steps should be taken into consideration and the related questions should be answered in each stage.

Steps	Questions
Initial research	What question is being answered? What is the object being valued?
Choice of survey method and valuation technique	What is the survey method? Which technique is being used?
Choice of population and sample	What is the target population? What kind of sample should be selected?
Questioner design	What form of question? What elicitation format?
Test the questionnaire and conduct main survey	Focus groups Redesign questionnaire Pilot survey Redesign questionnaire and conduct main survey
Economic analysis	Database coded and transferred to econometrics experts
Validity and reliability testing	Do the results meet validity and reliability tests?
Aggregation and reporting	Aggregating from the sample results to the target population and reporting requirements

Table 5.2 Research Work Plan

Up to this point the first two steps have explicitly been explained. The information related to the questionnaire design and its testing will be available in the appendix, and the economic analysis and its aggregation and response will be explained in their respective chapters. The remainder of this chapter will look at choice of population and sampling, advantages and disadvantages of the techniques and validity and reliability of the experiment.

5.7 Sampling and its importance

Given the target population identified for the valuation study (in this case Shiraz citizens), an appropriate sample that represents this population must be obtained. The sample should be a subset of Shiraz population to whom the survey will be administered. A sample is required to save the time and expense that would be required to survey the entire population. For the sample design it is important to decide which types of people to interview and how many is required. The population sample should be selected in a way that the results of the survey could reliably and accurately be extrapolated to the entire population. Statistically the sample must produce results that are unbiased and representative of the population; in addition the sample should be large enough to produce a sufficiently precise estimate of the mean or median WTP.

Different modes of data collection are available: the main modes are face-to-face interview, mail surveys, telephone interviews and some combination of these. They all differ in terms of the necessary time to collect the data, cost, quality and quantity of data, sample control, response rate and the degree of complexity and versatility allowed. It is very important that the design of the questionnaire must be consistent with the chosen data collection method.

Choosing the sample size is a balance of cost versus precision. The optimal sample size depends essentially on three considerations (Ian J. Bateman *et al.*, 2002):

1- The smallest subgroup within the sample for which estimates are needed.
2- The precision with which estimates are needed – how much sampling error can be tolerated,
3- How much variation there is in the target population with respect to the characteristic of interest?

The greater the variation in the underlying population, the larger the sample required to estimate a parameter with a given degree of precision. If there were no variation, a single observation would suffice (for example since all the blood cells in a person’s body are of the same type, one blood cell would be adequate to determine blood type). Of course, there is a paradox in sampling. The reason for sampling the population is because one does not know the true distribution of the variable of interest; yet one would need to know this distribution in order to design the most efficient sample. The paradox is broken in practice either by guessing at the value of the unknown population variance or by relying on information from other studies in the literature. Based on these considerations it is common to recommend sample size of about 250-500 for open-ended surveys and about 500 to 1000 for closed ended (referendum) surveys (Bateman, 2002, p.110).

5.8 Validity and reliability

Reliability refers to the degree of replicability of a measurement. Validity refers to the degree to which a study measured the intended quantity. It is clearly possible to have a highly reliable study result that does not represent a valid measurement.

Reliability can be conceptualised in three forms: (i) the classic psychology test-retest notion cast in terms of obtaining willingness to pay (WTP) estimates for the same individuals at two different points in time. The difficulty with this approach is that the act of surveying an individual may legitimately influence subsequent views (ii) compare the WTP distributions from two independent but statistically equivalent samples from the same population, typically interviewed at two different points in time; and (iii) compare the stability of the estimated bid function in repeated samples.

Validity can also be conceptualised in different ways. Ideally the results of an economic evaluation study are valid when the value stated by a survey respondent for a given good is equal to the actual value which the respondent would express for that good if given the opportunity in a real market.

The other major type of validity is construct validity, which is an assessment of whether the measurement is related in particular ways to other indicators of what should be measured. Some of these indicators are predictors from economic theory and some are empirical regularities in the form of associations with other variables, which seem intuitively correct and which hold across a large number of studies. Another form of construct validity occurs when there are multiple ways to measure the same underlying quantity. In such cases, the different measurements can be compared in a test of convergent validity, that is, a process of using different valuation techniques to see if they produce similar answers or answers that vary in a predicted manner.

5.9 Conclusion

In this chapter a brief explanation of the previous chapters has been discussed followed by highlighting the main question and objective of this research and its relative hypothesis. A conceptual framework was designed to answer the main research question. Meanwhile, three sub-questions have been mentioned that by answering those, solving the main question well become less problematic. The methodological approach has been argued explaining that this research can be classified into three different phases. Finally an explanation of a study work plan was suggested followed by the advantages and disadvantages of each method that will be used for this research. The next Chapter provides information about Shiraz case study showing its current status and the policies that has been taken into consideration in the past for city’s development.

Chapter 6: More about Shiraz (The Case study)

6.1 Introduction

An important part of any plan is to identify issues and set goals. Awareness of the issues related to a city, can be set up as a base to identify the needs and develop the goals. The first step that is required for identifying city's issues and needs is to process the spatial, demographic, economic and environmental development of the city. The results of this analysis, well allow us to identify whether these development are satisfactory or it can be predicted that answering to future needs will be met with more difficulties with the current developments. It also makes clear the areas of intervention in the planning.

In continue information related to development of Shiraz and its population structure is presented followed by some data about service area of the relevant urban services in three different level of accessibility.

6.2 Functional transformation of Shiraz city

The city of Shiraz is one of the important cities in the southern region of Iran, and plays particular roles in different functional fields. In general, geographical location, natural features and the role of local administration are the three pillars that strengthen the role of Shiraz in the southern regions. The situation of natural environment of the region and due to the position of Zagross Mountains, all of the major routes in Fars province passes through Shiraz and is destined to Iran's most important ports and the Persian Gulf. The geographical situation of Shiraz and its position at crossroads of communication and also its proximity to the Persian Gulf was very vital in shaping and expanding trade relations with other parts of the country and other Persian Gulf countries. This was significant even in ancient times whereas the way of Susa passed from Shiraz. Today the metropolitan city of Shiraz that is composed of many dense activity centres with diverse capabilities at the province level and also in the South West region of the country, have become a very special city and acts as poles of development in this area. In a more precise look, components that determine and define Shiraz functionality role in the country can be mentioned as:

- The cultural capital
- The agricultural pole in the south regions
- The pole of food industry, petrochemical and electronic
- The tourism hub
- The centre of service provider to the southern zones and regions
- The third place of inmate shrine

6.3 Shiraz Population Development

Study and evaluation of population issues and trends is the first step in identifying issues and problems in any biological complexes. Hence, in the next section information about Shiraz population and number of households, population growth and its development, age structure and population estimation is provided.

According to the General Population and Housing Census (GPHC), the population of Shiraz city in 2006 was reported as 1,335,358 of which 679,162 were males and 656,196 were females. The city's population sex ratio in this year was equal to 103.5. There were 313167 households in the city that shows the household size was equal to 4.26.

In 1996 the GPHC the population of Shiraz was recorded as 1,053,025 people of which 541,307 were males and 511,718 were female, resulting a sex ratio of 105.8. Also, the number of the households in the city in 1996 was 225,796 which results a 4.66 for the size of households. It is worth noting that in 1986 the size of household was 4.96 and the sex ratio was equivalent to 104.4. Table 6.1 shows the demographic statistics of the city.

Year	Population	Male	Female	Sex Ratio	Number of Households	Size of Households
1986	848289	433243	415046	104.4	171005	4.96
1996	1053025	541307	511718	105.8	225796	4.66
2006	1335358	679162	656196	103.5	313167	4.26

Table 6.1 Shiraz population and households in the past two decades.
Source: General Population and Housing Census

6.3.1 Shiraz Population Growth

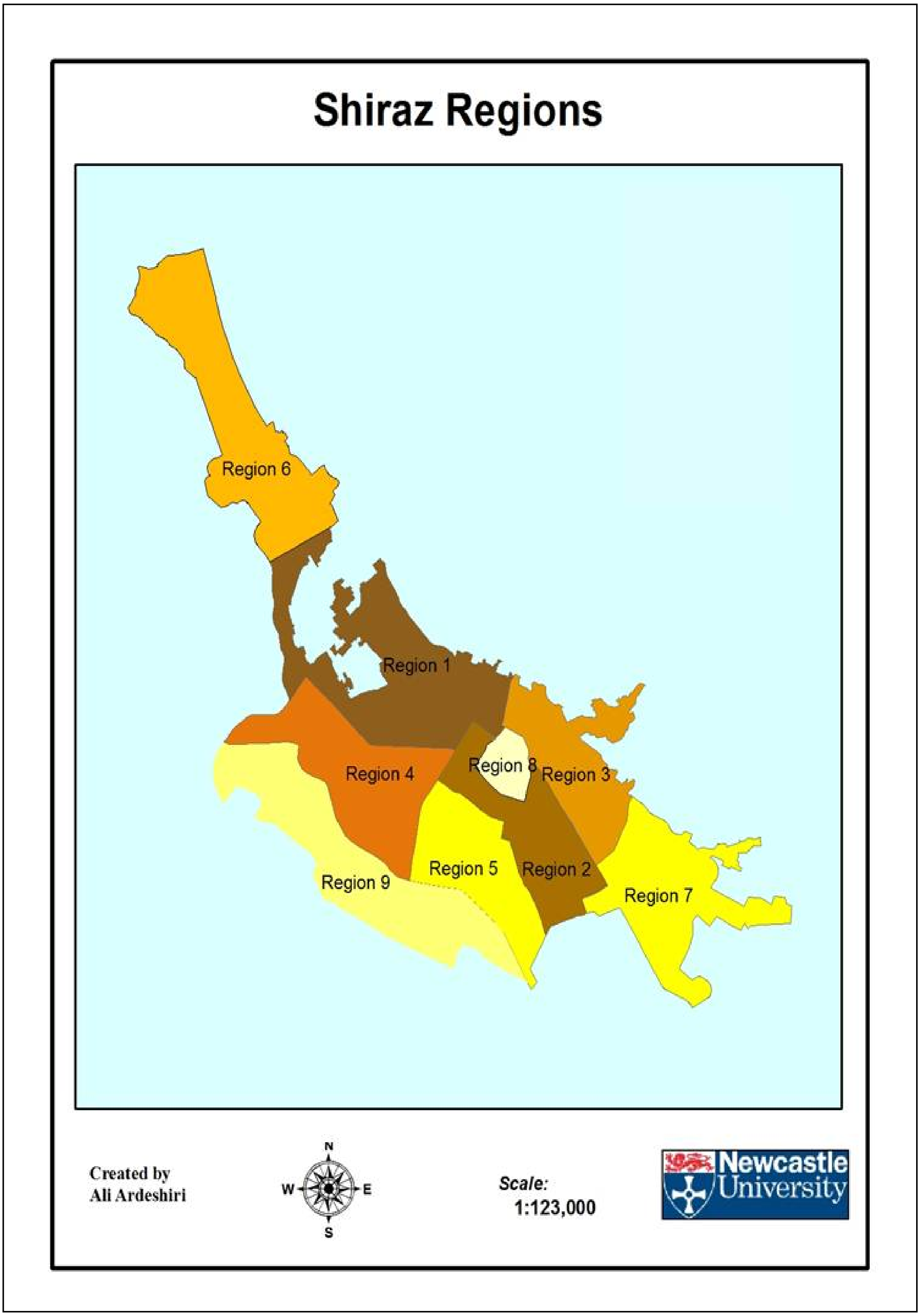
The average annual growth of Shiraz in 1996-2006 was around %2.404 per year, whereas in 1986-1996 the growth rate was equal to %2.186 per year. This shows an increase in the population growth in the past decades.

In 2006 the city of Shiraz was divided into 9 regions which region 9 was recently added to this division (1992). In recent years different regions in Shiraz have experienced different demographic changes. These differences are caused by many factors and different capabilities and limitation of these regions has led to the emergence of differences in population changes. The main cause of population change is fertility rates that in one hand due to population programmes and government policies in recent decades and on the other hand, financial problems caused by high population, has decreased the fertility rate in the country and Shiraz city. Hence, fertility rate has been less severe in the population increase however, due to social and cultural differences this factor is facing fluctuations within residents of different areas. Migration is also a factor that greatly effects the demographic changes. Each region can accept the immigrant population on the bases of it population capacity, level of development comparing to surrounding regions, the cultural and economic status, level of tolerance towards other cultures and ethnicities, geographical location and etc. Mortality status is also an important factor in demographic changes in an area. Another factor that usually effects the population is the geographic location ability of the area to absorb population and expand its development. A city as a set has the ability to expand in different geographic directions; however, the natural and man-made obstacles and also the limitation of the legally defined city area are important cases to take into consideration in estimating city's geographically development and population changes.

Regions	1986	1996	2006	Population Growth Rate		
				1986-1996	1996-2006	1986-2006
1	138569	153793	187628	1.048	2.008	1.527
2	192066	202001	193866	0.506	-0.41	0.047
3	144143	164405	177668	1.324	0.779	1.051
4	126380	187359	266032	4.016	3.568	3.792
5	97820	138318	163042	3.525	1.658	2.587
6	19300	40748	51949	7.76	2.458	5.075
7	41080	99347	131952	9.233	2.879	6.008
8	78911	67054	55194	-1.615	-1.926	-1.771
9*	N/A	N/A	108027	N/A	N/A	N/A
Total	848289	1053025	1335358	2.186	2.404	2.295

Table 6.2 Shiraz regions population and its growth rate in the past two decades.

Source: General Population and Housing Census 2006
*Region 9 was added from 1992 therefore population for the previous years are not available.



Map 6.1 Shiraz regions and its location

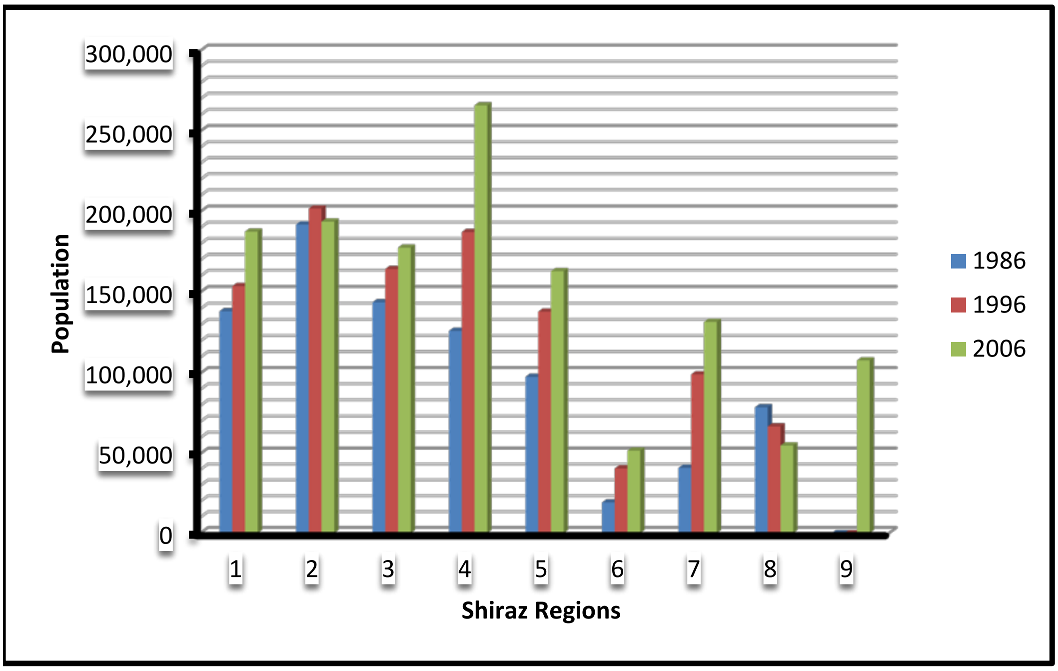


Figure 6.1 Shiraz regions population in the past three decades

As the Figure 6.1 shows region 7 experienced the height population growth with 6% rate. In the past two decades its population increased from 41080 in 1986 to 131952 in 2006. Vice versa, region 8 (Shiraz old texture) in the past two decades faced a decrease in its population and has declined from 78911 to 55194.

Regions	Area (Hectare)	Ratio of the total Area(Hectare)	Population Ratio			Population Density		
			1986	1996	2006	1986	1996	2006
1	4870	27.49	16.34	14.60	14.05	57.00	63.26	77.18
2	1668	9.42	22.64	19.18	14.52	114.33	120.24	115.40
3	1698	9.58	16.99	15.61	13.30	85.54	97.57	105.44
4	2309	13.03	14.90	17.79	19.92	30.73	45.55	64.68
5	1664	9.39	11.53	13.14	12.21	42.16	59.62	70.28
6	649	3.66	2.28	3.87	3.89	6.94	14.66	18.69
7	1585	8.95	4.84	9.43	9.88	25.97	62.80	83.41
8	374	2.11	9.30	6.37	4.13	210.43	178.81	147.18
9	2899	16.36	N/A	N/A	8.09	N/A	N/A	65.19
Total	17716	100.00	100.00	100.00	100.00	45.55	56.55	71.71

Table 6.3 Changes in population and density in each region

Source: General Population and Housing Census 2006

A comparison of population and population density of the regions can be considered as another indicator for a better glance on population change in Shiraz city. Looking at table 6.3, region 1 with a 27.49% of total city's area has more than 14% of the total population representing that the region's population change in the past two decade was nearly equal to the region's ratio of total area. However, this situation is not similar for regions 2 and 3 as they both have around 9% of the total area but respectively have 14.52% and 13.30%

of Shiraz total population in 2006. These results a population density of 115 and 105 person per hectare respectively for regions 2 and 3 that is nearly a third more than Shiraz average population density which is around 72 persons per hectare. The high population density in these regions might be one of the reasons that significantly have decreased the population for these regions in the past two decades. Other regions except region 8 which the population ration is equal or less than their ratio of total area are regions that have their doors open to more population and the ratio of their population share is now approaching the area ratio. Region 8 with only 2% of the total area share have 4.13% of the total population and making this region the densest region in Shiraz with around 147 persons per hectare. Similar to regions 2 and 3 the negative population growth in this region has decreased the density from 210 persons per hectare to 147.

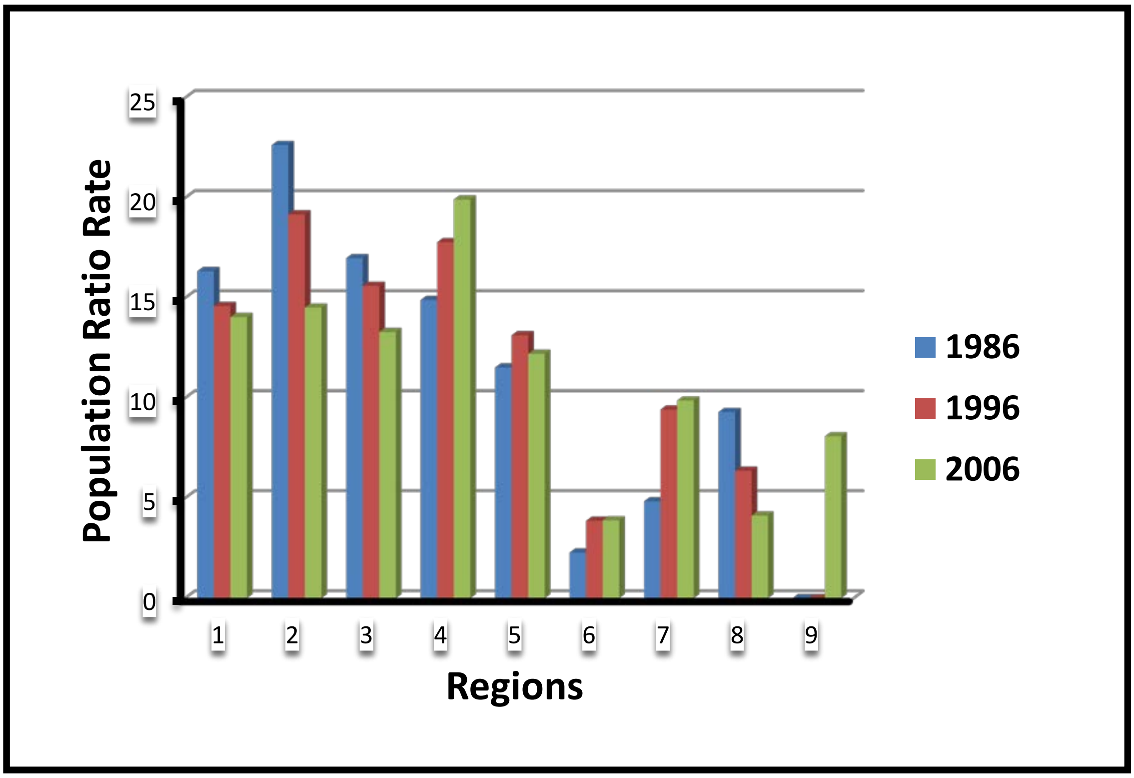


Figure 6.2 The process of change in the share of population in Shiraz regions in the past two decades

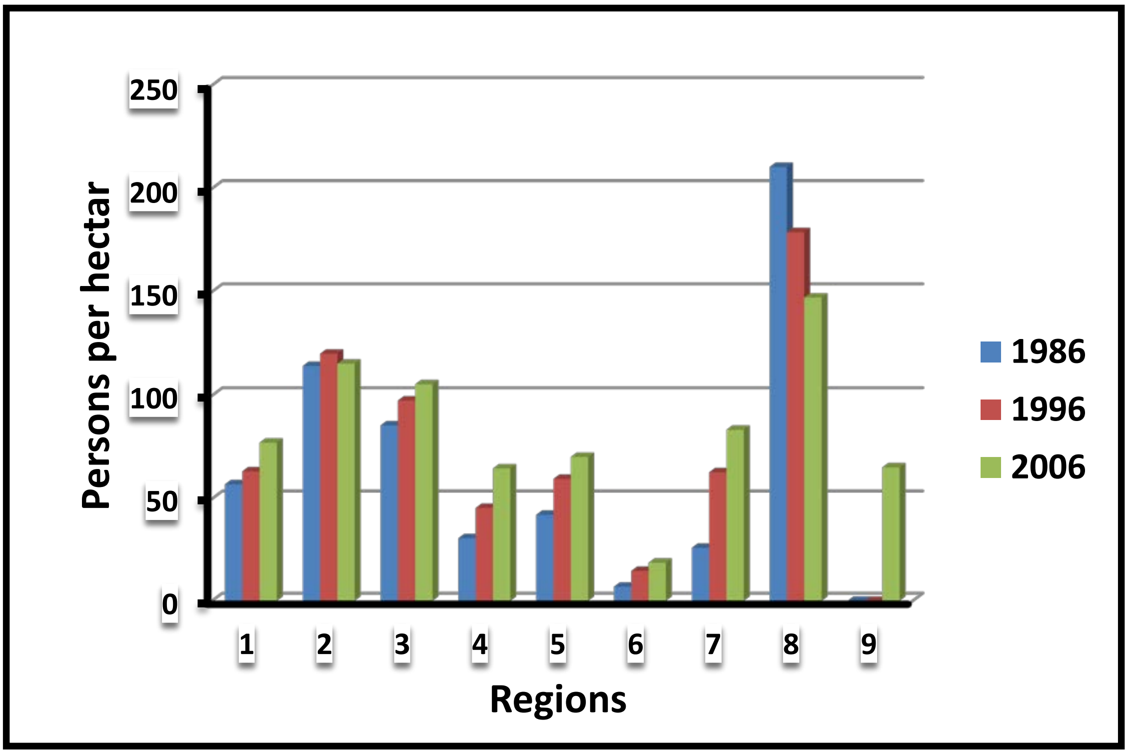


Figure 6.3 Changes in population density for each region in the past two decades

6.3.2 Shiraz Number of Households and its Size.

According to the Iran's statistics centre, in 2006, Shiraz had 341524 households that indicate an average of 3.91 persons in each household this indicator was 4.66 in 1996 and nearly 5 in 1986.

Regions	2006 population	Number of households	Average persons per household
1	187628	51119	3.67
2	193866	48512	4.00
3	177668	46055	3.86
4	266032	67831	3.92
5	163042	38217	4.27
6	51949	13903	3.74
7	131952	32981	4.00
8	55194	14549	3.79
9	108027	28357	3.81
Total	1335358	341524	3.91

Table 6.4 Population, Number of Households and Average Number of Persons in Household in each region in 2006
Source: General Population and Housing Census 2006

Region 1 with 3.67 had the lowest average number of persons in household and region 5 had highest with 4.27. Despite the increase in immigration between 1996 -2006 and increase in city's population, fertility rates have been facing with a reduction process. Reduced fertility rate, increased economic costs of households and rising rural-urban migration are the reasons for this reduction in average size of households and in return it has increased number of nuclear families.

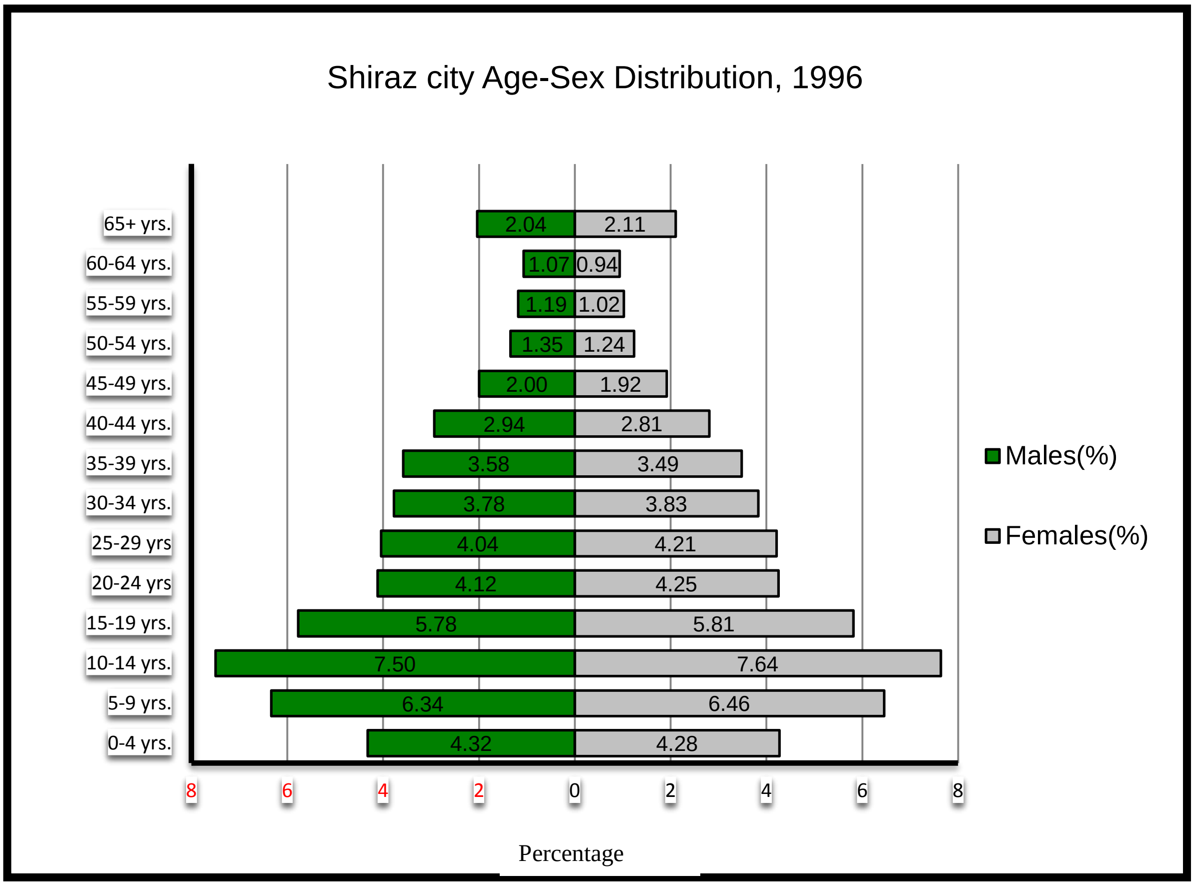
6.3.3. Shiraz Population Structure and Age Distribution

General Population and Housing Census 2006 data shows that the median age population in Shiraz was 25.3 in other words half of the population were younger than 25 years and the other half were older than 25 years. In addition the average age was 29.4. These data suggest that the population were in transition from youth group to middle age group. The age information relating to various regions, stating that the lowest median age is of region 8 and the highest median age is related to region 1. The highest and the lowest average age respectively are for region 1 and region 7.

Shiraz City		Regions								
		1	2	3	4	5	6	7	8	9
Median Age	25.3	28.1	24.7	25.3	25.5	25	26.9	24.4	24.1	26.1
Average Age	29.4	32.7	28.9	29.2	29.3	27.6	30.3	27.1	28.5	30.6

Table 6.5 Mean and Median Age of Population in Urban Regions of Shiraz in 2006
Source: General Population and Housing Census 2006

In this section the age pyramid is used to represent Shiraz population structure for the years of 1996 and 2006.The age pyramid reflects the demographic history of a country. Looking at the age pyramid, information related to fertility and mortality rates, immigration can be distinguished. New births increase the base of the pyramid that can be controlled by family planning methods and birth control. In addition, natural disasters, war, starvation and mass killings can cause irregularities in the age pyramid on a specific age group. Comparing the age pyramid in consecutive periods in addition of showing the population structure, has information about population changes and movements. Figure 6.4 shows the age pyramid for Shiraz city for 1996 and 2006.



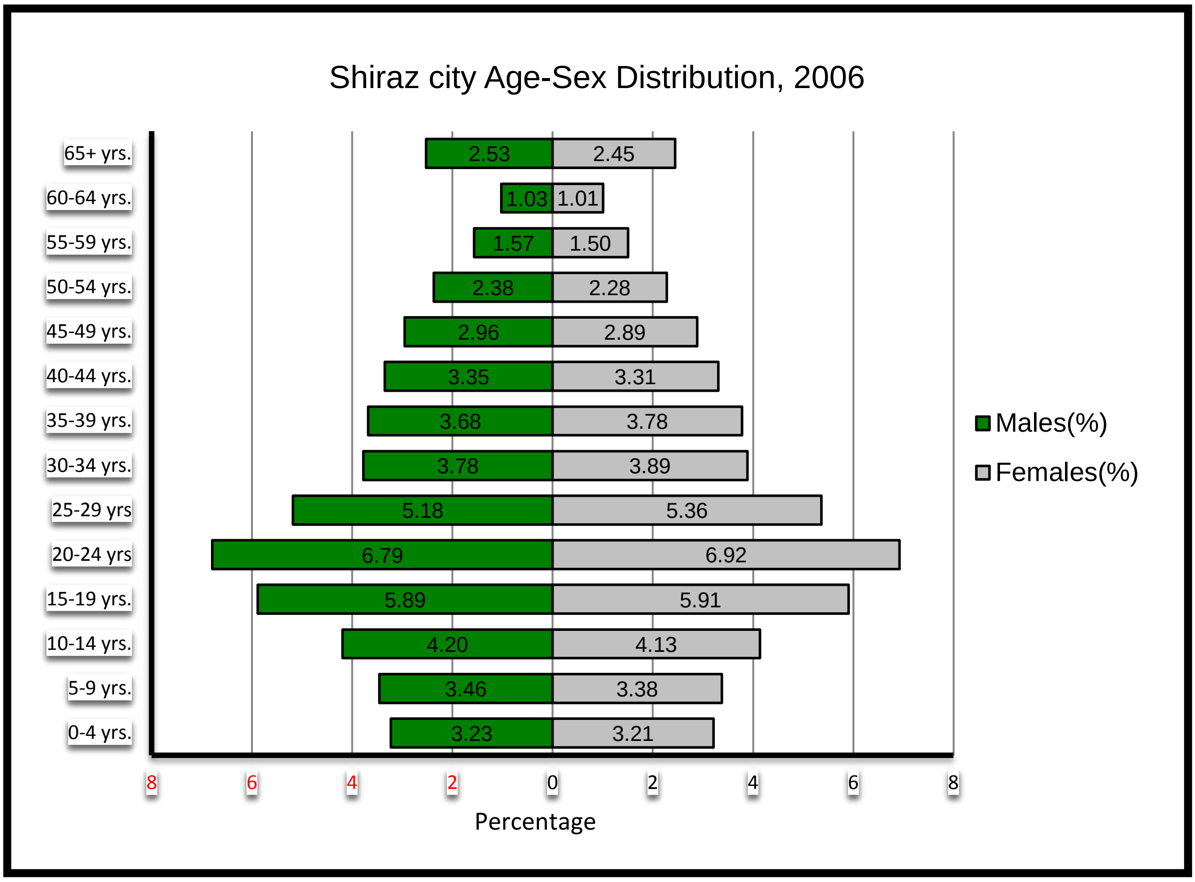


Figure 6.4 Shiraz Age and Sex Pyramid Comparison for 1996 and 2006

In 1996 the highest population group were the 10-14 years old with more than 15% of the total population. As it can be seen in 2006 this grouped moved to the 20-24 years old with an overall 13.72% indicating that in this period nearly 1.3% have migrated or died.

6.3.4. Shiraz Population and its Growth in the Next Decade

Different methods can be used to predict the population. The process of changes in population is very important in choosing the appropriate method. Figure 7.5 shows the population growth trends in Shiraz for the past 5 decades. As can be seen in the figure, the city's population trends indicate an asymptotic Gompertz curve.

In the Gompertz model the population is estimated from the following equation:

$$\boldsymbol{P = Ka^{b\hat{}n}}$$

In this equation p is the population for the predicted year, n is the year, K is the maximum population, *a* and *b* are coefficients. Looking at the previous census, the coefficients and maximum population for Shiraz has been calculated as below:

a= 0.6503

b= 0.9615

K= 2280884

Therefore the estimated population for 2011 and 2016 are as below:

$P_{2011} = 1623105$

$P_{2016} = 1742944$

Figure 6.6 presents the population growth trend up until 2016. This estimation predicts a growth of 2.7% per year showing an increase of around 0.30% per year comparing to the period 1996-2006 and more than 0.53% per year comparing the period of 1986-1996.

To calculate the changes in population for each region, this research uses process of changes in the population density for each region. The reason for selecting this indicator is relatively due to its reasonable changes in the past. Table 6.6 shows the population density and adjusted population for each region.

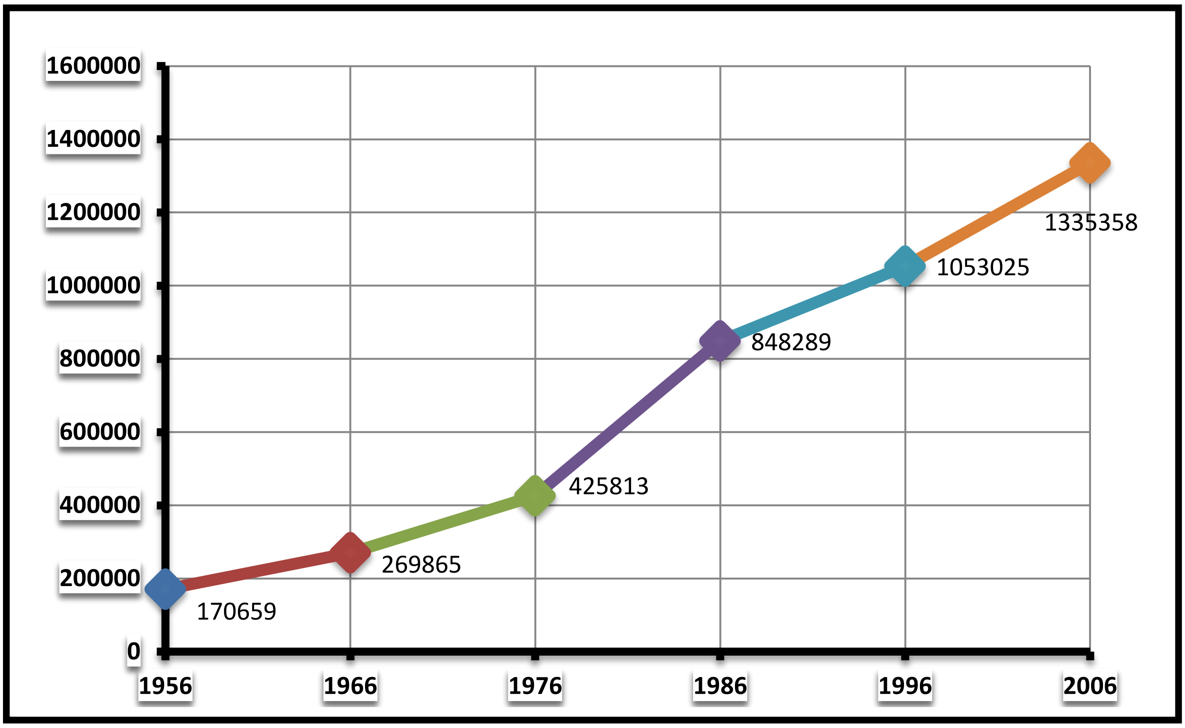


Figure 6.5 Population Growth Trends in Shiraz by 2006

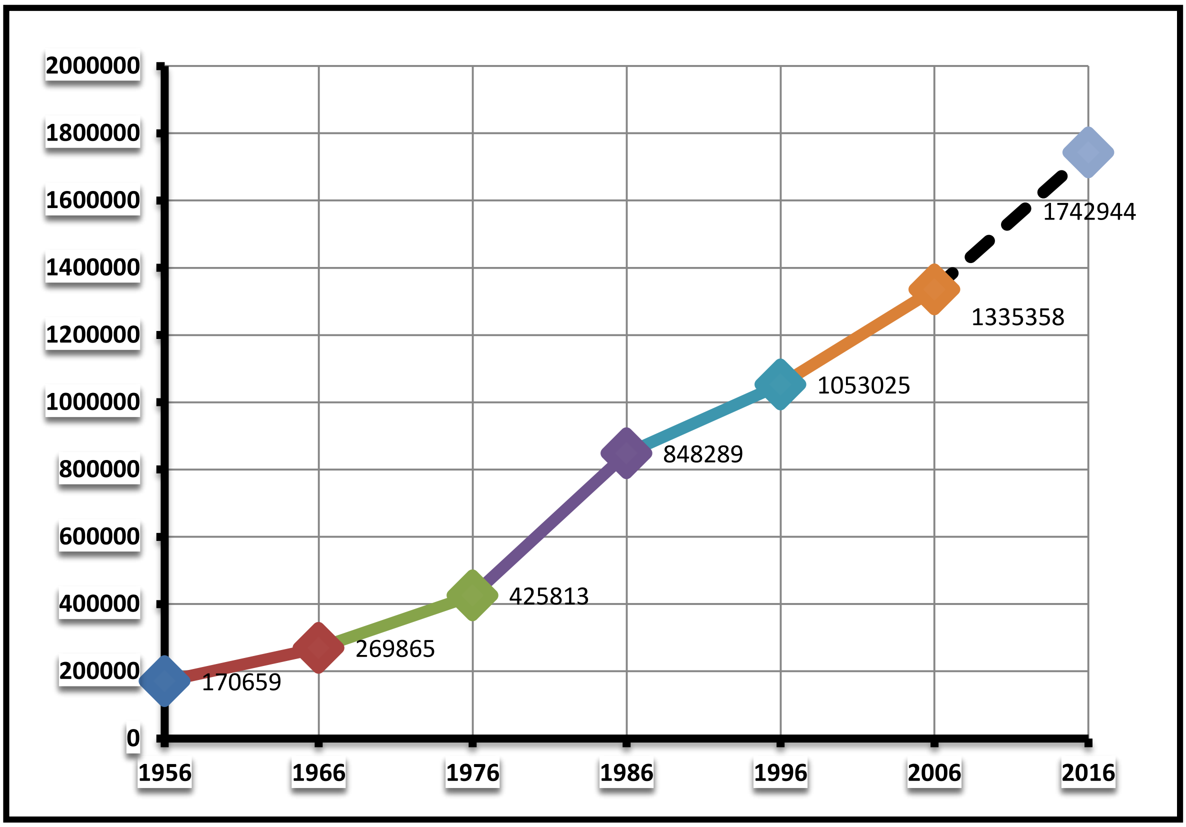


Figure 6.6 Population Growth Trends in Shiraz by 2016

Regions	Area (Hectare)	Population Density				Total Population			
		1986	1996	2006	2016	1986	1996	2006	2016
1	4870	57	63.26	77.18	110.60	138569	153793	187628	268869
2	1668	114.3	120.2	115.4	111.30	192066	202001	193866	186984
3	1698	85.54	97.57	105.4	113.90	144143	164405	177668	191922
4	2309	30.73	45.55	64.68	99.40	126380	187359	266032	408832
5	1664	42.16	59.62	70.28	83.07	97820	138318	163042	192722
6	649	6.94	14.66	18.69	52.11	19300	40748	51949	144814
7	1585	25.97	62.8	83.41	96.70	41080	99347	131952	152979
8	374	210.4	178.8	147.2	129.40	78911	67054	55194	48525
9	2899	N/A	N/A	65.19	88.89	N/A	N/A	108027	147297
Total	17716	45.55	56.55	71.71	93.60	848289	1053025	1335358	1742944

Table 6.6 Population estimation for Shiraz regions in 2016

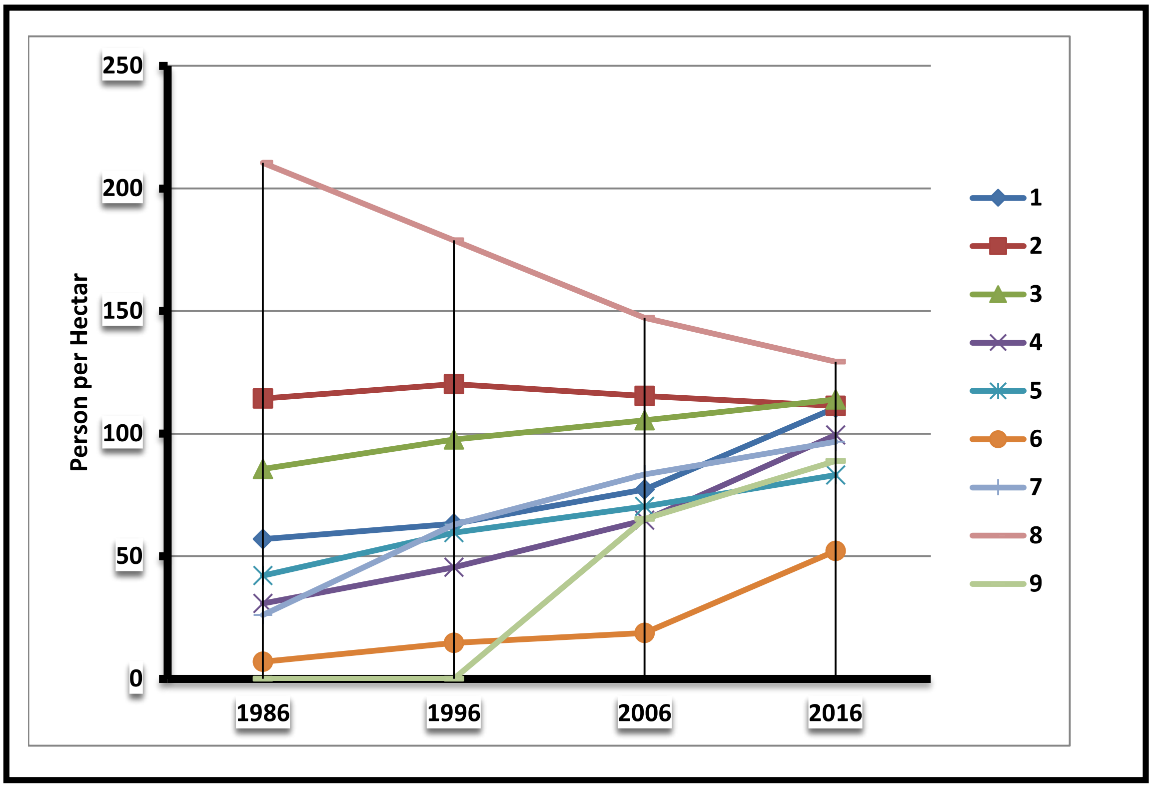


Figure 6.7 Shiraz Regions Population Density Growth Trends by 2016

Figure 6.7 illustrates that it is expected by 2016 Shiraz region's share of population and area are closing up, this means that the city is moving towards a more balanced population distribution in the city.

6.4 Shiraz Physical and Structural Development

Historical studies show that the historic fabric of Shiraz has benefited from a relatively harmonious and coherent structure. Create development axes by rulers in different periods of time and concentration of urban elements and services around the developed axes in one hand, and the creation of independent neighbourhoods, on the other hand were the cause of balance and structural integrity in city of Shiraz.

In Nazareth Farsnamh the structure of Shiraz was described as a city with elements such as the citadel mall, squares, major mosques, shrines and six major gateways within dense tissue, compacted and organic.

With the break of city's barrier and the tendency to live and construct in surrounding area the developments to the west side started to expand. Beautiful gardens and outdoor attraction in the west was one of the main reasons for the west expansion and become a place for expanding new elements of the city and provide housing for upper class group. The expansion tends to be less severe in the north, were the main axis of communication occurred. Figure 6.8 presents a developed map of Shiraz in Ghajar period 1795-1925 (currently Shiraz region 8) showing the development axes and the six city gates.

In general, following the constitutional revolution and foreign relations, the beginning on oil exports and its increase share of the national income all Iran cities had a vast improvement including Shiraz. Among these measures was the establishment and development of accessibility and transportation network that was happening regardless of the city's structure and caused the loss of the city's fence. Socioeconomic developments intensified in the city with the increase in migration and along with intensify focused decision making, as well as structural changes. Lack of proper urban development policies in this period not only weakened the performance of cities elements and services, but was the cause of urban land use sprawl and rupture in city's skeleton. In the period of mid 1950's to 1978 (before the revelation) the migration from rural to urban, disintegration of tribal, the expansion of investment in the service industry sector, and in overall the increase in population, changed Shiraz appearance to an international metropolitan city. After the 1978 revolution due to negligence and lack of plans and the weak urban planning and land development institutional system, scattering was expanded in the city although the population was continuingly increasing. With the outbreak of war, lack of strategy and program for controlling the population movements and the flow of war and Afghan immigrants added problems to the process of urbanization of Shiraz.

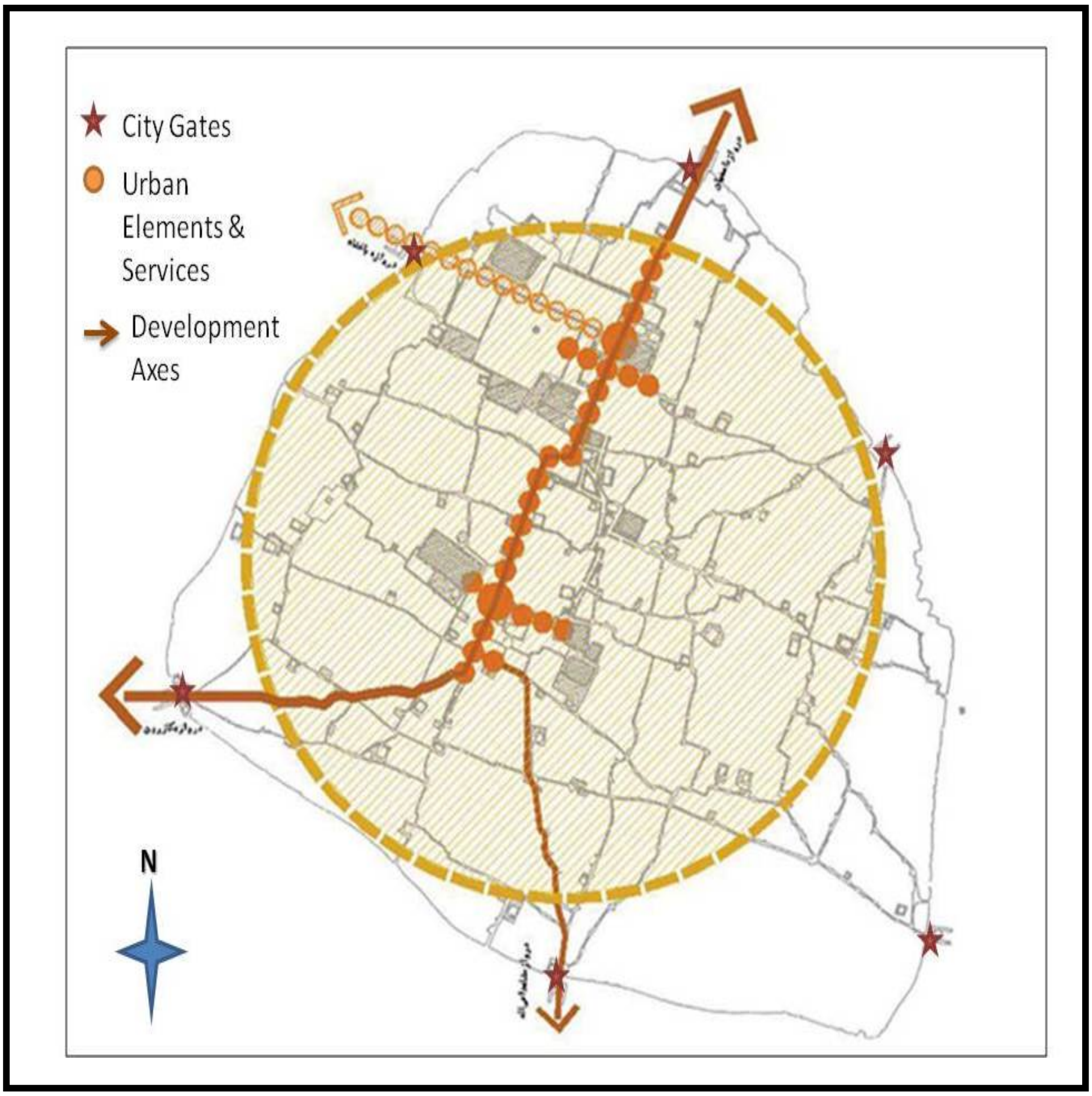


Figure 6.8 Map of Shiraz in Ghajar Period 1795-1925

This emerged the phenomenon of "City-Issue" for this period. Some of the spatial structure problems in Shiraz that was outlined in the structural strategic plan are described as below:

- Residential area is relatively homogeneous, low density and scattered across the city
- The highest density of residential is located in the city centre near to the highest concentration of economic entities and services in urban and regional scale.
- Military lands adjoining gardens and open spaces with low population density.
- Distribution of local, district, and regional services in an imbalance and elementary form.

In analysing the causes and contributing factors in formatting the above features, these factors can be highlighted:

1- Historical factors
2- Natural factors
3- Geographical factors
4- Economic factors
5- Political factors
6- Distribution of urban services

6.4.1 The Historical Factors

The gradual growth and development has leaded Shiraz old region (Region 8) to have a higher population density and become the urban distressed area in the city. The importance of having access to urban services is the reason for having high population density in this region that complicates the supervision of the municipality and observance of planning principles. The quality of the transport network and its pathways and also the adjacency factor played an important role in the development of this region. Relative improvement of the network system in north and west of the old region and the establishment of old airport, cement factory, Shiraz cemetery and prison in the southern part of the old region, effected the physical structure of the city. Thus, moving from north and northwest to south and southeast the intensity is increased and the quality of urban environment has decreased.

6.4.2 The Natural Factors

Among the natural factors, climate, highlands and general slope of Shiraz city, have been very significant in shaping the physical structure of the city. The role of the weather, especially wind direction was the cause of development towards the north and west of the city of Shiraz. These trends gradually affected the land price and led the north and northwest regions become more desirable textures of the city. The city's slope and the level of underground waters from the northwest to southeast has also strengthen this tendency and with its impact on land price, the low income groups have been settled in the southeast parts due to a lower land price. Of heights regions, especially north and west of Shiraz, Shiraz and other factors that linear development toward the north-west - south-east have been effective. The linear structure, whereby the northern regions were particularly relative to the longitudinal arteries which cause the price of decreased quality of urban environment in the southern regions led. The existence of heights, especially in the north and northwest of Shiraz, is the other factors that has been effecting the linear development toward the northwest – southeast in Shiraz.

6.4.3 The Geographical factors

Different geographical factors have influenced the physical structure of Shiraz. Ghasrodasht Gardens in the northwest of the city and the agricultural lands in the south and southeast in addition to the seasonal river, have a great impact in the distribution of urban services and the transportation network and proving more evidence in the difference between north and northwest with south and southeast.

The presence of the Ghasrodasht Gardens has affected the city's structure in two ways. It has changed the weather condition and the landscape view for the nearby neighbourhoods and become a tourist attraction place and also more tendencies for development of the northwest axis of Shiraz. However, the legal construction policies and problems in land use changes near the gardens has prevented from developing the city in this regions, therefore the development in these regions are very sprawl but the quality has been relatively satisfactory. This sprawl development has decreased the density and increased the quality of the constructions.

Agricultural lands have become a major barrier to expand the city in the south and southeast. These lands have delayed the development in these regions. Although in Shiraz master plan these lands have been considered for further development in the city, but the economical and regulation factors have prevented the realization of the predictions of the comprehensive plan.

The seasonal river has divided the city into two parts. The northern section of the river that had difficulty in accessing the city centre in the past has experienced a delayed development. This limitation has its own advantages, namely a better texture, density, services distribution and better transport network.

6.4.4 The Economic factors

The combination of natural and geographical factors has affected the housing market tendency and caused difference in price of land and property that result in distribution of social classes in the city. An investigation by the Department of Housing and Planning shows that residential units and rent price are considerably fluctuated in each region. The market trend shows that in regions 1 and 4 there are higher demands for efficient use of urban lands and therefore the potential increases in demands for high-rise buildings in these regions. While regions 2, 3 and 5 that has been considered in the master plan for regions with potential for high density construction, do not actually have the support of the market.

6.4.5 The Political factors

Another factor in the formation of Shiraz structure is the influence of political-executive factors. In general the economic pressure and low income groups accessibility to land and housing market and also the executive and administrative organizations difficulties in providing land for urban services has led to increase political considerations and implementation involved in urban management and land use.

6.4.6 Distribution of urban services

Finally yet importantly the distribution of urban services and the degree of accessibility to these services plays a very important and crucial role in shaping the city's structure. In general the natural and geographical limitation that hindered the development of Shiraz in past has increased the intensity of density in the central area of the city. The concentrated population in the central area resulted in agglomeration of urban services in the central. This in turn has led to better access to urban services in the central region and has attracted more population for housing in this area. In other words, the mutual relationship between population and urban services has resulted in having high population density with agglomeration of urban services in the central and low population density and urban services in marginal areas of the city.

On the other hand the supply of urban services in the city lacks from having a hierarchical system. This leads to the formation of all municipal services, regardless of their functional scale. They are usually located around the main streets to benefit from accessibility factor, causing the middle tissues to act as residential complex and attract fewer investments. In other word the body of Shiraz streets, depending on the antiquity, are covered with services land uses in a way that is difficult to distinguish among arterial streets and services streets in Shiraz.

The distribution of urban services units in terms of functionality has an organic link with the spatial structure of the city. Large scale functional units have been organised around the backbone of the city. Government agencies, organizations and institutions, central banks offices, educational centres, hotels, insurance offices, and specialized clinics, and similar other entities are performing in the market of main East – West axis of the town making the old texture of the city (region 8 and 2) as the gathering place for a variety of service activities.

Since the focus of this research is on urban services, in continue a more detail information about the distribution of some of the urban services and its service area is provided using GIS analysis.

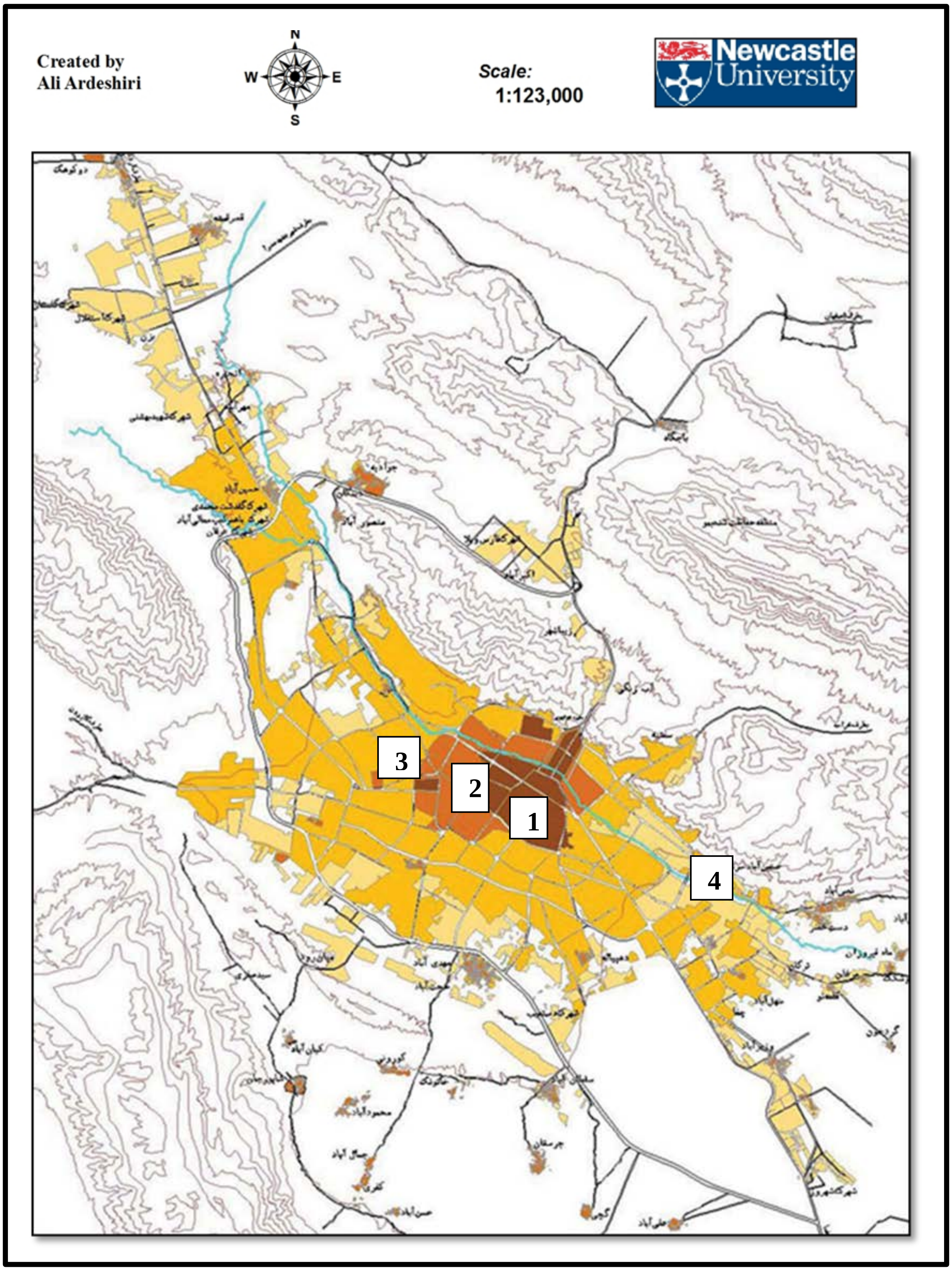


Figure 6.9 Map of Shiraz developments in different stages

6.5 Urban service distribution and its services area in Shiraz

In chapter four, seven services were mentioned that this research emphasis on at Shiraz city. In order to assess the degree of accessibility of each service and calculate the services area for each urban service in this research, the service area tool in ArcGIS was used. Since the accessibility to these services are calculated in the scale of a ***neighbourhood*** in this research, therefore we assess the ***walking*** distance to these services in three different levels of ***500m, 800m, and 1200m***. It is very crucial that these levels are measured within the actual network system and not the closest distance in ArcGIS. Therefore by using the transport network system layer, the layer that shows the location of each services and using the service area tool this calculation can be conducted for different levels of accessibility.

6.5.1 Parks and green area

The first urban service is park and green areas. In Shiraz 128 parks can be located with an average area of 8250sqm with a minimum of 817sqm located in region 4 and maximum area of 46 hectares also located in region 4. The total area of parks in Shiraz is about 230 hectares which is about 1% of the total area and providing about 1.72sqm of green space per capita.

The outcome is presented in Figure 7.10 and table 6.7. The dark green indicated the 500m level and the grass green colour shows 800m level and finally the light green present the 1200m level. Results show that 2520 hectares of the total area is covered by less than 500 meter of accessibility. In another words 14% of Shiraz city is proximate to park by 500 meter or less. Region 4 has the highest proportion and region 8 has the lowest proportion. 3107 hectares or just about 18% is located within the 800 meter range and 4461 hectares or 25% is within the range of 1200 meter. In total 10088 hectares which is nearly 57% of the total area in Shiraz is located 1200 meter or less to a park.

Parks	Count	500 M	800 M	1200 M	Total
Region 1	16	209.83	371.87	786.66	1368.3553
Region 2	23	492.95	602.96	454.35	1550.26
Region 3	20	358.7859	431.3909	476.2358	1266.4126
Region 4	19	445.71	514.40	886.60	1846.7174
Region 5	20	417.39	392.18	435.30	1244.8624
Region 6	11	148.38	140.89	174.21	463.48066
Region 7	10	255.12	336.59	400.62	992.32518
Region 8	0	16.64	64.56	157.09	238.29046
Region 9	9	175.18	252.16	690.14	1117.48
Total	128	2520	3107	4461	10088
Parks	Min Area	Max Area	Total Area	Population 2006	Per capita (Metre)
Region 1	0.09	19.57	28.43	187628	1.515232
Region 2	0.08	7.13	33.96	193866	1.751725
Region 3	0.08	5.63	19.48	177668	1.096427
Region 4	0.08	45.94	59.87	266032	2.250481
Region 5	0.08	18.44	54.51	163042	3.34331
Region 6	0.08	0.71	2.51	51949	0.483166
Region 7	0.08	3.32	11.54	131952	0.87456
Region 8	0.00	0.00	0.00	55194	0
Region 9	0.10	2.04	19.83	108027	1.835652
Total			230.13	1335358	1.723358

Table 6.7 Data from Service area for parks in Shiraz

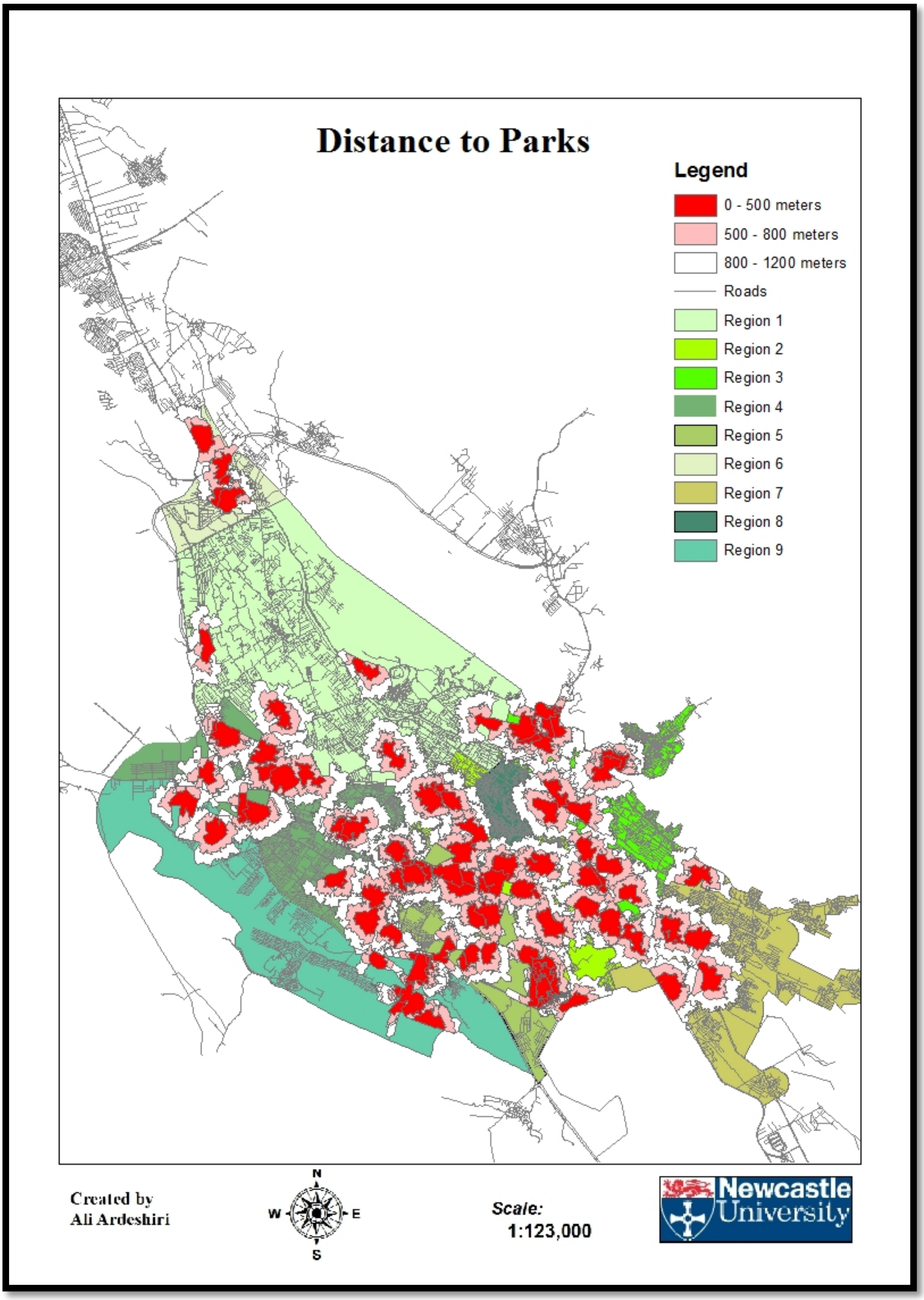


Figure 6.10 Service Areas of Parks in Shiraz

Shiraz is very famous for its beautiful gardens. History shows that these gardens provided a comfortable place for King's and their crow to enjoy Iran's hot summer in a cooler place. Although for the growth and development of the city many of the gardens have been divided to smaller lands for other land use purposes, still the remaining gardens have a great influence on the environment around it therefore they are an important indicator when buying a house in Shiraz. The majority of the gardens (about 90%) are located in region 1. About 1688 hectares in region 1 are within 500 meter approximately of a garden and 1102 hectares are between the range of 500 to 800 meter and 1001 hectares are in the range of 800 to 1200 meter covering a total of 3791 hectares in region 1. Looking at region one's area (that is 4870 hectares) it can be concluded that in region 1 about 78% of the area is approximated to a garden in less than 1200 meter. The existence of these gardens in region 1 is the main reason that more capital is expended in this region by public and private sectors and making it one of the most developed regions among the other region in Shiraz.

Gardens	Count	500 M	800 M	1200 M	Total
Region 1	1153	1687.79	1102.35	1001.47	3791.61
Region 2	65	8.85	37.74	99.15	145.74
Region 3	144	232.01	212.21	296.69	740.92
Region 4	130	70.98	126.62	256.13	453.73
Region 5	0	0.00	0.00	9.95	9.95
Region 6	39	134.14	118.42	143.33	395.89
Region 7	0	0.00	0.00	0.00	0.00
Region 8	0	0.00	0.00	5.58	5.58
Region 9	0	0.00	0.00	0.00	0.00
Total	1531	2134	1597	1812	5543
Gardens	Min Area	Max Area	Total Area	Population 2006	Per capita (Metre)
Region 1	0.04	25.64	1098.03	187628	58.52
Region 2	0.03	5.41	17.73	193866	0.91
Region 3	0.02	5.63	28.71	177668	1.62
Region 4	0.03	9.37	82.29	266032	3.09
Region 5	0.00	0.00	0.00	163042	0.00
Region 6	0.35	1.87	13.79	51949	2.65
Region 7	0.00	0.00	0.00	131952	0.00
Region 8	0.00	0.00	0.00	55194	0.00
Region 9	0.00	0.00	0.00	108027	0.00
Total			1240.55	1335358	9.29

Table 6.8 Data from Service area for Gardens in Shiraz

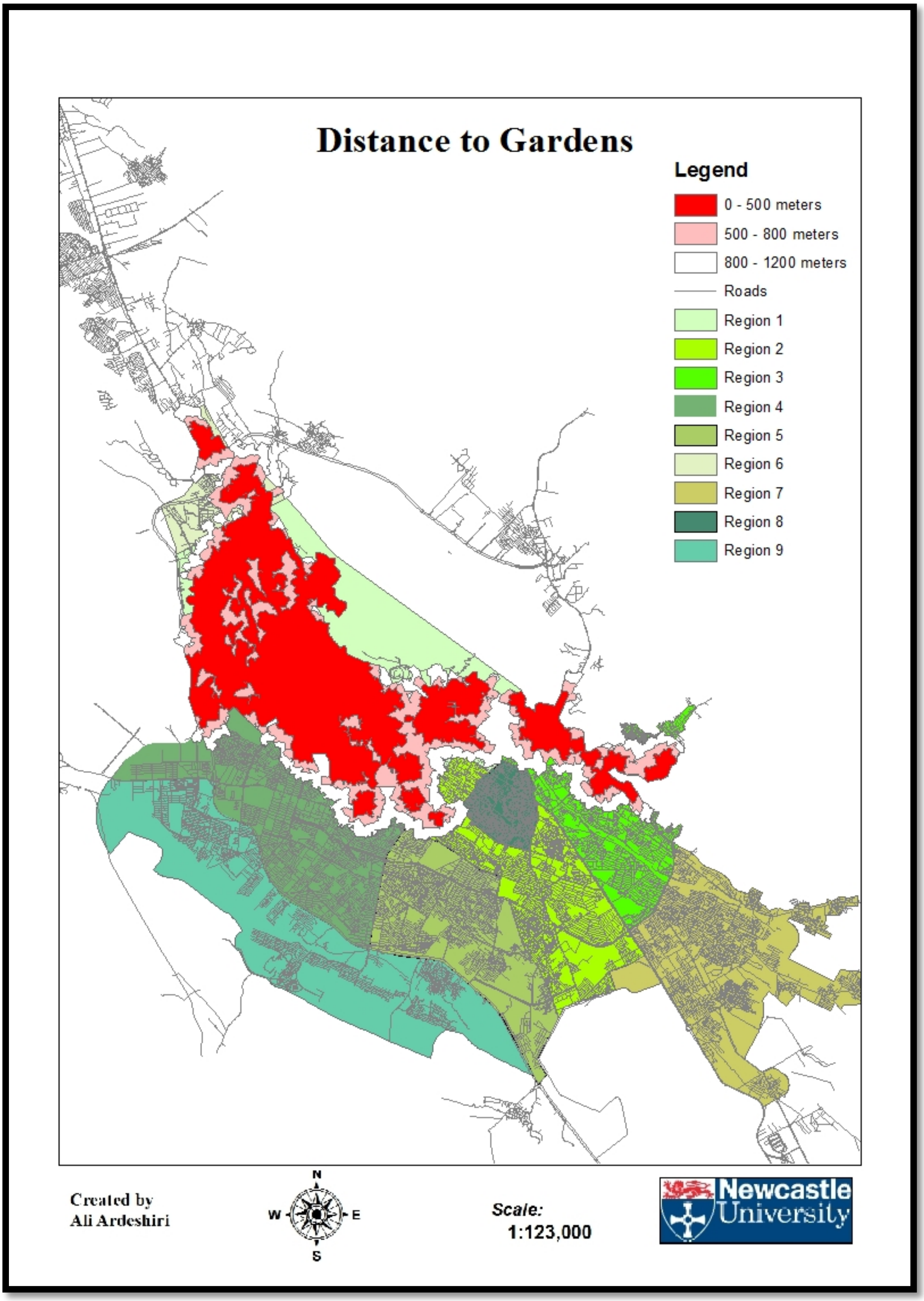


Figure 6.11 Service Areas of Ghasrodasht Gardens in Shiraz

Many people ranging from young kids to elderly people schedule sport in their daily activities. In Shiraz outdoor and indoor places are available to play different sport during day. Since most of these places are next to a green area or next to park these services have been included within the parks and green area group. Due to the obesity issue in the country recently the Government has started to prepare outdoor sites with simple machines for public to work out and do fitness activity for free and this has been welcomed by the citizens. In total there are 81 sport and recreation sites in Shiraz with a minimum of 187 sqm in region 8 and maximum 7.7 hectares sport complex in region 1. However the available space per capita is only 0.52 sqm showing that more sites need to be developed in the city. Regions 1 and 3 with 17 sites have highest number of sites among the other regions and respectively they each provide more than 300 hectares of the region's area with an access to a sport site of less than 500 meters. Regions 6 and 5 have the least area of 500 meter access to a site. In general in Shiraz 1432 hectares (8% of total area) have less than 500 meters access to sport services, 1964 hectares (11% of total area) have access to sport site between 500 to 800 meters and 3713 hectares (21% of total area) have access range of 800 to 1200 meters. In total 7109 hectares or equivalent to 40% of the Shiraz area have access to a sport site of less than 1200 meters.

Sport	Count	500 M	800 M	1200 M	Total
Region 1	17	300.212	414.0239	932.6837	1646.92
Region 2	14	280.95	325.12	439.53	1045.61
Region 3	17	309.677	335.565	492.1883	1137.43
Region 4	8	126.673	191.3519	576.8943	894.92
Region 5	4	56.92	129.89	281.85	468.65
Region 6	2	27.30	32.32	93.99	153.61
Region 7	10	198.627	364.066	561.9506	1124.64
Region 8	4	70.50	104.77	165.02	340.29
Region 9	5	61.19	67.08	169.35	297.61
Total	81	1432	1964	3713	7109
Sport	Min Area	Max Area	Total Area	Population 2006	Per capita (Metre)
Region 1	0.04	7.70	15.04	187628	0.80
Region 2	0.05	4.23	28.00	193866	1.44
Region 3	0.04	3.93	10.47	177668	0.59
Region 4	0.03	4.23	4.98	266032	0.19
Region 5	0.04	1.13	1.84	163042	0.11
Region 6	0.10	0.31	0.41	51949	0.08
Region 7	0.02	2.16	7.75	131952	0.59
Region 8	0.01	0.15	0.25	55194	0.05
Region 9	0.09	0.97	1.30	108027	0.12
Total			70.04	1335358	0.52

Table 6.9 Data from Service area for Sport and Recreation Sites in Shiraz

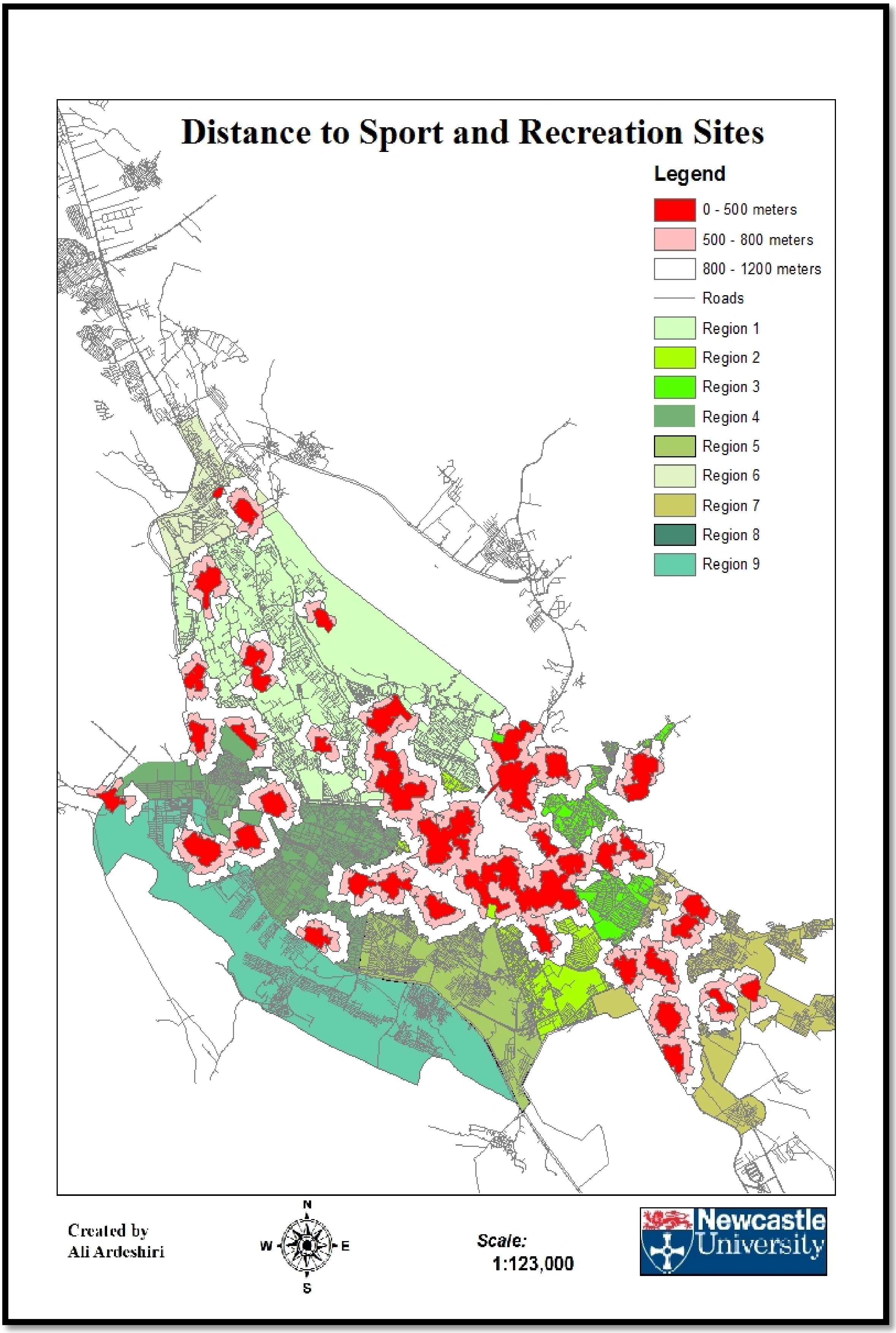


Figure 6.12 Service Areas of Sport and Recreation Sites in Shiraz

6.5.2 Educational Centres

In Shiraz we have 675 public or private educational centres providing necessary training and educational courses to young people in different age groups. Region 1 with 186 counts has the highest number of educational centres and region 6 with only 26 counts has the least. The smallest centre is located in region 3 with 150 sqm and the biggest centre is located in region 7 with 2.45 hectares. More than 33% of Shiraz area has access to an educational centre within 500 meters, 23% have access between 500 to 800 meters and 21% have access between 800 to 1200 meters resulting in general a total of 77% or 13573 hectares of access with less than 1200 meters. From these outcomes it is obvious that the government is trying to provide educational centres in neighbourhoods within 500 meters.

Educational Centres	Count	500 M	800 M	1200 M	Total
Region 1	186	1306.41	956.394	1041.513	3304.32
Region 2	127	900.819	457.926	212.0284	1570.77
Region 3	82	836.264	531.831	283.1689	1651.27
Region 4	85	838.413	710.956	571.4851	2120.86
Region 5	43	467.242	356.565	410.8596	1234.67
Region 6	26	194.816	145.895	171.9393	512.65
Region 7	65	676.324	460.167	480.8779	1617.37
Region 8	33	262.012	93.5974	19.8429	375.45
Region 9	28	389.756	309.936	486.4302	1186.12
Total	675	5872	4023	3678	13573
Educational Centres	Min Area	Max Area	Total Area	Population 2006	Per capita (Metre)
Region 1	0.04	2.09	39.13	187628	2.09
Region 2	0.02	2.20	35.54	193866	1.83
Region 3	0.01	1.50	24.82	177668	1.40
Region 4	0.02	0.50	14.18	266032	0.53
Region 5	0.02	1.38	15.70	163042	0.96
Region 6	0.01	1.67	6.67	51949	1.28
Region 7	0.03	2.45	17.12	131952	1.30
Region 8	0.02	1.50	8.70	55194	1.58
Region 9	0.04	0.95	9.05	108027	0.84
Total			170.91	1335358	1.28

Table 6.10 Data from Service area for Educational Centres in Shiraz

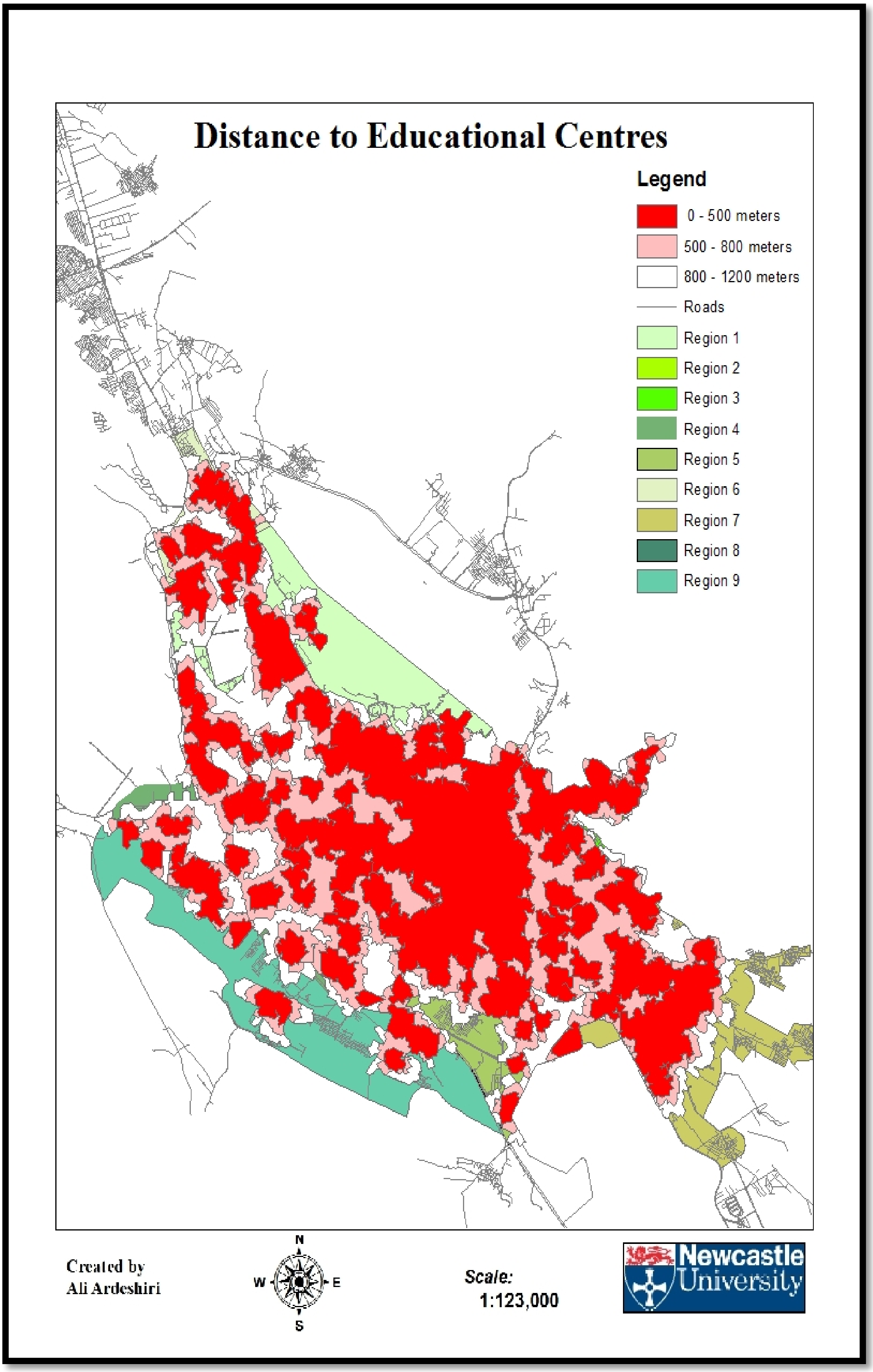


Figure 6.13 Service Areas of Educational Centres in Shiraz

6.5.3 Bus Stops

Buses are the main public transport in Shiraz. Shiraz metro is under construction and has not been available for citizens. Figure 6.14 shows that bus stops have been distributed quiet equally across the city. Only some parts in the north (Region 1) due to existence of mountains and in south (Region 9) due to newly development of the region have lack of bus services. In general Shiraz has 403 bus stops with the highest count with 132 in region 1 and the lowest count in region 8 with 13. Looking at the figures presented in table 6.11 it can be elicitation that the government plan is to provide bus stops in so that they become more accessible in so the system can be used more regularly. This is the reason that in Shiraz 5982 hectares (34% of total) have access to a bus stop in less than 500 meters, 4096 hectares (23% of total) have access within the range of 500 to 800 and 3352 hectares (19% of total) have access in the range of 800 to 1200 meter. This means that 13430 hectares or 76% of total area have access to a bus stop in less than 1200 meters. In addition looking at result for the distribution of education centres shows the these two public services have a close relationship with each other meaning that where ever there is an educational centre there is a bus stop nearby.

Bus Stop	Count	500 M	800 M	1200 M	Total
Region 1	132	1301.424	894.8854	1027.501	3223.81
Region 2	52	833.1419	479.4334	232.5305	1545.11
Region 3	42	806.285	550.3233	295.8675	1652.48
Region 4	44	814.355	778.4427	551.3035	2144.10
Region 5	30	602.2188	364.6874	296.3748	1263.28
Region 6	38	300.642	152.371	112.9594	565.97
Region 7	30	593.9505	430.5566	301.4554	1325.96
Region 8	13	265.2905	91.39055	19.72086	376.40
Region 9	22	464.4727	353.7014	514.4137	1332.59
Total	403	5982	4096	3352	13430

Table 6.11 Data from Service area for Bus stops in Shiraz

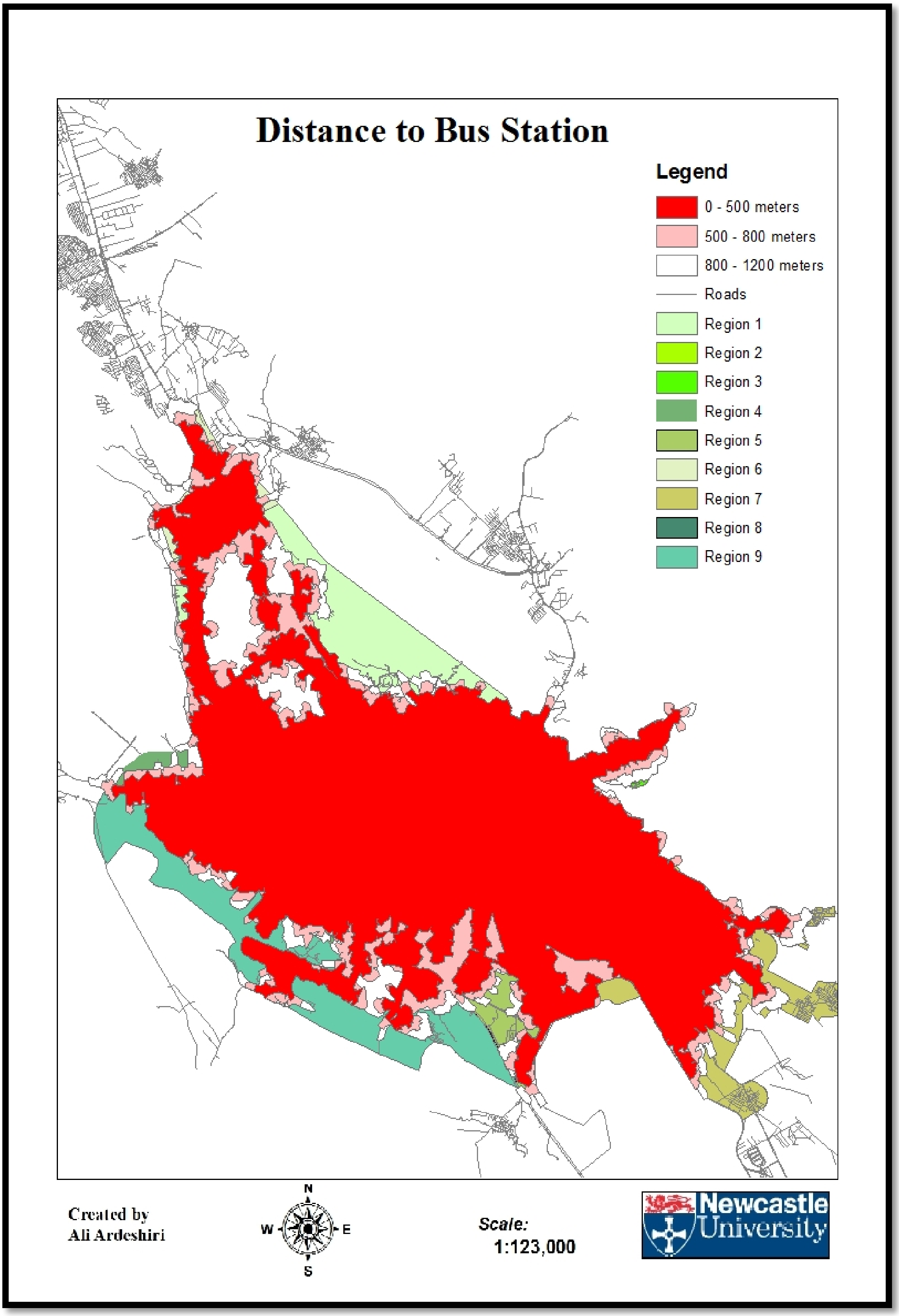


Figure 6.14 Service Areas of Bus Stops in Shiraz

6.5.4 Health and Medical Centres

Shiraz is also very famous for its health centres and specialist and doctors working in them. These centres are providing services locally nationally and internationally. Many people from countries around the Persian Gulf travel to Shiraz to be treated by the professional. In total there are 225 centres in Shiraz ranging from a small clinic with less than 140 sqm in region 7 to large hospital in region 1 with almost 8 hectares. It has been calculated that the per capita land for each person is 0.49 sqm however the per capita of this public services is higher than this number since the number of stories and their area for each centre is not calculated since the actual data was not available. Around 48% of Shiraz area have access to a medical centre with less than 1200 meters. This includes 2148 hectares or 12% of total having access in less than 500 meters, 2532 hectares or 14% have access within the range of 500 to 800 meters 3796 hectares or 21% have access between 800 to 1200 meters. The majority of these centres as it is shown in figure 6.15 are located in centre of Shiraz.

Medical Centres	Count	500 M	800 M	1200 M	Total
Region 1	114	649.229	769.4213	1196.886	2615.54
Region 2	25	396.97	399.62	380.02	1176.61
Region 3	19	326.351	335.8741	439.6882	1101.91
Region 4	14	220.34	327.66	651.70	1199.71
Region 5	8	135.733	245.2187	432.4851	813.44
Region 6	7	63.2381	81.93023	205.2356	350.40
Region 7	9	59.30	113.60	239.82	412.72
Region 8	22	206.697	139.1469	30.55897	376.40
Region 9	7	89.8036	119.0381	219.4495	428.29
Total	225	2148	2532	3796	8475
Medical Centres	Min Area	Max Area	Total Area	Population 2006	Per capita (Metre)
Region 1	0.021	7.970	34.520	187628	1.84
Region 2	0.023	4.540	12.980	193866	0.67
Region 3	0.022	2.310	6.140	177668	0.35
Region 4	0.030	0.560	2.730	266032	0.10
Region 5	0.020	2.123	5.580	163042	0.34
Region 6	0.021	0.597	0.250	51949	0.05
Region 7	0.013	0.193	0.450	131952	0.03
Region 8	0.014	0.150	1.210	55194	0.22
Region 9	0.020	0.523	1.239	108027	0.11
Total			65.10	1335358	0.49

Table 6.12 Data from Service area for Health and Medical Centres in Shiraz

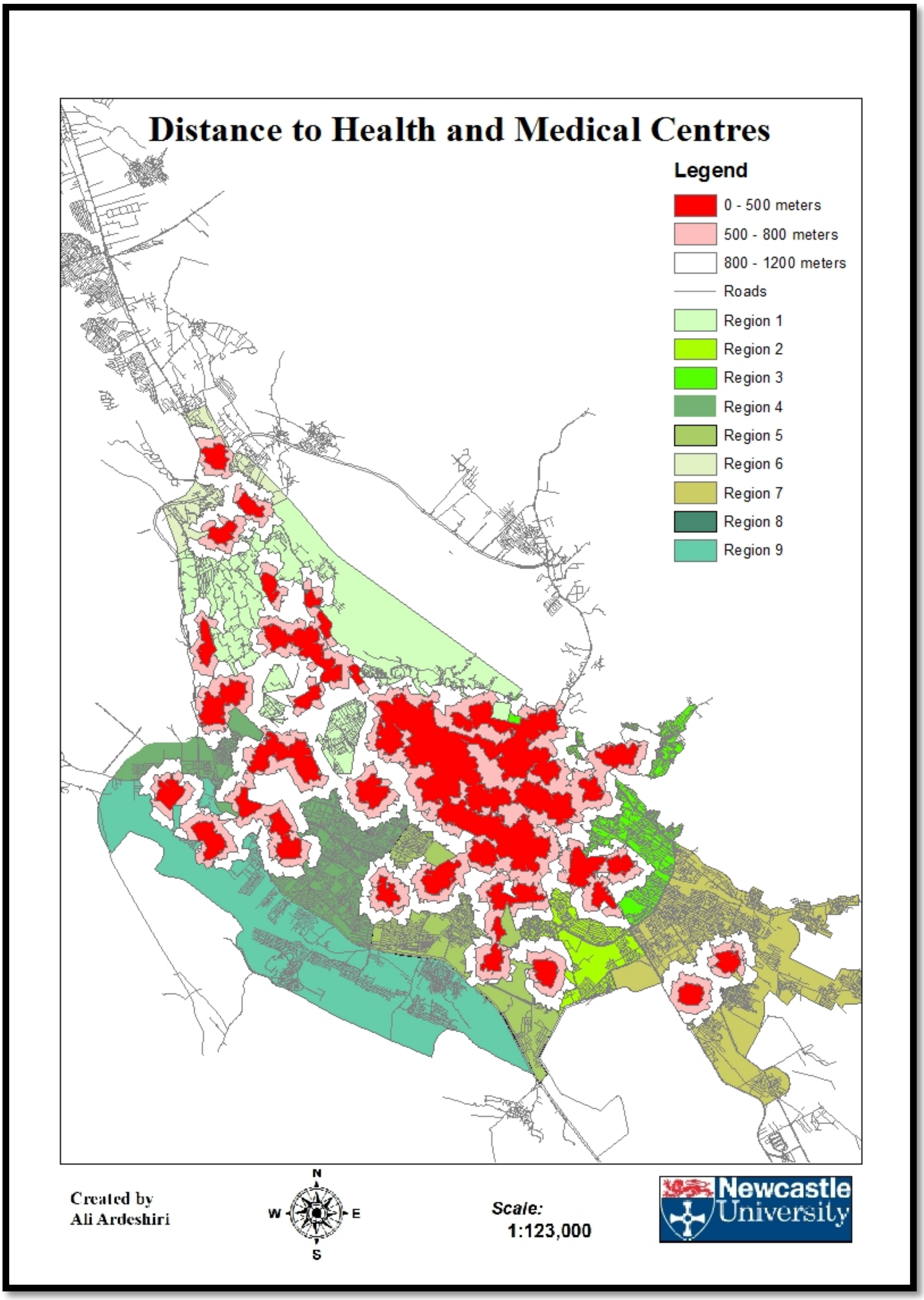


Figure 6.15 Service Areas of Health and Medical Centres in Shiraz

6.5.5 Post Office

In Shiraz there are 19 post offices in total which region 4 has the highest count with 4 post offices. Region 8 has the least cover for 500 meters with only 2.67 hectares and region 4 hast the most cover with almost 120 hectares. This is the same for the 800 meters range, region 4 covering 216 hectares and region 8 covering 22.21 hectares. Although region 4 covers the highest area for 800 to 1200 meters range, in region 6 only 66.5 hectares are covered. In general 496 hectares (3% of total) have access to a post office within 500 meter range, 832 hectares (5% of total) have access between 500 to 800 meters and 2003 hectares (11% of total) have access to a post office between 800 to 1200 meters.

Post	Count	500 M	800 M	1200 M	Total
Region 1	3	39.70339	63.22782	209.5311	312.46
Region 2	2	84.46534	152.6754	239.4947	476.64
Region 3	2	51.17764	74.16728	237.362	362.71
Region 4	4	119.8389	216.5399	546.2329	882.61
Region 5	2	46.66848	66.06686	170.0664	282.80
Region 6	1	27.534	32.370	66.528	126.43
Region 7	2	58.22991	98.80878	229.3446	386.38
Region 8	1	2.67	22.21	109.41	134.28
Region 9	2	65.99882	105.6636	195.3853	367.05
Total	19	496	832	2003	3331

Table 6.13 Data from Service area for post offices in Shiraz

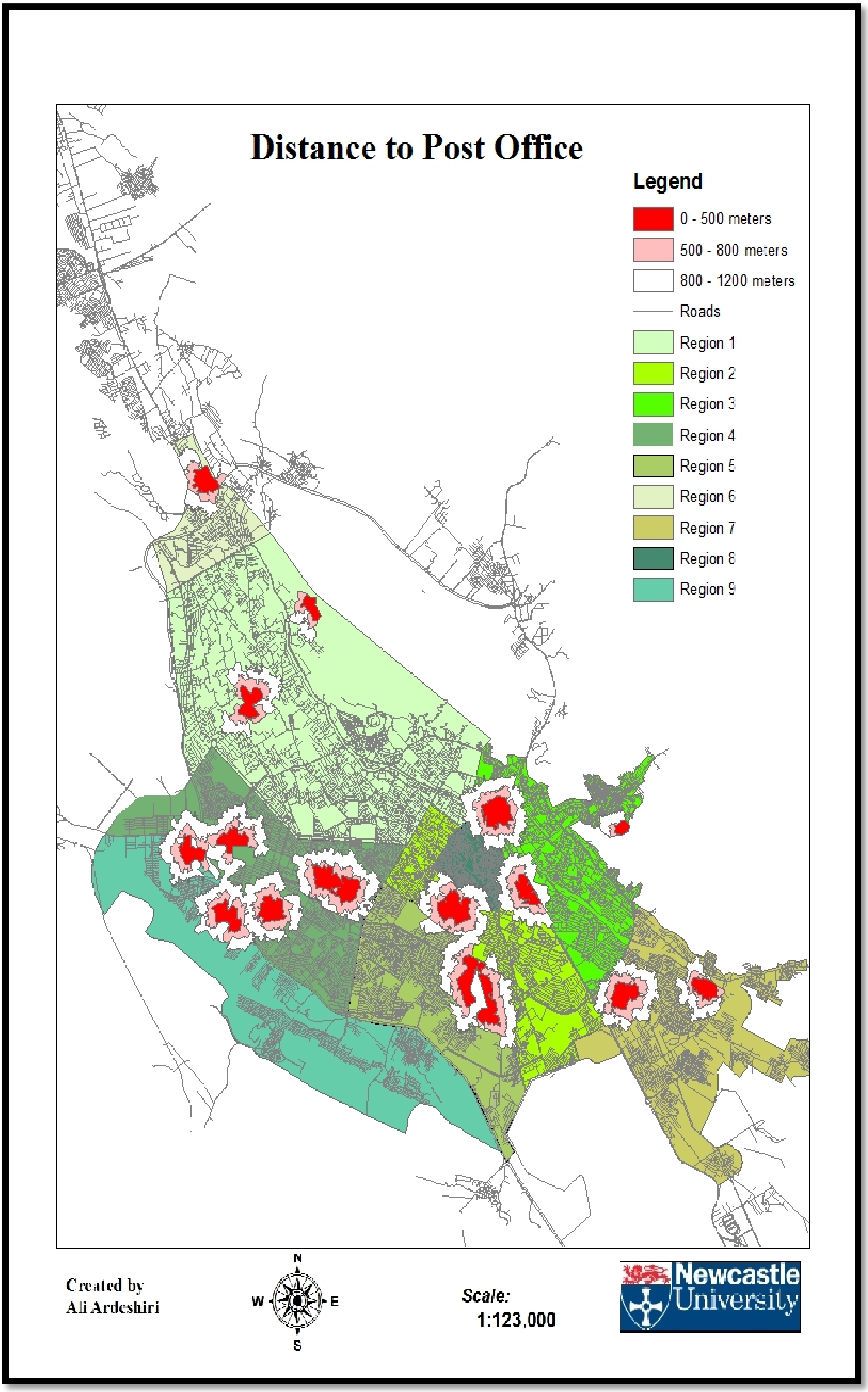


Figure 6.16 Service Areas of Post Office's in Shiraz

6.5.6 Local Centres

A local centre is very important to be available near neighbourhood so that residents have easy access to do daily shopping's. Although in Shiraz a special centre is not recognized to be available in all neighbourhoods like Tesco and Asda in UK or Westfield in Australia for daily shopping, on site observation in Shiraz 39 centres have been located across the city that different shops have been aggregated and local people do their daily shopping from these places. Region 6 and 1 respectively with 9 and 8 centres have the highest count in the region and region 7, 8 and 9 with only 1 count have the least. In 500 meters range of accessibility region 6, in the range of 500 to 800 and 800 to 1200 meters region 1 has the highest cover. The least cover for 500 meter access is region 8, within the range of 500 to 800 meter is region 7 and region 9 in the range of 800 to1200 meter. In general 1160 hectares (7% of total) have access in 500 meters, 1842 hectares (about 10% of total) have access in the range of 500 to 800 and 3626 hectares (20% of total) have access within 800 to 1200 meters covering a total of 6628 hectares (37% of total) of Shiraz city.

Local Centres	Count	500 M	800 M	1200 M	Total
Region 1	8	180.06	371.62	882.76	1434.45
Region 2	6	145.87	200.26	368.49	714.62
Region 3	6	149.43	227.37	508.57	885.36
Region 4	4	141.92	247.20	513.80	902.93
Region 5	3	137.63	262.32	482.54	882.50
Region 6	9	286.04	341.12	430.35	1057.5
Region 7	1	32.86	51.81	152.17	236.85
Region 8	1	31.54	64.44	155.59	251.57
Region 9	1	54.56	76.03	131.78	262.38
Total	**39**	**1160**	**1842**	**3626**	**6628**

Table 6.14 Data from Service area for Local Centres in Shiraz

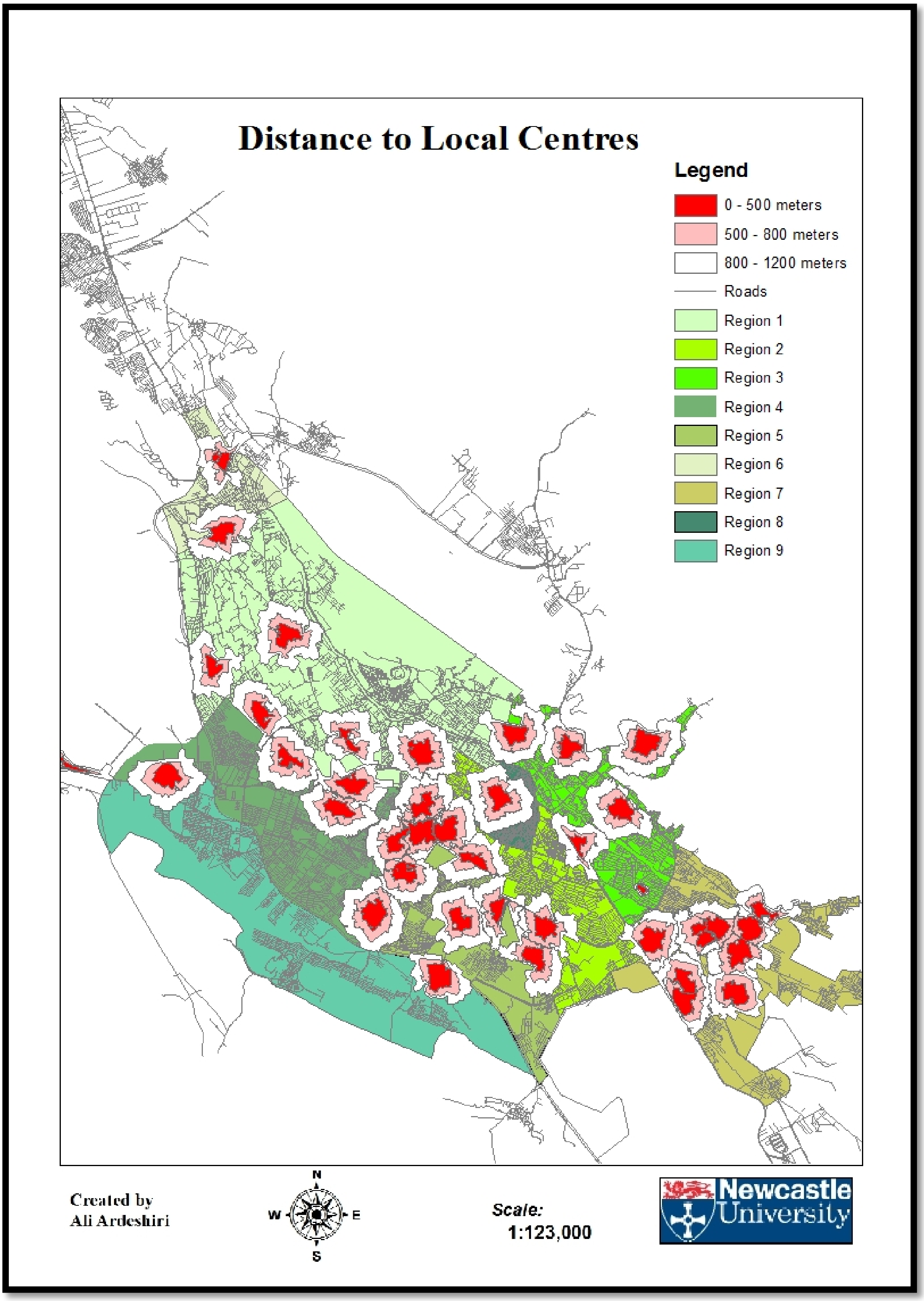


Figure 6.17 Service Areas of Local Centres in Shiraz

6.5.7 Police and Security Centre

Police and security centres are established in cities to protect residence in order to provide a safe environment for them to live in. In Shiraz these centres are located in the centre of the city where most of the shopping centres and CBD is located. In general Shiraz has 58 centres with region 1 having 18 counts and region 6 with 1. Region 2 covers the highest for 500, 800 and 1200 meters access and region 6 covers the least. In total these centres cover 1413 hectares or 8% of total with the range of 500 meters, 2028 hectares or 11% of total with access of 500 to 800 meters and 3473 hectares have access between 800 to 1200 meters.

Police	Count	500 M	800 M	1200 M	Total
Region 1	18	190.47	265.28	344.09	799.83
Region 2	10	531.44	733.41	1062.76	2327.61
Region 3	12	205.50	312.57	519.09	1037.172
Region 4	4	99.47	166.46	468.65	734.58
Region 5	4	100.87	155.20	289.66	545.73
Region 6	1	20.79	21.19	50.60	92.57
Region 7	3	67.96	122.39	325.75	516.10
Region 8	3	113.83	118.86	132.82	365.51
Region 9	3	83.02	132.59	279.16	494.77
Total	58	1413	2028	3473	6914

Table 6.15 Data from Service area for Police and Security Centres in Shiraz

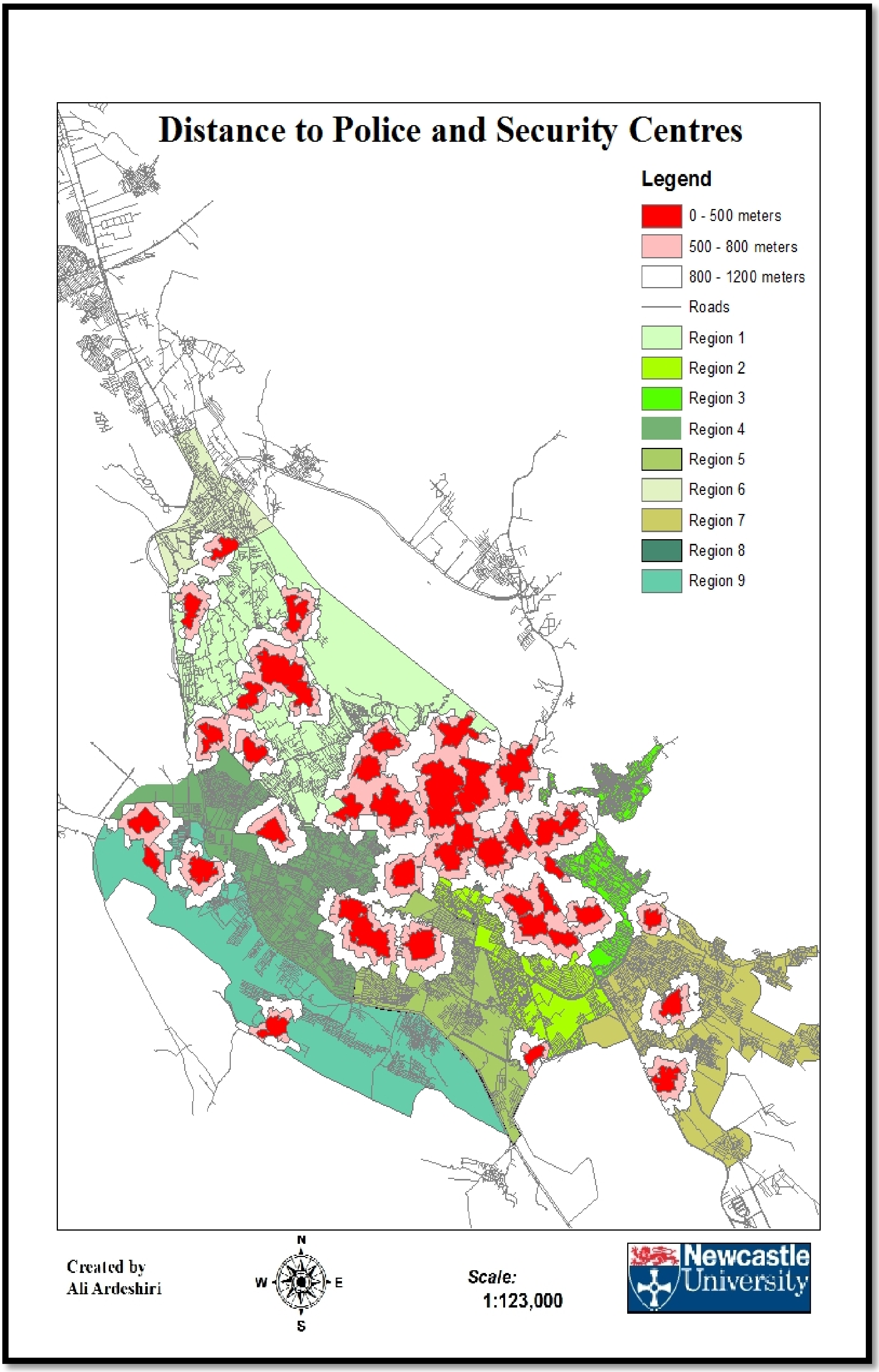


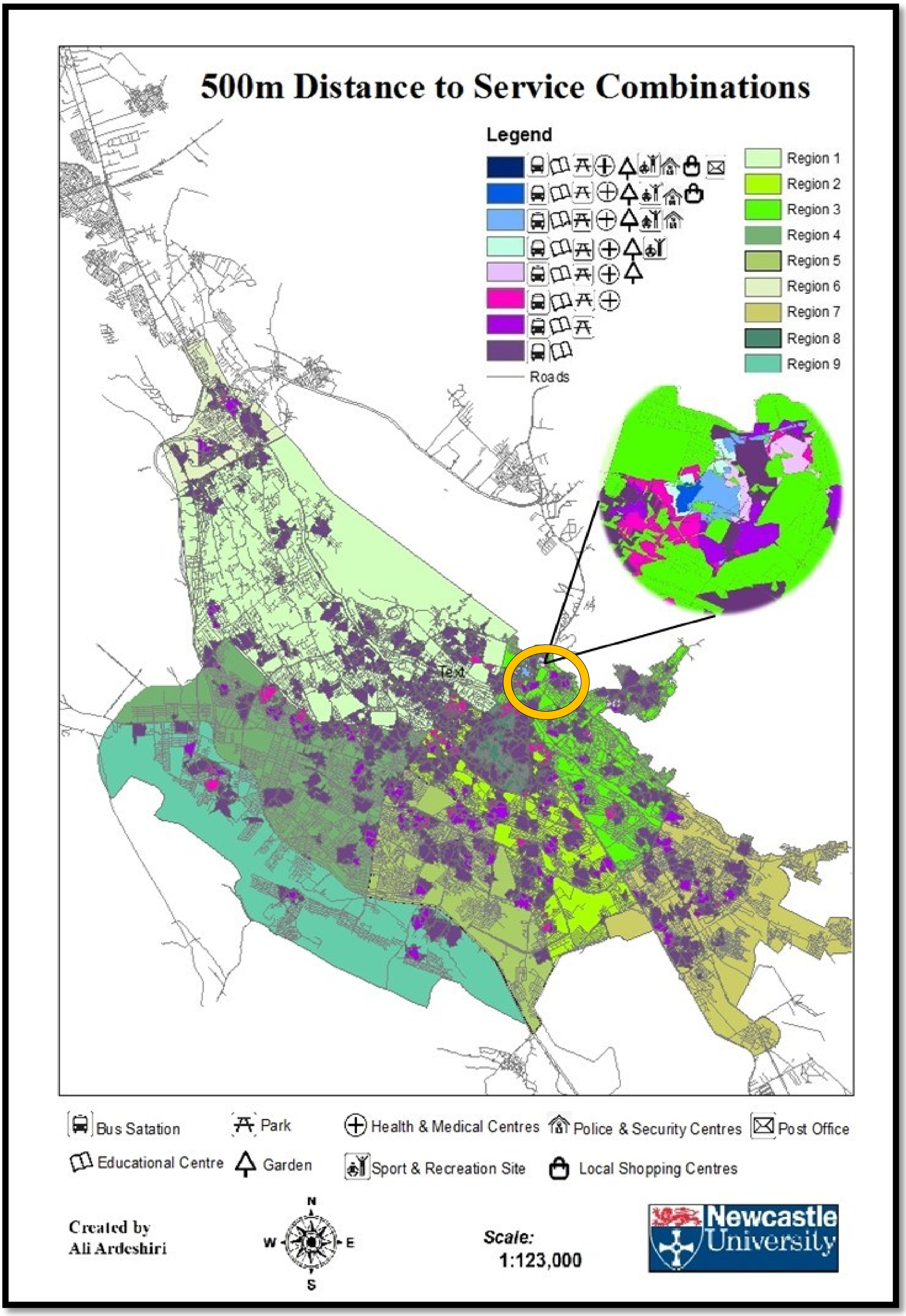
Figure 6.18 Service Areas of Police and Security Centres in Shiraz

6.6 Conclusion

Looking at different levels of accessibility of the nominated urban services in Shiraz provided in previous pages it can be summarized that firstly **bus stops, educational centres and parks** respectively are covering the highest amount of area with less than 500 meter access to these services. The same result appears for the 500 to 800 meter access and again these services cover the largest amount of area in Shiraz. However for the 800 to 1200 meter range parks, health and medical centres and sport and recreation sites have the highest accessibility for this level. This shows that the local government priority is providing an environment for young people to study and have easy access to these services using bus as the main public transport in addition providing a park next to these services as an additional place to study play and relax. However this information shows that the required context and services are available but it is very important that the quality of each services matches the standard as wells so the environment have the optimum effect on the users.

Secondly it was the Author's believe that results should have shown the agglomeration of most of the services in one place, however the results show that only one area in region 3 have the agglomeration of all services except post office covering 2.3 hectares (Table 6.16) of the total area and providing less than 500 meters access for the residents of that neighbourhood to all the services in one place. The result is similar for the other two level of accessibility. This explains that a local centre in each neighbourhood is not defined properly and urban services are spread widely across the city. This increases the number of travel between different services that respectively increases the energy cost and time of the travel and the amount of carbon dioxide in the air which decreases the quality of life in a city. The following figures and table shows the outcome of the overlapping area of different services.

Now that an overview of the relative urban services and their service area for three different level of accessibility is explained in this chapter for the city of Shiraz in the next chapter the analysis of hedonic pricing and life satisfaction method is demonstrated.



Where the highest amount of overlapping of services occurs

Figure 6.19 overlapping areas of services with 500 metre access

Overlapped Areas (in Hectares) of selected Services with 500 meter range of access	
	3423.70
	840.78
	246.30
	43.77
	16.71
	12.31
	2.32
	0.00

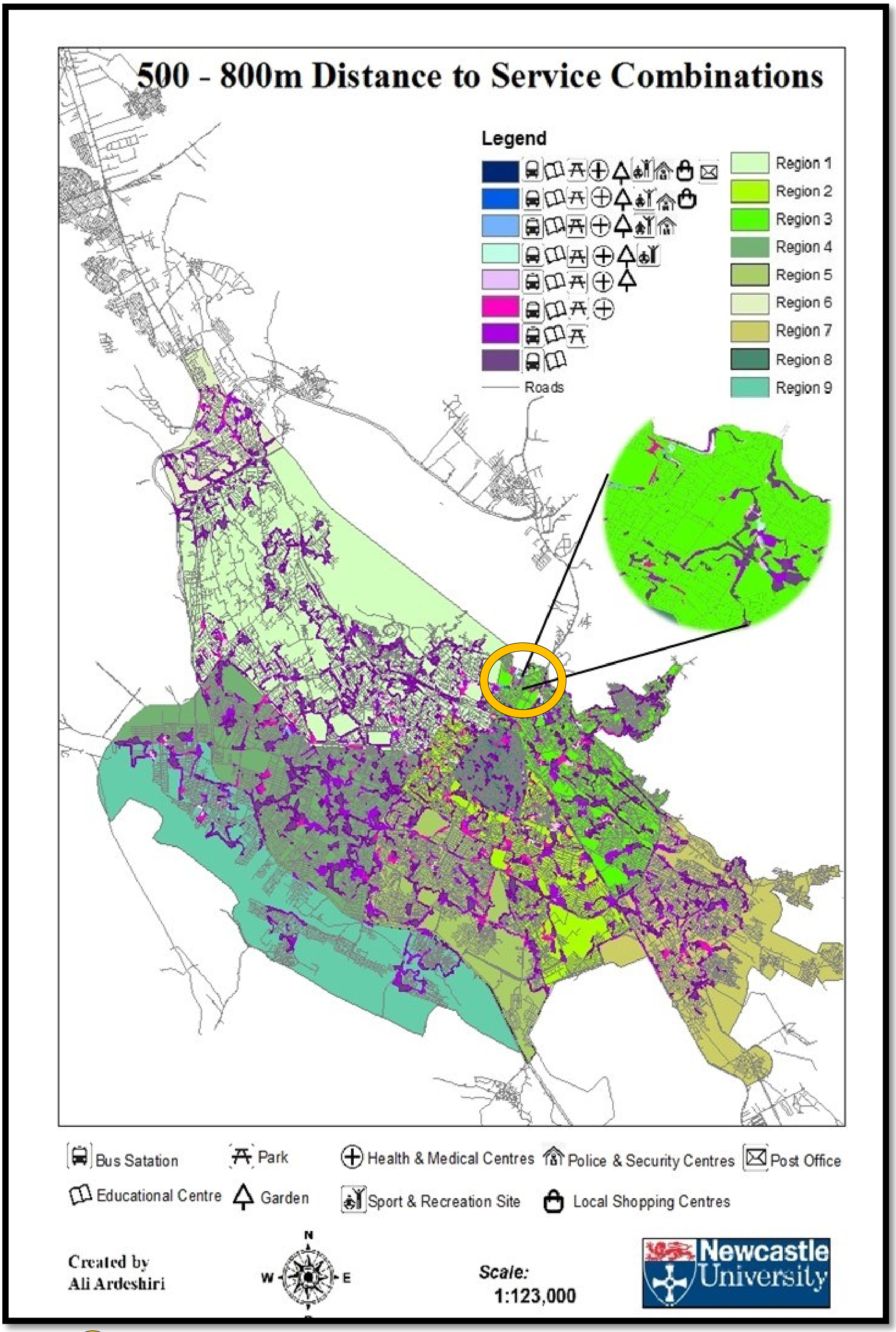
Bus Satation Park Health & Medical Centres Police & Security Centres Post Office
Educational Centre Garden Sport & Recreation Site Local Shopping Centres

Table 6.16 Overlapped Areas (in Hectares) of selected Services with 500 meter range of access

Overlapped Areas (in Hectares) of selected Services with 500 to 800 meter range of access	
	1371.08
	332.18
	90.89
	17.92
	5.80
	2.24
	0.20
	0.00

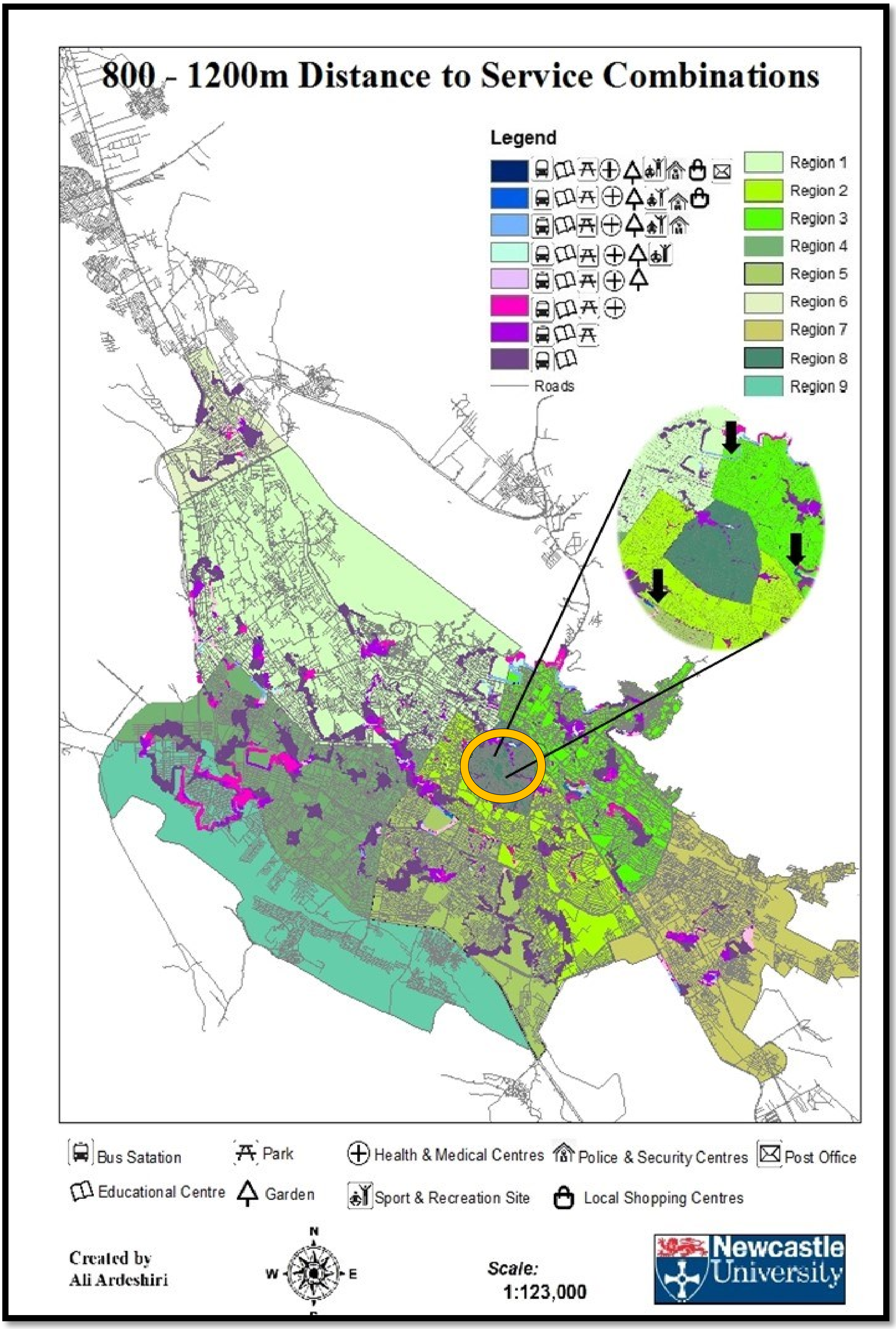
Bus Satation Park Health & Medical Centres Police & Security Centres Post Office
Educational Centre Garden Sport & Recreation Site Local Shopping Centres

Table 6.17 Overlapped Areas (in Hectares) of selected Services with 500 to 800 meter range of access



Where the highest amount of overlapping of services occurs

Figure 6.20 overlapping areas of services with 500 to 800 metre access



Where the highest amount of overlapping of services occurs

Figure 6.21 overlapping areas of services with 800 to 1200 metre access

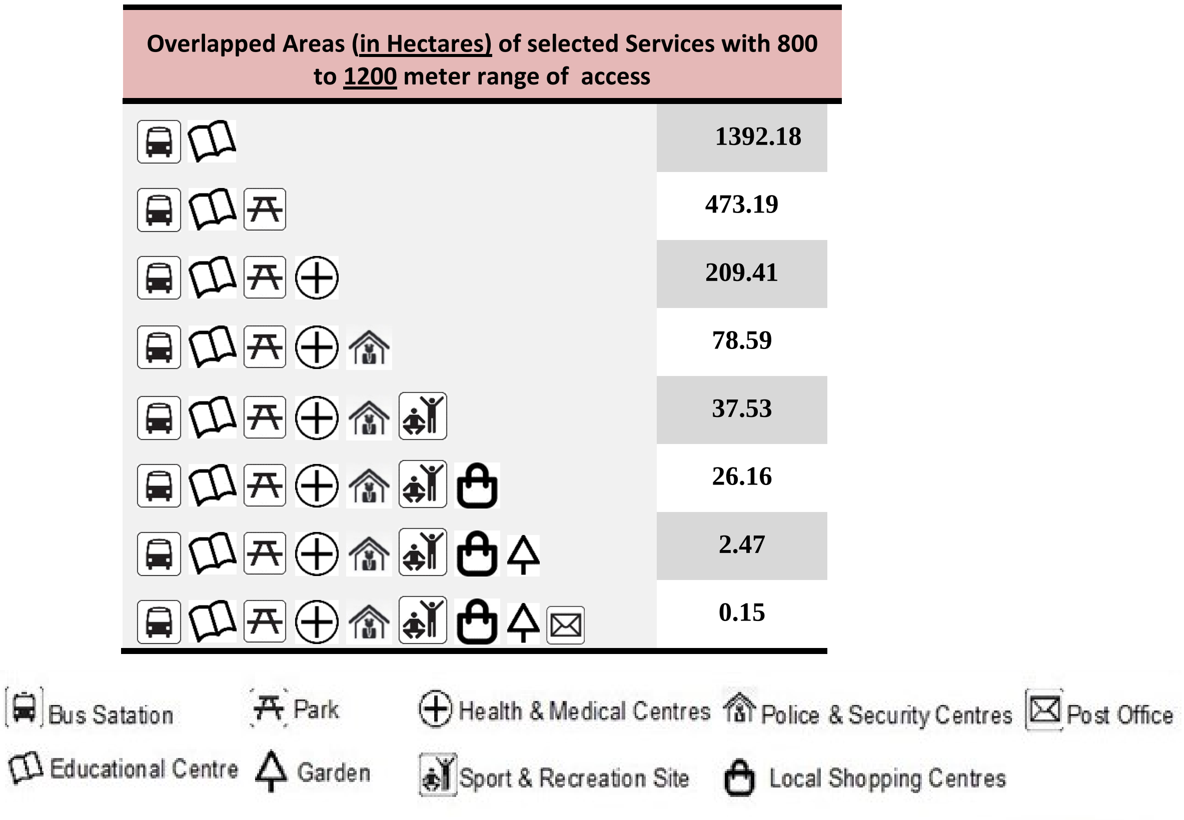


Table 6.18 Overlapped Areas (in Hectares) of selected Services with 800 to 1200 meter range of access

Chapter 7: Valuating “Quality of life’s” Objective and Subjective Urban Environmental Characteristics

7.1 Introduction

With the rapid growth in urban population, large cities are facing typical problems such as neighbourhood degradation, increased road traffic, socio-economic deprivation and inequities in health, well-being and health care accessibility, etc. This is reflected in the essential role of local environmental quality in recent strategic governmental policy papers with respect to housing, spatial planning and local environmental policy. At an international level, this focus is apparent in numerous scientific publications, and other documents concerning quality of life (QoL) and urban planning.

So far, science has not advanced a comprehensive framework to address these issues in an integrated manner and to enable an evaluation of physical, spatial and social indicators. Review of relevant literature revealed that no generally accepted conceptual framework in relation to well-being and QoL has been neither developed, nor any coherent system to measure and properly evaluate aspects of, and trends in, environmental quality. The concepts of urban environmental quality and related terms such as liveability, QoL and sustainability enjoy great public popularity and form a central issue in research-programmes, policy making, and urban development—or at least they do so in terms of the appearance of these terms in the respective literatures. However, the manifestation and context in which environmental quality and QoL is used in research and policymaking is seldom uniform. Therefore, research on QoL is a very complex issue in terms of choosing the right methodology and theoretical framework; however, it is very essential for achieving more clarification on this subject.

This chapter does not pretend to solve all the problems that must be addressed to establish a system for monitoring the quality of urban life in Shiraz city. It does aspire, however, to serve as a means by which local governments, analysts of urban problems and communities themselves may take advantage of a new generation of urban QoL monitoring strategies that have significant potential for contributing to public decision-making processes. In addition, enables policy makers at both national and local levels to identify disadvantaged urban areas and determine the most effective interventions. The findings presented also might help individuals or firms make more informed decisions concerning their locations and what they should demand from the local and central government.

7.2 Conceptual Approach to Urban Environmental Quality and Quality of Life

Rapid urbanization is followed by an intense demand for qualitative and quantitative development in physical dimensions and urban systems. This despites the fact that limitation in productive capacity, commensurate with rate of urbanization, not only makes it difficult to meet demand in different dimensions but it is also the cause of urban poverty, injustice, environmental degradation, lack of proper utilization of the capacity of cities in economic development and etc. Urbanization in developing countries is inevitable and preventive policies are doomed to failure in controlling the urbanization process. There is a consensus that to confront this problem in under developing countries, efficient urban management is required to tackle and solve the problems of urbanization, especially for mega cities in these countries. Urban management seeks to adopt a set of appropriate policies, effective and coordinated, in strategic areas to ensure that not only has the urban population got access to the labour market, housing and urban services, but also urban environments are organized to enhance the quality of life for its citizens. Moreover, cities need to play an effective role in economic development of the country by using their locational relative superiority.

In recent decades, many cities, regions, and countries have established systems for monitoring the QoL that take into account the interest and needs of cities' residents. In Europe, Urban Audit system of Eurostat, which uses more than 300 indicators to monitor QoL in 357 cities, is the widest QoL coverage system (Feldmann, 2008). Other less geographic coverage system in the world that can be mentioned are the QoL report covering 12 of New Zealand's cities, which encompasses 186 individual measures across 11 domain area (Quality of Life Projects, 2009) and initiatives in several cities of Brazil and Colombia from the developing world.

All of these systems share two interesting but problematic traits. The first problem is avoiding subjective variables as much as possible, believing that they limit international comparability. Many important aspects of people's lives do not lend themselves to objective measures, such as the beauty of the urban environment (or the lack of it), feelings of insecurity, or the quality of the relationships among neighbours. However, subjective measures may be misleading as well, because of a lack of public information, cultural biases, habituation, or aspiration factors. The second problematic feature is the inclusion of a large number of topics. Because the very essence of urban life is the meeting of diverse individuals who undertake a variety of activities and may have greatly differing interests and tastes, it may seem necessary for a monitoring system to cover many dimensions of a city's services and amenities and of the ways in which residents use and value them.

To combine objective and subjective information in a coherent manner and to focus on the most relevant dimensions of the QoL in a city or neighbourhood, Lora et al (2010b) used two conceptually basic criteria: the market price of housing and the individual's life satisfaction. They argue that the sale or rental prices of housing in a city are a synthesis of how the market values certain characteristics or attributes-not only those of a house itself but also those of its surroundings. Housing prices therefore are a good synthetic measure of the quality of urban life that residents may enjoy, provided that those prices reflect all of the city's characteristics that have an effect on well-being. Here is where life satisfaction comes into play. Although life satisfaction cannot be measured with the same precision as the price of a house, it can be fairly well approximated by means of a very simple question that is often included in QoL surveys. Life satisfaction is, in turn, a synthetic measure of the recognition that individuals give to all aspects of their lives, including the home and city where they live. Just as housing prices may not reflect all aspects of a city that affect well-being, an individual's life satisfaction may not depend on some of the same variables that affect housing prices. Satisfaction may depend, instead, on other conditions of the city, along with numerous individual factors ranging from friendships and religious beliefs to one's state of health and temperament. Therefore, these two approaches to measuring the factors that affect the quality of urban life-the hedonic price approach and the life satisfaction approach-can be used in a complementary manner to answer such questions relative to QoL concept.

Both approaches first may be used to calculate implicit prices for nonmarket goods; and then, with those prices used as weights, an urban QoL index can be developed. That index would provide a summary of how the salient amenities affect people's wellbeing. Such an index showing how value varies across neighbourhoods and individuals may become a central policy instrument to guide decision-making: neighbourhoods with particularly low values might become areas for priority actions, or individuals with particular characteristics might become the recipients of targeted polices. Underlying valuations then may be used to make decisions on the value of providing different services, whether involving incentives for improvements in housing quality, urban amenities, and public goods; or involving efforts to reduce the negative impact of urban problems.

The hedonic approach has a long tradition in the urban economic literature as a method of placing monetary values on the welfare impact of city amenities and public goods.

Families' location decisions implicitly reflect preferences regarding a set of characteristics pertaining to the house purchased or rented, the neighbourhood where the house is situated, and the amenities offered in that location. In turn, those preferences will affect property prices in the market for land. A better-quality house in a location that offers a wider set of amenities and fewer problems will command a higher price. Given sufficient variation in the house and location combinations present in the market, and assuming that the market functions smoothly, house prices will reflect the value of the full set of relevant housing and neighbourhood features and amenities. As examples of this approach, Blomquist, Berger, and Hoehn (1988) and Roback (1982)use hedonic price methods to estimate implicit values of local amenities, the prices then may be used to construct price-weighted QoL indexes.

An alternative and complementary approach is to ask people how satisfied (or happy) they are with their lives, their cities, or their neighbourhoods. More recent literature has emphasized this use of subjective satisfaction or happiness indicators for evaluating well-being: for example, Di Tella and MacCulloch (1998)Winkelmann and Winkelmann (1998); Gardner and Oswald (2001); and Frey, Luechinger, and Stutzer(2004). Because income is included as an explanatory variable in the standard LS regression, the marginal valuations of other significant variables included in the analysis may be computed. Under certain circumstances, including income in the regression allows for calculating an implicit price for various QoL attributes-which again may yield a scheme to weight variables to generate an aggregate QoL index.

7.3 Monitoring Quality of Life in Shiraz City

Looking at the world’s urbanization growth rate from 1950-2010, urban population in less developed regions has increased more than 7 times, and it is expected that by 2050 this increase will reach up to 16 times greater than the population in 1950. This trend also characterises Iran. During 1950-2010 Iranian urban population has increased more than 10 times with more than 70% of total population living in urban areas; and this trend will intensified by 2050 (United Nations, 2009). Shiraz is the sixth most populous city in Iran and is the capital of Fars Province. The population is around 1.5 million and it is located in the southwest of Iran on the Roodkhaneye Khoshk (Dry River) seasonal river. As it was mentioned in the previous chapter, the city of Shiraz includes 9 diverse regions (fig 7.1) in terms of their history and socioeconomic characteristics. No previous academic or policy work has been published related to monitoring QoL of neither Shiraz city nor any other cities in Iran and this makes this research unique and of curse essential. Here, the objective is to consider a within region analysis using primary data gathered through questioners among each region comparing life satisfaction of residents located in different regions.

A basic but critically important question for Shiraz citywide planning authorities, sub-city units of government, and neighbourhood organizations that regularly must make decisions about the provision of public services as they try to improve living standards for urban populations is “Which housing characteristics, neighbourhood amenities, and urban public services are important in determining individuals' levels of well-being or QoL?” Making such decisions is a particularly challenging task, however, because many such services and amenities are not traded in direct markets, and there is little reason for individuals to disclose their true demands or valuations. This leads the path for another relevant issue, which is, what QoL indicators to monitor?

7.3.1 Choice of Indicators

The present research took an open view in that regard, preferring to collect a wide variety of indicators and thus allow the data to reveal which factors are important. Apart from general indicators - such as income, health, age and education - indicators pertaining particularly to urban QoL were collected. Those indicators may be divided into ones related to housing characteristics and ones related to neighbourhood amenities.

Regarding housing characteristics, typical indicators refer to the size of the house (number of bedrooms and bathrooms) and the building's quality of construction (structure, direction, materials). In relation to neighbourhood characteristics, one important focus is the neighbourhood’s access to the city as a whole and to other areas. Consequently, the distance to a bus stop, the quality of public transportation services, the quality of roads and pavements, and the degree of traffic congestion are neighbourhood characteristics that may affect QoL. In addition, neighbourhood amenities such as parks, proximity to gardens (in Shiraz case, Ghasrodasht, Eram, Afif Abad, Hafezieh and Sadieh Gardens), neighbourhood cleanness density, and even the abundance of trees are relevant characteristics. The other areas that are highly relevant for QoL are the proximity of educational institutions, commercial centres, health care facilities, leisure related venues, post office and security stations.

Although those indicators are largely objective in nature, subjective measures and perceptions also may be used, especially in the LS approach. In particular, the surveys included questions about overall life satisfaction and satisfaction with housing quality and various neighbourhood features. However, the overall LS variable is the key dependent variable to be used in the LS approach, other subjective measures of access to and quality of different local public services and amenities may be incorporated into the analysis.

7.3.2 Description of Shiraz Regions Quality of Life Survey (RQLS)

Since the objective of any study concerning QoL should focus on the interaction of subjective evaluations of living conditions and on objective indicators of amenities and services availability. This study was designed as a three step data collection process, comprising a household survey, subjective environmental quality indicators collected at the street level and finding the distances (objective environmental quality indicators) of individual urban service from each dwelling using GIS techniques.

The sample size necessary for attaining a degree of representativeness for the city of Shiraz was beyond the resources and time available to do this project. The data collection effort thus was conceived as a pilot program to be conducted. In July 2010, 450 interviews from the households were carried out in the city of Shiraz. The survey was directed at decision makers in the household, those more likely to make location choices and to pay the rent and property expenses.

The upper half of table 7.1 summarized the main demographic indicators of RQLS sample. The average age of respondents is 46.36 years higher than the average in regions 1, 4 and 6. The majority of the respondents are male (65%).

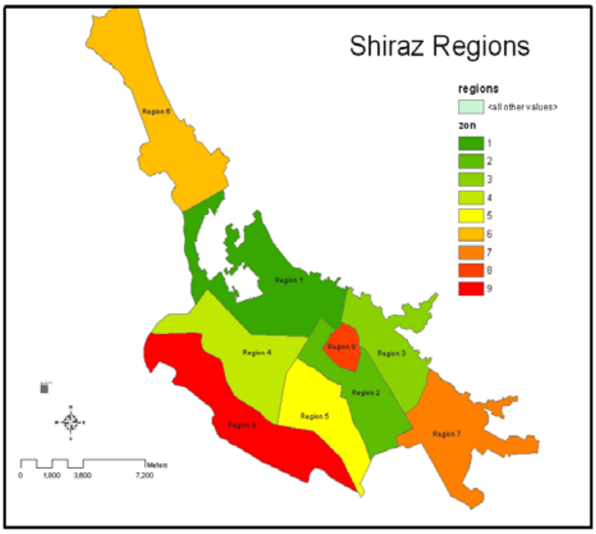


Figure 7.1 Shiraz Region

Source: Shiraz Master Plan

Regions 4, 5 and 9 respectively have the highest proportion of respondents with Diploma or lower education. Region 8 has, by far, the highest level of respondents with some upper diploma education. Regions 6 and 1 with 36% and 28% have the highest respondents with Bachelor degree. Finally, regions 7, 3, and 8 have the highest respondents with masters or above education. The total household's average income in Shiraz is 1.16 million Tomans (equivalent to £580 in 2010) which is less than the average in Regions 4, 1 and 6 and much higher in regions 8 and 9. Income per capita, household size and number of children behaves in a similar fashion to income, regions 4, 6 and 1 with the highest per capita income and regions 6, 4 and 1 respectively having the lowest proportion of house hold size and number of children. Just over 50% of the respondents in Shiraz are working in the private section with region 4 having the highest proportion and 35% working for the government with regions 8 and 2 with the highest proportion. Only 7% of the households are students with region 6 having the highest proportion. Not employment in region 9 is more than 4 times of the average and region 5 with 0.1% have the lowest rate. 63% of the respondents in Shiraz are married, which is higher than the average in regions 1, 4, 5 and 6.

The lower half of the table 7.1 presents a series of housing and dwelling characteristics. Region 1 respondents are much more likely to own a house (instead of renting it) than the other regions. In addition, respondents in regions 5 and 7 have the similar status; they are more likely to live in houses with gardens (instead of apartments). Average area of the properties is more or less similar among the regions. Respondents in regions 3 and 8 have been living in the same place for more than 18 years. Density of the units is higher in regions 1 and 6 this is the consequence of region's renovation and building new apartments. Dwellers in Shiraz benefit more from the sun light during the day if they are facing towards North-South (instead of facing East-West) therefore there is more demands for such dwellers. As the data shows region 1 dwellers, by far, have the opportunity facing the North-South direction. Rental price are much higher in regions 1 and 6 than in other regions. Finally, by looking at the average tax value for each region, region 8 has the highest tax amount because of its central location and also having the old Bazaar located in this region. The new malls are located mainly in region 1, increasing the average tax value in this region.

The RQLS also collect extensive information on general life satisfaction and subjective satisfaction with a series of life domains. The results from these questions also point to specific patterns among the regions, as shown in table 7.2. The neighbourhood levels of satisfaction revealed by answers to these questions are expressed on a 1 to 10 scale, with 10 being the highest possible valuation for the domain. Residents in more affluent regions report significantly higher levels of general satisfaction than do those in worse-off areas. In this case region 1, 6 and 4 are slightly better than Shiraz average general satisfaction and regions 8 and 9 are the regions with the lowest general satisfaction. However, average general satisfaction of 4 out of 10 in Shiraz indicates the dissatisfaction of the residents from general life domains. In general, the lower levels of satisfaction are in poorer regions and the higher levels are in richest regions.

Variables	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Average
Household and Respondent characteristics										
Age (Years)	32.09	55.04	53.5	38.34	51.93	34.42	50.4	49.77	51.82	46.36
Male Respondents (%)	71	57	61	63	66	55	66	61	81	64.56
Diploma or lower education (%)	39	40	40	54	46	39	26	38	45	40.78
Upper diploma education (%)	22	34	23	20	23	13	23	46	31	26.11
Bachelor degree (%)	28	17	16	11	16	36	20	0.1	18	18.01
Master's Degree (%)	7	1	9	11	10	10	23	15	4	10.00
PhD degree (%)	1	5	9	2	3	1	6	0.1	0.1	3.02
Total Household Income (In thousand Tomans)	1,333	1,142	1,036	1,334	981	1,223	1,060	712	770	1065
Per Capita Income (In thousand Tomans)	798	570	447	879	539	818	495	251	321	568.7
Household size	2.3	3.01	3.09	2.18	3.3	2.1	2.93	3.76	3.27	2.88
Number of Children	0.77	1.79	1.36	0.64	0.97	0.58	1.07	1.85	1.45	1.16
Student (%)	8	3	2	6	6	21	0.1	0.1	0.2	5.16
Private Employee (%)	72	21	33	81	43	55	63	15	36	46.56
Government Employee (%)	17	73	61	6	50	15	30	76	45	41.44
Not Employed (%)	0.7	1	2	4	0.1	7	6	7	18	5.09
Married status (%)	51	76	73	52	60	50	86	84	81	68.11
Dwelling Characteristics										
Owns home (%)	62	51	54	50	50	47	53	23	9	44.33
Home with Gardens (%)	40	35	45	36	67	53	63	38	41	46.44
Parking Space/garage (%)	95	71	57	77	70	84	70	38	55	68.56
Home is house (%)	41	35	45	36	67	53	67	38	41	47.00
Store (%)	79	60	38	59	33	61	33	15	18	44.00
Years in neighbourhood	14.1	13.6	18.9	11	10.6	16.6	7.2	18.4	9.2	13.29
Number of bedrooms	3.03	2.75	2.35	2.15	1.9	2.6	2.16	2	1.95	2.32
Number of Bathrooms	2.13	2.06	1.83	1.59	1.5	1.42	1.43	1.61	1.63	1.69
Number of Stories	3.43	2.38	2.43	3.2	2.1	3.32	2.23	1.85	2.68	2.62
Number of Units	7.87	4.42	5.19	7.5	3.9	7.71	5	1.77	6.32	5.52
Floor Area (M^2)	257.8	347.3	267.6	247.1	157.8	203.5	156.7	207.6	193.3	226.5
Directing towards North-South (%)	93	57	47	61	56	71	40	30	31	54.00
Dwelling Price per Square Meter (In thousand Tomans)	1611	703	752	940	819	1341	775	421	677	893.2
Rent (In thousand Tomans)	1784	906	665	737	535	1221	541	391	476	806.2
Average Tax block (In thousand Tomans)	108	63	47	69	34	50	26	142	24	62.56

Table 7.1 Summary Statistics, Household, Respondent and Dwelling Characteristics

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: In the regressions, Housing and Dwelling Characteristics correspond to HC variable.

Type of Satisfaction	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Average
General life satisfaction	5.58	3.4	2.33	4.7	2.63	5	2.73	2.15	2.72	3.47
Satisfaction with neighbourhood quality	5.28	4.44	4.04	4.61	4.26	4.92	4.06	3	3.54	4.24
Satisfaction with owns economic situation	5.11	2.73	2.76	3.2	2.9	4.02	2.73	1.61	1.81	2.99
Job satisfaction	4.33	3.48	3.04	3.65	3.26	3.94	3.1	2	2.54	3.26
Satisfaction with home	5.27	3.5	3.07	4.09	3.2	4.73	3.16	2.38	2.54	3.55
Simple Average	5.11	3.51	3.05	4.05	3.25	4.52	3.16	2.23	2.63	3.50

Table 7.2 General Satisfaction and Satisfaction with Life Domains on scale of 1-10

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: On the scale, 10 = the highest possible valuation for the Domain. In the regressions, general life satisfaction corresponds to GS variable. Neighbourhood QoL satisfaction corresponds to RS variable.

Table 7.3 presents a set of in-depth subjective evaluation of region characteristics that are relevant for urban QoL. As in table 7.2, the answers are on a 1-10 scale, covering such areas as sidewalk and streets conditions, cleaning, security, green areas, population density, dwellers density, air and noise quality, traffic and cycling conditions and building facades quality. Slightly the same pattern in general satisfaction appeared with regions 1 and 6 with the highest average and regions 8 and 9 with the lowest average.

Characteristic	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Average
Police Performance in neighbourhood	6.57	5.86	5.04	6.18	5.36	6.31	5.3	4.61	4.09	5.48
Traffic in neighbourhood	5.78	6.12	5.76	5.77	5.67	6.58	5.67	5.23	4.64	5.69
Annoying noise during the night	6.02	5.92	6.04	5.5	6.13	6.26	5.86	6	5.18	5.88
Air pollution in neighbourhood	6.53	6.92	6.33	6.23	6.13	7.16	6.53	6.77	6.45	6.56
Condition of streets	7.49	5.15	3.9	5.5	5.2	7.37	5.53	3.69	4.82	5.41
Condition of pavements	6.89	5.69	4.28	5.36	4.6	6.5	4.4	3.84	5.36	5.21
Safety for cycling	7.43	5.42	3.81	5.32	4.93	5.42	5.53	3.85	4.91	5.18
Garbage collection in neighbourhood	5.35	5.54	4.71	4.73	4.87	6.42	4.53	3.23	3.45	4.76

Neighbourhood cleanness	5.61	5	5.19	5.95	5.26	5.47	5.6	4.61	4.54	5.25
Street and sidewalk lightning at night	6.43	6.23	6.23	5.86	6	5.73	6.6	5.69	6.09	6.10
building facades quality and condition	6.93	6.08	6.14	6.09	5.93	6.37	6.53	5.69	6.18	6.22
Density of the neighbourhood	5.69	5.96	5.95	5.36	5.67	5.68	5.33	5.38	5	5.56
Overpopulation in the neighbourhood	5.69	5.85	5.95	5.14	5.8	5.68	5.33	5.69	5.45	5.62
Amount and quality of green areas	6.8	4.88	5.33	6.18	5.53	6	5.4	4.61	4.9	5.51
Simple Average	6.37	5.76	5.33	5.66	5.51	6.21	5.58	4.92	5.08	5.60

Table 7.3 Subjective Evaluation of Region Characteristics on scale of 1-10

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: On the scale, 10 = the highest possible valuation for the characteristic. Region evaluation corresponds to the SC variable in the regression.

Characteristic	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Average
Educational facilities (%)	73	88	74	82	63	68	73	31	45	66.33
Religious places (%)	29	71	43	52	40	24	33	100	45	48.56
Parks (%)	43	21	24	9	33	55	10	0	14	23.22
Bus stops (%)	92	98	93	98	100	100	73	38	82	86.00
Health facilities (%)	53	44	19	16	10	18	3	15	9	20.78
Security stations (%)	29	12	7	16	13	13	10	8	5	12.56
Leisure-related venues (%)	47	29	31	20	3	11	7	8	9	18.33
Commercial facilities (%)	48	29	38	39	47	42	23	38	14	35.33
Gardens (%)	72	2	21	11	0	37	0	0	0	15.89

Table 7.4 Objective Evaluation of Region Characteristics: Availability of services within 800 meters of the dwelling

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: These Objective Characteristics corresponds to the OC variable in the regression.

Table 8.4 presents the percentage of dwellers in the region with proximately of less than 800 meters (network rout) to different urban services, which has been produced using Service Area tool in GIS software after the data were geo-referenced and matched to each surveyed household by block of residence. It is important to mention that in the survey people were asked to choose their desired distance to the services that made them happy and motivated to walk towards it, and the outcome was 8 to 10 minutes (approximately 800 meters).

Although about 86% of the dwellers in Shiraz have access to bus stop and 66% have access to educational facilities access to other services is very limited for all regions especially regions 7, 8 and 9.

From a historical point of view, Shiraz main core was based in region 8 and data's show the low tendency of capitalization on urban services in order for renovate and develop new services and also lack of management to direct the capital equally among different regions in the city. These problems can be even more highlighted in region 9 as Shiraz newest region.

The results, so far, indicate the presence of three distinct sets of regions: regions 1, 6 and 4 respectively have higher average of income, degree of satisfaction with their lives and neighbourhoods, regions 2, 5 and 7 with equal average as of the city's, and regions 3, 9 and 8 with lower level of all those indicators.

The rest of the Chapter will use the indicators presented in a multivariate regression context to study urban QoL in Shiraz through the relationship of neighbourhood characteristics with property price and with life satisfaction.

7.4 Inferring QoL at the Shiraz Regions, Using Hedonic Price Regression

The data in table 7.1 indicate that there are significant differences in the rent paid (or estimated, in the case of ownership) by respondents in each regions. A QoL index can be derived using the variables in the survey, exploiting the greater availability of regions characteristics in the data set.

The results present in table 7.5 correspond to an ordinary least square (OLS) regression of the monthly rent value as a function of property characteristics (HC variable, from table 7.1) and both objective (OC variable, from table 7.4) and subjective evaluations (RS and SC variables, from tables 7.2 and 7.3) in the regression. Therefore, the regression is of the following form:

$$Rent = \alpha + \sum_b \eta_b HC_b + \sum_c \theta_c OC_c + \sum_d \lambda_d SC_d + \gamma RS + \nu \qquad (1)$$

Dependent Variable: Monthly Rent			
Model	B	t	Sig.
(Constant)	-1467801.221	-4.549***	.000
Property Characteristics (HC variable)			
Home is House	910007.655	11.166***	.000
Years in neighbourhood	-6826.479	-1.806*	.072
Bedrooms	471203.914	10.592***	.000
Bathroom	244014.068	4.984***	.000
Tax block	2.483	2.320**	.021
Subjective Characteristics (SC variable)			
Neighbourhood traffic	-392322.720	-2.036**	.042
Neighbourhood road condition	674093.297	3.692***	.000
Neighbourhood recycle collection	293963.519	1.850*	.065
Neighbourhood cleaning	340303.424	2.038**	.042
Neighbourhood population	528116.182	1.951***	.052
Objective Characteristics (OC variable)			
Availability of Park within 800 m	-151594.466	-1.670*	.096
Availability of Police within 800 m	171081.991	1.749*	.081
Availability of Gardens within 800 m	315098.318	3.451***	.001
R^2	0.684		

Table 7.5 Augmented Hedonic Price Regressions for Monthly Rent

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: Only variables with coefficients significant at the 10 percent level are included.
*P<.10 **P<.05 ***P<.01

The results for housing characteristics in table 8.5 are fairly standard. Newly homes with more bedrooms and bathroom in cleaner, less population, less traffic, better road conditions neighbourhoods near to gardens and security stations, command a higher rental prices. The negative and significant coefficient of Availability of Park within 800m, is possibly reflecting the imposed by the relatively lower levels of peace and quiet. Finally, higher value of tax for dwellers reflects its relative superiority of its location, services and accessibility.

These results (summarized in table 7.6) indicate that better neighbourhood quality and accessibility to services increases the rent value. Using Shiraz average amount of rent value from the hedonic price regression (average value in thousand Tomans = 1317) as a reference we can than compare the implicit price of OC and SC of each region. For example the rental value of a dwelling with two bedrooms and two bathroom, on the bases of only regions objective characteristics (in this case is access to services), in region 1 is 174,960 (more than 13 percent of average value) Tomans higher than Shiraz average value and if the identical dweller was located in region 8 the rental value had a decrease of 22650 Tomans. Respectively regions 1, 6, 4 and 3 have and premium of 174960, 19110, 12050 and 5420 Tomans on Shiraz average rent value, and regions 5, 9, 2, 7 and 8 respectively have a penalty of 64130, 49010, 41340, 34390, 22650 Tomans on the average. Inclusion of regions subjective characteristics variable in the equation, larger differences and reordering of some regions can be observed. With regions implicit rent price difference base on objective and subjective characters ranging from decrease of 183160 Tomans for region 8 to an increase of 345380 Tomans for region 1. Correspondingly environmental quality of regions 1, 6, and 4 having a positive impact on rent value and regions 8, 9, 3, 5, 2 and 7 have a negative impact.

Region	Percentage of Objective Characteristics From Shiraz Average Rent Value	Implicit Rent Price Difference base on Objective Characters (in 1000 Tomans)	Percentage of Objective and Subjective Characteristic s From Shiraz Average Rent Value	Implicit Rent Price Difference Base on Objective and Subjective Characters (in 1000 Tomans)
Region 1	13.28	174.96	26.22	345.38
Region 2	-3.14	-41.34	-3.70	-48.72
Region 3	0.41	5.42	-6.43	-84.74
Region 4	0.91	12.05	0.99	13.02
Region 5	-4.87	-64.13	-4.86	-63.97
Region 6	1.45	19.11	13.38	176.22
Region 7	-2.61	-34.39	-2.68	-35.23
Region 8	-1.72	-22.65	-13.91	-183.16
Region 9	-3.72	-49.01	-9.02	-118.79
Shiraz Average Rent Value (in 1000 Tomans) = 1317				

Table 7.6 Implicit Price Differences for RQLS

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)

The following section derives another set of measures of environmental quality and QoL from an alternative methodological perspective.

7.5 QoL in Shiraz regions: The LS Approach

This section presents a further analysis of QoL, focusing on the interaction of subjective evaluations and objective indicators. The urban economic literature explains difference in QoL by city and sub-city area, assuming that city or neighbourhood amenities are capitalized in property prices and wages (Gyourko *et al.*, 1999). An alternative strand of research, related to the happiness literature attempts to derive valuations for intangibles and externalities by studying the impact of the relevant factors on life satisfaction.

This section presents an extension of the alternative strand. The main difference consists of joint modelling of the relationships between income and general satisfaction, on the one hand, and between life satisfaction and neighbourhood QoL, on the other hand. This methodology computes the impact of the variables related to urban QoL in monetary terms.

7.5.1 Life Satisfaction Methodological Issues

QoL can be approximated through the general life satisfaction (GS) variable included in the RQLS data, whereas the NS variable provides information on neighbourhood satisfaction. A series of conditions need to be met to apply the two-equation valuation method to the neighbourhood QoL setting. First, a relationship must exist between general life satisfaction and Region Satisfaction (RS). Second, an unbiased estimator of the effect of RS on GS must be available. Third, the region's characteristics must be correlated with RS. Finally, these characteristics must affect GS only through their effect on RS (that is, they are exogenous to determination of GS). If these conditions are met, it is possible to estimate the following system of equations:

$$GS = \alpha + \sum_{c} \beta_c X_c + \rho Y + \gamma RS + \nu \qquad (2)$$

$$RS = \alpha_2 + \sum_s \phi_s SC_s + \sum_c \theta_c OC_c + \varepsilon \qquad (3)$$

Where the X variables represent individual characteristics; Y is the level of income; RS is region satisfaction; GS is general satisfaction; and the other groups of variable represent objective and subjective region characteristics: OC are objective geographic characteristics; SC are subjective evaluation of region characteristics.

Under the conditions mentioned, equations (2) and (3) can be estimated as a system, instead of sequentially, correcting for the probable endogeneity of RS variable in the GS regression. This endogeneity bias is corrected by instrumenting RS with the region characteristic variable, resulting in an unbiased γ coefficient. A monetary valuation of region amenities and characteristic then can be derived from their impact on general life satisfaction through their effect on regional satisfaction.

7.5.2 Life Satisfaction Regression Results

As a first approximation, the two equations in the system can be estimated independently. Because the dependent variables are both ordered on a 1 to 10 scale, the model is estimated by cardinal OLS (COLS), which first transforms all ordered variables (dependent and independent) to a form similar to the normal distribution and then applies OLS to estimate the model (for methodological details see (van Praag and Carbonell, 2004).

The results from these simple regressions are presented in the tables 7.7 (RS regressions) and 7.8 (GS regression). Starting with the latter table, the results match well established results in happiness literature (see (Oswald, 1997), among others): Life satisfaction increases with income, is lower for people with graduate qualifications than under graduation or below, and decreases with age. Marriage, gender family size and employment do not have a significant effect. Last and the most interesting for the purpose of this study, the level of satisfaction with region QoL (the RS variable) has a positive and strongly significant effect on GS.

Regarding the determination of regional satisfaction the results in table 7.7 presents the estimation result of RS as a function of OS and SC. Of the objective indicators, having a health care centre, Parks, Leisure-related venues and commercial have a positive effect and only proximately to religious centres have a negative effect on the environment which again could be the consequence of having relatively lower levels of peace and quiet in the region. The entire subjective variables have a positive effect on the environment indicating the importance of regions safety and cleanness with good quality of green areas and the value of infrastructures maintenance.

From this preliminary analysis, it appears that there is indeed a relationship between life satisfaction and region satisfaction (GS and RS) and that objective and subjective variables are relevant determinants of region satisfaction. The latter result implies that the OS and SC variables might be appropriate instruments to correct for the potential endogeneity of RS in the GS regression. The region characteristics have an impact on general life satisfaction only through their effect on region satisfaction.

Dependent Variable: Region Overall Satisfaction			
Model	B	t	Sig.
Subjective Characteristics (SC variable)			
Neighbourhood safety	0.253	6.883***	0
Neighbourhood noise pollution	0.074	1.967**	0.05
Neighbourhood sidewalk condition	0.067	1.848*	0.065
Neighbourhood cleaning	0.065	2.029**	0.043
Neighbourhood lightning condition	0.104	2.314**	0.021
Neighbourhood amount and quality of green areas	0.136	3.489***	0.001
Objective Characteristics (OC variable)			
Availability of Religious centres within 800 m	-0.028	-1.896*	0.059
Availability of Parks within 800 m	0.034	1.985**	0.048
Availability of Healthcare centres within 800 m	0.059	3.451***	0.001
Availability of Leisure-related venues within 800 m	0.033	1.876***	0.061
Availability of Commercial centres within 800 m	0.063	4.103***	0
R^2 0.487			

Table 7.7 Region Satisfaction Regression

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: Only variables with coefficients significant at the 10 percent level are included.
*P<.10 **P<.05 ***P<.01

Dependent Variable: General satisfaction			
Model	B	t	Sig.
(Constant)	0.74	4.361***	0
Masters	-0.056	-2.228**	0.026
PhD	-0.185	-4.555***	0
Region overall satisfaction	0.444	9.321***	0
Income	2.58E-08	1.962**	0.05
Log Age	-0.312	-2.409***	0.016
R^2	0.525		

Table 7.8 General Life Satisfaction Regression

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)
Note: Only variables with coefficients significant at the 10 percent level are included.
*P<.10 **P<.05 ***P<.01

The estimation results from tables 7.7 and 7.8 can be used to compute QoL indicators. Table 7.9 reports the average valuation of for Shiraz regions using only objective characteristics (first results column) and using the objective and subjective characteristics (second results column).

The first column indicates that objective characteristics are valued relatively very little, on average, for the whole sample 5880 Tomans compared with the average income of

1066000. This average , makes a large variability between regions moving from regions 1, 6, 4 and 3 to the synthetic average regions required average compensation of 150470, 22930, 20490 and 2440, respectively whereas regions 7, 5, 2, 9 and 8 would give up 41270, 35270, 31030, 24510 and 11330 Tomans to move to the average region.

The second result column of table 7.9 computes the compensation based on all region characteristics. The sample average compensation is 25.26, with average ranging from -91580 for region 8 to 297030 Tomans for region 1.

Finally table 7.10 computes the correlation between the four indexes computed for the RQLS data set – two based on hedonic price regressions and two based on the LS approach, including either objective variables only or all region characteristics. The correlations between indexes based on different methodologies are all positive, indicating that the two methodologies are at least partially accounting for some common underlying level of QoL.

Region	Income value of LS index, Based on Objective Characteristics (In 1000 of Tomans)	Income value of LS index, Based on All Region Characteristics (In 1000 of Tomans)	Average Monthly Income (In 1000 of Tomans)
Region 1	150.47	297.03	1333
Region 2	-31.01	-36.54	1142
Region 3	2.44	-38.13	1036
Region 4	20.49	22.13	1334
Region 5	-35.27	-35.18	981
Region 6	22.93	211.46	1223
Region 7	-41.27	-42.28	1060
Region 8	-11.33	-91.58	712
Region 9	-24.51	-59.40	770
Average	5.88	25.28	1066

Table 7.9 Monetized value of LS- Base Region QoL index

Source: Author’s calculations, based on the Regional Quality of life Survey (RQLS)

		Hedonic regression		LS	
		Price difference, index based on objective characteristics	Price difference, index based on all characteristics	Income value of LS index, Based on Objective Characteristics	Income value of LS index, Based on All Region Characteristics
Hedonic regression	Price difference, index based on objective characteristics	1.000			
	Price difference, index based on all characteristics	.675	1.000		
LS	Income value of LS index, Based on Objective Characteristic	.311	.201	1.000	
	Income value of LS index, Based on All Region Characteristics	.157	.217	.354	1.000

Table 7.10 Correlation Between Hedonic and LS Index

Source: Author's calculations, based on the Regional Quality of life Survey (RQLS)

7.6 The outcome of this approach in policy making strategies

The pervious discussion holds that the Hedonic and LS approaches should be considered complementary. The Hedonic regression revealed a set of housing and neighbourhood characteristics to be significant which implies that housing markets in the regions do function well in that they reveal considerable information about what individuals believe to be important. On the other hand LS regressions also exposed a set of variables to be significant. Although housing markets function, it is clear that they do not function perfectly. Showing that not all characteristics are priced appropriately at all times. Both set of results should be considered relevant and be taken into account by policy makers.

The result may also be beneficial to answer some relevant policy making questions of how to finance the provision of public goods. Amenities that are reflected in housing price may be financed through property taxes, and those reflected in life satisfaction may be financed through general taxation.

This research takes a broad view of what factors may be more significant for individual QoL. It is interesting to know that having a park within 500 meters accessibility comes through highly important in both approaches. Although house prices reflect part of the value of living in a neighbourhood close to a park, they do not appear to reveal the full value of it. The monetary valuations from the hedonic regression in this instance are likely to underestimate the value of access to a park. On the other hand, Hedonic regressions find access to police is important. LS regressions generally do not find that to be true. Hence, the market may reflect the value of this characteristic more fully, and the valuations in the hedonic regressions then may be fully revealing. If they compare the results in this way, policy makers may use both sets of results to consider likely true valuations (Lora et. al, 2010).

An implication of the finding that housing markets reveal a wide set of neighbourhood characteristics also suggests that Shiraz neighbourhoods are likely to be characterized by deep economic segregation. Segregation has received attention in the literature on urban economics, from both a theoretical and an applied perspective. Tiebout (1956) advances a theoretical model where inhabitants organize themselves into different areas, depending on their preferences for public goods. Different preferences imply an economic rationale for segregation. As Homogeneous subcity areas develop, they exacerbate segregation at the city level. This economic segregation contrasts with ethnic or other motives for segregation.

Lora et. al (2010) believes that the more segregated the urban area is, the more local governments may develop to serve the needs of each homogenous subcity zone. This is a prediction of the Tiebout model, borne out by evidence from the United State. Vandell (1995), in the extension of the same argument, holds that the higher-income families will outbid lower-income families for property with desirable characteristics. The result is that richer areas will cluster closer to desirable amenities. More generally, according to that view, market forces are likely to generate areas where residents have similar attributes, perhaps including neighbourhood characteristics such as natural features or parks and the provision of higher quality public services.

Therefore, it should come as no surprise that Shiraz is highly segregated, given that region’s high income inequality and the finding here that housing markets do reflect a wide set of public goods and bads. Moreover, the urban economic literature also concludes that rapid development of cities allows the demand for segregation to be both quicker and deeper.

7.7 Conclusion

A first conclusion from the empirical analysis is the existence of some multidimensional QoL factor associated with regions characteristics, as witnessed by the similarity in the distribution of indexes for different methodologies. Moreover, whether based on the reflection of local amenities and characteristics in property prices or on subjective level of satisfaction, the two approaches suggest the environmental quality is of great importance for the environment that the residents of Shiraz are living in and different objective and subjective environmental characteristic can be monetized which can enhance urban public policy making and improving the QoL. Information on the significant variables in the analysis could be collected on regular basis to monitor the evaluation and impact of these urban public policy interventions.

Both the LS and hedonic approaches may be used to determine the actual monetary valuations of improvements in services or provision of better amenities. Moreover, comparing the LS and Hedonic approaches provides further insights. For example, where both approaches suggest that a particular issue is important, it is likely that both approaches underestimate true valuations. If a characteristic is found to be significant in the LS approach, it implies that markets are not fully reflecting individuals' true valuation. On the other hand, finding that a characteristic is not significant in the LS approach does not necessarily imply that there is no public policy concern. Furthermore, the results found using both approaches could be used to answer the very important policy question of how to finance provision of public services. Amenities that are reflected in housing prices are amenable to financing through property taxes, and those reflected by the LS approach may be financed through general taxation.

In addition, in the extreme case where markets fully reflect all valuations, economic segregation is likely to be very deep and cities are likely to be characterized by sever inequality in QoL. In turn, spill overs between neighbourhoods will may reduce the QoL of all inhabitants. In particular, one view is that deep economic segregation feeds crime as it was mentioned in chapter four the fear of violence is one of the main justifications in neighbourhood segregation (Calderia, 1996). Because the lack of sense of security may be the most serious issue found to affect QoL in the cities analysed here, the link between segregation and crime surely is an important issue for further analysis.

Chapter 8: Analysis of Choice Experiment Model

8.1 Introduction

With line to the pervious analysis, the focus of this chapter is to estimate a simulated price for having access to public services. Analysis of willingness to pay of data collected in this survey is presented in this chapter. Consumers in real markets make decisions among competing alternatives. Much marketing research is directed toward predicting how those consumers will react to changes in available choice sets, typically in the context of adding new products or modifying existing ones. Survey methods that ask consumers to make choices from "experimental choice sets" enable researchers to learn about consumer preferences for products and attributes that do not yet exist in real markets. To identify the demands of people living in urban areas this chapter uses a primary source of data gathered from 450 households from nine regions of Shiraz asking their preferred urban services. Also this chapter examines how people value access to these services in urban neighbourhood and their general life satisfaction.

8.2 Choice Experiment

Environmental valuation has come a long way since the original work on the travel cost model and contingent valuation in the USA in the 1960s. This Chapter sets out the basic concepts behind a relatively new methodology in environmental valuation, namely "Choice Experiments" (CE). The CE technique is an application of the characteristics theory of value (Lancaster 1966), combined with random utility theory (Thurstone 1927; Manski 1977). It thus shares strong links with the random utility approach to recreational demand modelling using revealed preference data (Bockstaell et al. 1991). In many cases, the dependent variable of interest in choice modelling (CM) is discrete or limited in nature. Contingent ranking can be an example where each respondent ranks a number of alternatives. However, in Choice experiment, people respond 'choice A' or 'choice B' or 'neither' to choice questions. Linear regression models are not appropriate for such data sets because in a linear regression

- Conditional expectation $E(y_i|x_i)$ can lie outside the limits (0,1) i.e. estimate probabilities can lie outside admissible range (0,1): the dependent variable is not bounded between 0 and 1, and
- Errors u_i are not normally distributed, and thus problems occur with application of tests of significance.

Limited dependent variable methods such as logit models are typically used instead.

Choice experiments give welfare-consistent estimates for four reasons. First, they force the respondents to trade-off changes in attribute levels against the costs of making these changes. Second, the respondents can opt for the *status quo*, that is, no increase in environmental quality at no extra cost to them. Third, it can represent the econometric technique used in a way which is exactly parallel to the theory of rational, probabilistic choice. Fourth, it can derive estimates of compensating and equivalent surplus from the 'output' of the technique.

8.2.1 Selection of the Attributes

In this stage the relevant urban services that act as non-market goods are identified. This attributes includes;

- Those thought to be part of people's preferences for the environmental change being considered; and
- Those that can be implied by policies/project/management option choices.

Different ways are available to choose the right attributes such as literature review, focus group discussions and direct questioning. For this research, direct questioning method has been used to find people's preference of services in their neighbourhood. Table 8.1 shows the outcome of asking from 450 households to rank their **top 3** urban service to be in their desirable range of accessibility in neighbourhood.

Urban Services	Preference no. 1	Preference no. 2	Preference no. 3
Parks and Green Areas	267	18	82
Educational centre	29	34	55
Public transport	79	133	34
Health care centre	14	96	3
Post office	17	5	6
Sport centres	12	9	52
Local shopping centre	19	81	154
Security centres	13	74	64

Table 8.1 Preferred urban services voted by the residents of Shiraz City

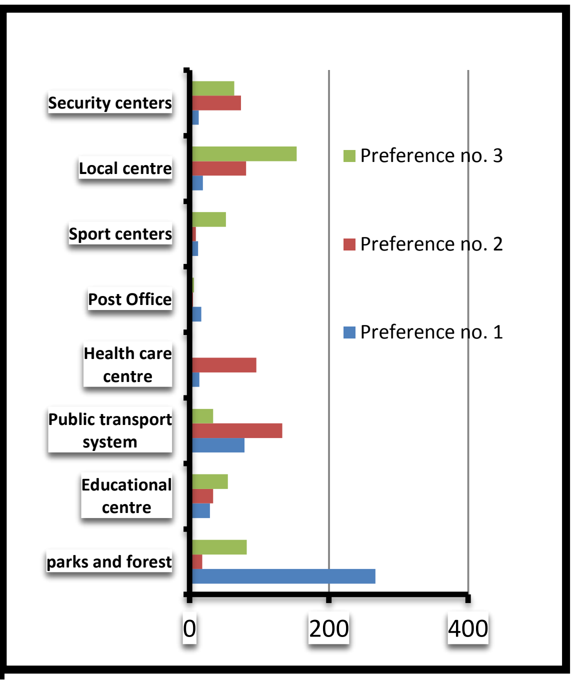


Figure 8.1 Preferred urban services voted by the residents of Shiraz City

The results in table 8.1 show that residents have chosen parks and green areas as their first preference. This Urban service is representing Parks, country parks, landscaped, open space and generally any green open space. Certainly such spaces acts as peaceful retreats from the city, recreational resources, attractive backdrops to urban development, safe and exciting play areas for children and reserves for urban wildlife and contributes to the quality of life in many ways.

The second preference was public transportation. In this research public transport is referred to buses only since the metro is being under construction and yet Shiraz does not have a metro system to be used as public transport. Residents are completely aware that access to an adequate and appropriate transportation services is required in a better quality of life.

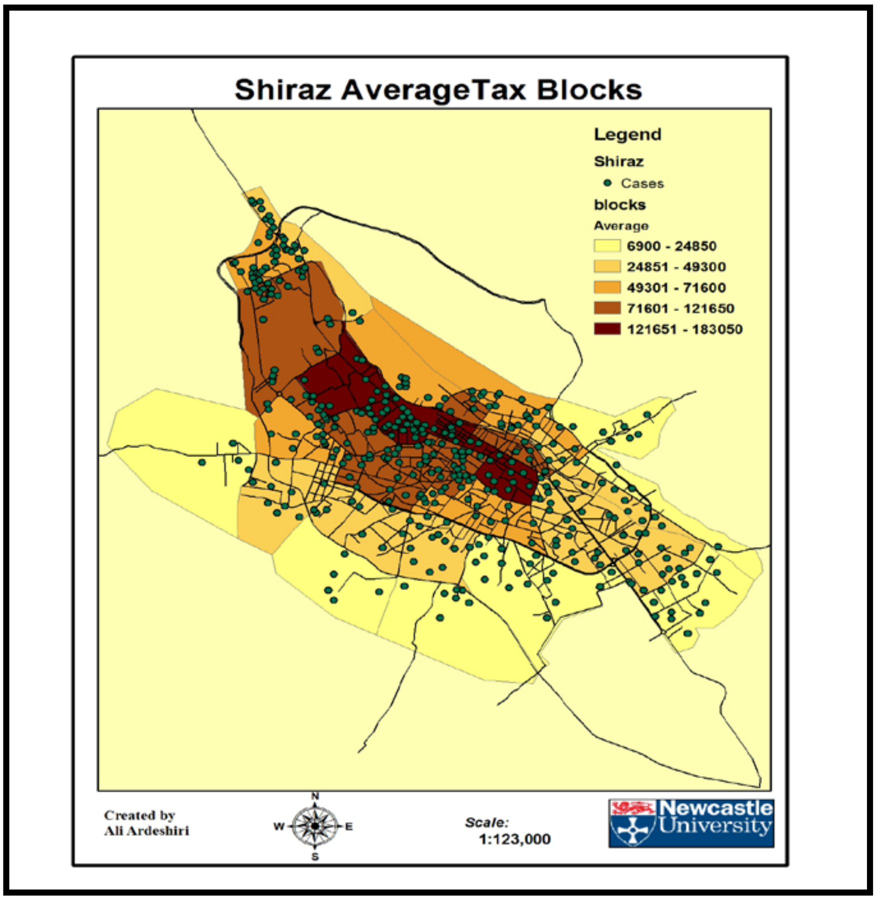
Finally as their third preference, they have selected local shopping centres from which daily necessary requirements can be bought and people could spend sometimes with their family. Having a local shopping centres fulfil an important role in meeting local needs, particularly for those without access to a car. Therefore, access to local shopping facilities is considered very important.

Since this research is for a welfare-theoretic estimation of benefits or costs of accessible public services and not just to imply a ranking of attributes, the price term needs to be included as well. Clearly the price tag needs to be credible and realistic, and ideally one which also minimises incentives for strategic behaviour. Therefore, for this research the price tag has been set as the amount of increase or decrease on ***tax*** that a household needs to pay for its house.

8.2.2 Assignment of Levels

After selecting the relevant attributes for this study, different levels are required to be assigned for each attribute. In planning and building regulations section of Shiraz detail plan three levels of accessibility to services have been mentioned as “distance of accessibility” in designing and planning for a neighbourhood. These levels are 0-500m, 501m-800m and 800m-1200m which is respectively set to be equivalent to average walking distance in 5 minutes, 10 minutes and 15 minutes of walking distance. Consequently same distances have been selected for different levels of accessibility to the chosen services.

For the price term relevant ranges have been estimated from the pilot study and through focus group with some authorities in the municipality. Looking at the average amount of tax that household pay for their property (as it is shown in Map 8.1) in Shiraz, it is very noticeable that is not a very large amount. The ranges of taxes are from 6900 Tomans (equivalent to 1.4 British pounds) in the suburbs to 183050 Tomans (equivalent to 34.5 British pounds) in the city centre. This amount is for one year period. After having the focus group it was consensually agreed that residents will agree to pay up to maximum of 100% increase in tax if they receive the required services. However it is crucial to ensure that all the prices being offered are commensurate with the levels of attributes. For example prices that are too low will always be accepted and the result will be a very small or zero price coefficient, which translates into an inflated money value for attributes. On the other hand prices that are too high will always be rejected, and this too can mean, paradoxically, that the price coefficient comes out to be small or zero. Since this topic has not previously been researched a pilot study was used. To avoid having too many levels the assigned levels started for -10% decreases in tax and reached to maximum of 100% increases and in total 8 levels were allocated. Table 8.2 represent the assigned levels for each four attributes.



Map 8.1 Shiraz Average Tax Block

<table>
<tr><td>Parks and Green Areas</td><td colspan="3">500 Meters</td><td colspan="2">800 Meters</td><td colspan="3">1200 Meters</td></tr>
<tr><td>Public transport</td><td colspan="3">500 Meters</td><td colspan="2">800 Meters</td><td colspan="3">1200 Meters</td></tr>
<tr><td>Local Shopping Centre</td><td colspan="3">500 Meters</td><td colspan="2">800 Meters</td><td colspan="3">1200 Meters</td></tr>
<tr><td>Tax</td><td>-10%</td><td>-5%</td><td>0%</td><td>20%</td><td>40%</td><td>60%</td><td>80%</td><td>100%</td></tr>
</table>

Table 8.2 Assigned levels for the relevant attributes of the study

8.2.3 Experimental Design

After selecting the relevant attributes and the required levels to be assigned for each alternative, it is essential to design the experiment. Number of alternative scenarios or descriptions should be prepared to be offered to respondents. In this case the three urban services attributes have appeared in three levels and the tax attribute has been set in eight levels. It would be possible to generate $3 \times 3 \times 3 \times 8 = 216$ (the number of levels to the power of the number of the alternatives) alternatives from these, simply by considering all the possible combinations in other words performing the complete factorial design. Clearly it would not be practical to ask respondents to consider simultaneously 216 possible alternatives. However, using statistical experiment designs it is not required to ask 216 alternatives from each respondents. The statistical experiment design provides the means to select subset of the total set of possible alternatives for use in an experiment or a questionnaire in a statistically efficient manner, in another words *fractional factorial design* can be used for large experimental designs. For this research SAS software was used to choose 72 alternatives that can be presented as 36 choice sets. For each set the "do nothing" or *status quo* level has been included.

In general, respondents should not be asked to undertake tasks that are too difficult or complex because they may not perform them reliably and/or may resort to shortcuts or haphazard answers. Nor should they be asked to complete too many choice sets because they will become tired and either the quality of respondents will fall or they may terminate the interview before completion (Bateman et al., 2002). Smith and Desvousges (1987) find that ranking sets of between 4 to 6 elements yield the most consistent answers, with more 8 becoming more complex for most respondents to handle. Therefore a manageable task for each respondent can be constructed by using smaller sets of alternatives to be presented to respondents from the full set of alternatives identified by the experimental design. For this research the 36 choice sets have been split into 6 blocks and each respondent has been offered only one block of 6 different choice cards. In total the choice sets have been distributed among 360 people, which is equivalent to 60 respondents per block.

8.3 Socioeconomic Analysis of the Choice Experiment Questioner Respondents

From the 360 respondents to the CE questioner more than 70% are male and only 29.7% were female (Table 8.3). This is due to male being the main head of household in the family. The age group of the households start from 18 years old to 86. As it is presented in Figure 8.2 the majority of the respondents are between 22-45 years old.

Gender	Frequency	Percent
Male	253	70.3
Female	107	29.7
Total	360	100

Table 8.3 Frequency of male and female respondents to CE questioner

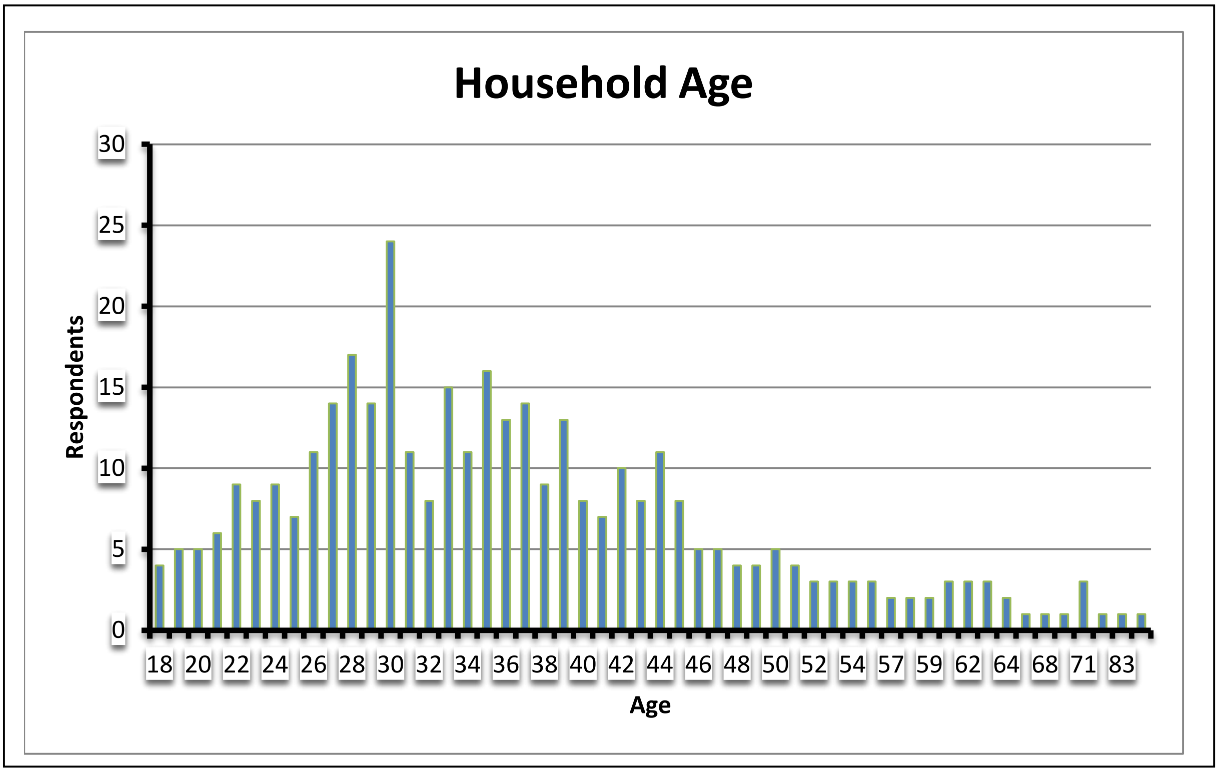


Figure 8.2 Age categories of respondents to CE questioner

The respondents had different levels of education. The majority had a diploma or lower with 43%, upper diploma and bachelor level both had nearly 22% each and only 11% had master or higher level of education. With regards to occupational status 65% worked in private company or organization and only 18% worked for the governmental organizations and the remaining were either students, not employed or retired (Table 8.5).

Educational Level	Frequency	Percent	Cumulative Percent
Diploma or lower	155	43	43
Upper Diploma	82	22.8	65.8
Bachelors	80	22.2	88
Master	33	9.2	97.2
PhD	10	2.8	100
Total	360	100	

Table 8.4 Educational Level of the respondents to CE questioner

Occupational Status	Frequency	Percent	Cumulative Percent
Student	22	6.1	6.1
Private Employee	235	65.3	71.4
Government Employee	66	18.3	89.7
Not Employed	19	5.3	95
Retired	18	5	100
Total	360	100	

Table 8.5 Occupational Status of the respondents to CE questioner

Iran Centre of Statistics has announced that families with less than 700000 Tomans a month are below the poverty line in Iran. From all the respondents 10 people did not answer to the question related to income and from the remaining 350, 62 household had income below 700000 which is equivalent to nearly 18% of the total. More than 69% had incomes between 700,000-1,5000,000 Tomans and 13% earned more than 1,500,000 Tomans a month. Figure 8.3 represents the total income date from the respondents.

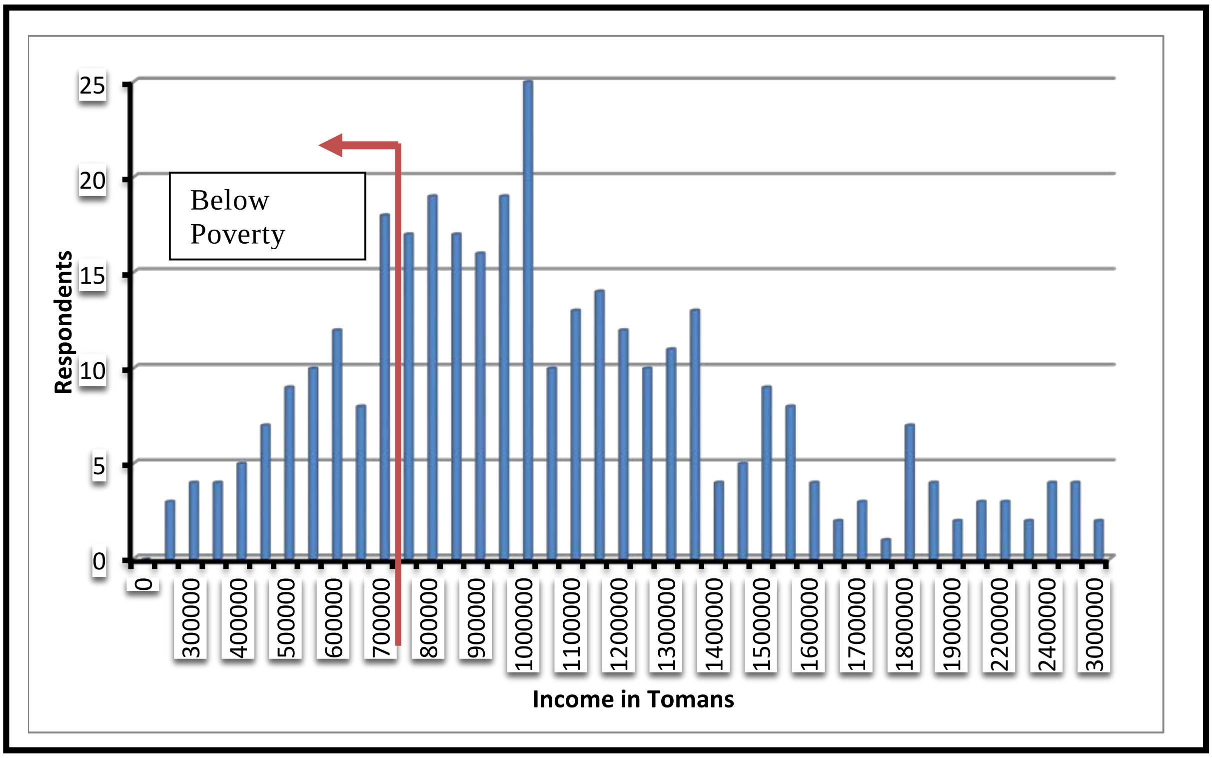


Figure 8.3 Total incomes of the respondents to CE questioner

8.4 Choice Experiment Analysis

For each of descriptions, individuals could make one of three choices: choose option A, choose option B, or choose neither (i.e., prefer the status quo). In this case study the number of observations is 2160 ($360 \times 6 = 2160$) and the number of cases is 4320 ($360 \times 12 = 4320$). The data from the CE questioner are analysed in three stages. The first stage uses the conditional logit model which estimate the distance to urban services coefficients and then derives WTP values as a ratio of the attribute coefficient to the price coefficient, with a model in which the WTP distribution is estimated directly from utility in the money space. In the second stage the socioeconomic variables are added to distance to urban services attribute and price attribute to present how these variables can affect the model and goodness of fit using the conditional logit model. In the third stage all the socioeconomic variables, combined with the urban services attributes and the price attribute, are analysed using the mixed multinomial logit model to compare the results with conditional logit model.

As it was discussed in the chapter four conditional logit model is well suited for behavioural modelling of polychotomous choice situations and the model was developed by McFadden in 1973. Both conditional and mixed logit models can be estimated by conventional maximum likelihood procedures using SAS software package using McFadden's LRI function.

Table 8.6 shows an example of a choice card presented to a respondent during the stated preference experiment. Respondents were presented with a choice between two different alternatives of having access to three urban services with given an increase or decrease of tax price for each alternative. For example in this choice set (Table 9.6) the respondent have a choice (A) that is having a park in 500 meters range, having a bus stop in the 800 meter range and a local shopping centre within the range of 800 meter of his/her property but with a 60% higher tax amount than the current situation. In Choice (B) the distance to the park increases to 1200 meter, the bus stop becomes closer and within the 500 meter and distance to a local shopping centre remains the same, but the tax amount decreases by 10% compared to the current amount. Alternatively the respondent can choose the status quo if he or she is happy with the current situation. In this choice set for example the respondent is being asked to value between having a park nearby or a bus stop, for a tax change.

Choice set No. 1	Choice A	Choice B
park	500	1200
Bus Stop	800	500
Local centres	800	800
Tax	60%	-10%

I am happy with the current situation_____

Table 8.6 Example of a Stated Preference Choice Car

Each respondent was provided with 6 choice cards, in random order, and asked to make their response. Repeated choices by customers from sets of alternatives reveal the trade-offs that customers are willing to make between attributes of urban service provision, and tax changes. Each individual was asked to choose one alternative from each choice set. This choice is modelled as a function of the urban service attributes using Random Utility Theory. As discussed in chapter five Random Utility Theory is based on the hypothesis that individuals will make choices based on the characteristics of a good (an objective component) along with some degree of randomness (a random component) which helps the analyst reconcile theory with observed choice. The random component arises either because of randomness in the preferences of the respondent or the fact that the researcher does not have the complete set of information available to the respondent.

Both multinomial logit (MNLGT) and conditional logit (CLGT) are used to analyse the choice of an individual among a set of *J* alternatives. Conditional logit models are appropriate when the choice among alternatives is modelled as a function of the characteristics of the alternatives, rather than (or in addition to) the characteristics of the individual making the choice. Huffman and Duncan (1988) argue that many problems of interest to demographers and other social scientists can be modelled by using a "characteristics of the alternative" approach. Thus they are appropriately estimated with conditional logit. Furthermore they suggest that it is often difficult to attach a behavioural interpretation to the results of models that focus exclusively on the "characteristics of the chooser" that is, those estimated by conventional multinomial logit. The central distinction between the two can be put very simply: MNLGT focuses on the individual as the unit of analysis and uses the individual's characteristics as explanatory variables; in contrast, CLGT focuses on the set of alternatives for each individual and the explanatory variables are characteristics of those alternatives.

Let Xi stand for the characteristics of individual *i* and *Zi*, for the characteristics of the j_{th} alternative for individual *i*, with the corresponding parameter vectors denoted by β and α, respectively. Let *J* be the number of unordered alternatives (for the moment, assumed constant for all individuals) and *Pi*, the probability that individual *i* chooses alternative *j*. The choice probabilities in the MNLGT and CLGT models are

$$MNLGT \qquad P_{ij} = \exp(X_i\,\beta_j) \Big/ \sum_{K=1}^{J} \exp(X_i\beta_k) \qquad (1)$$

$$CLGT \qquad P_{ij} = \exp(Z_{ij}\,\alpha) \Big/ \sum_{K=1}^{J} \exp(Z_{ik}\,\alpha) \qquad (2)$$

In a mixed model that includes both characteristics of the alternatives and the individual, the corresponding probability can be written as

$$Mixed \qquad P_{ij} = \sum_{k=1}^{J} \exp(X_i\,\beta_j + Z_{ij}\,\beta) \Big/ \exp(X_i\,\beta_K + Z_{iK}\,\alpha) \qquad (3)$$

Most general-purpose statistical software packages contain a bivariate logit procedure and an MNLGT procedure. Software to estimate the CLGT model is less common. For this research the SAS software program has been used to estimate both the CLGT models and Mixed multinomial logit model. Tables 8.7 to 8.10 present the outcome of the CLGT estimation. In table 8.9 McFadden's LRI goodness of fit has been calculated as 0.1375 this value is without any socioeconomic information about the respondent. This pseudo-R^2 value of 0.1375 is an above average goodness-of-fit. A pseudo-R^2 value of 0.12 is generally considered a satisfactory goodness-of-fit (see Breffle and Rowe, 2002).

Conditional Logit Estimates	
Algorithm converged.	
Model Fit Summary	
Dependent Variable	choice
Number of Observations	2160
Number of Cases	4320
Log Likelihood	-1291
Log Likelihood Null (LogL(0))	-1497
Maximum Absolute Gradient	23.59463
Number of Iterations	11
Optimization Method	Dual Quasi-Newton
AIC	2591
Schwarz Criterion	2613

Table 8.7 Conditional Logit Estimates

Discrete Response Profile			
Index	Choice	Frequency	Percent
0	1	942	43.61
1	2	1218	56.39

Table 8.8 Discrete Response Profile

Goodness-of-Fit Measures		
Measure	Value	Formula
Likelihood Ratio (R)	411.71	2 * (LogL - LogL0)
Upper Bound of R (U)	2994.4	- 2 * LogL0
Aldrich-Nelson	0.1601	R / (R+N)
Cragg-Uhler 1	0.1735	1 - exp(-R/N)
Cragg-Uhler 2	0.2314	(1-exp(-R/N)) / (1-exp(-U/N))
Estrella	0.1854	1 - (1-R/U)^(U/N)
Adjusted Estrella	0.1819	1 - ((LogL-K)/LogL0)^(-2/N*LogL0)
McFadden's LRI	0.1375	R / U
Veall-Zimmermann	0.2756	(R * (U+N)) / (U * (R+N))
N = # of observations, K = # of regressors		

Table 8.9 Goodness-of-Fit Measures

Once the parameter estimates have been obtained, a WTP welfare measure for a policy change that impacts on the environmental good can be derived, in this case the amount of tax that people are willing to pay for having access to urban services a linear utility index the WTP formula can be presented as the coefficient of any of the attributes (b_c) divided by the coefficient of the cost attribute (b_y).

$$\boldsymbol{WTP = \frac{-b_c}{b_y}} \qquad (4)$$

Table 8.10 presents the Conditional Logit Parameter Estimates and the relevant coefficients and significant values. As it can be seen all the parameters are significant in less than 0.01 percent of significance level which shows that the results are highly significant. The negative signs for the coefficients indicate that the greater the distance to the park the less amount of tax residents are willing to pay for these urban services. Table 8.11 presents the WTP value for each three urban services studied for this method. The estimates show that people are willing to pay more respectively for parks, local shopping centre and bus stops. Residents are willing to pay 1589.41 Rial per meter more in a year for parks, 1504.20 Rial per meter for local shopping centre and 1474.5 Rial per meter more in a year for having access to bus stop in Shiraz city.

Conditional logit model					
The MDC Procedure					
Conditional Logit Estimates					
Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Park	1	-0.001231	0.0000993	-12.39	<.0001
Bus Stop	1	-0.001142	0.000101	-11.27	<.0001
Local Shopping	1	-0.001165	0.000104	-11.20	<.0001
Tax	1	-7.745E-7	2.3198E-7	-3.34	0.0008

Table 8.10 Conditional Logit Parameter Estimates

Parameter	WTP Estimate (Meters/Rials) in a year
Park	-1589.41
Bus Stop	-1474.50
Local Shopping	-1504.20

Table 8.11 Welfare Measures Estimates

To improve this model some socioeconomic variables have been added in the next stage to observe how the characteristics of the individual can influence choice. From the socioeconomic analysis of the respondents section, respondent have been categorized by the socioeconomic factors such as age, gender, income, education level and the region of residence on Shiraz. These groups are as shown in table 8.12.

Factors	Groups
Age	Age1 = age ≤ 35 Age2 = 36 ≤ age ≤ 53 Age3 = 54 ≤ age
Gender	Gender1 = Male Gender2 = Female
Income	Income 1 = income ≤ 700,000 Income 2 = 700,001 ≤ income ≤ 1,500,000 Income 3 = 1,500,001 ≤ income
Education level	Education1 = if education level is below diploma or diploma Education2 = if education level is bachelor Education3 = if education level is master or PhD
Region	Region1= Regions 2,3,4,7,8 Region2= Regions 1,5,6,9

Table 8.12 Respondents socioeconomic categorise

Now that respondents have been categorized by socioeconomic factors, the conditional logit model was run again and the outcome reveals a higher Goodness-of-Fit (Table 8.13).

Goodness-of-Fit Measures for conditional logit model with socio-econ interactions		
Measure	Value	Formula
Likelihood Ratio (R)	468.82	2 * (LogL - LogL0)
Upper Bound of R (U)	2994.4	- 2 * LogL0
Aldrich-Nelson	0.1783	R / (R+N)
Cragg-Uhler 1	0.1951	1 - exp(-R/N)
Cragg-Uhler 2	0.2601	(1-exp(-R/N)) / (1-exp(-U/N))
Estrella	0.2103	1 - (1-R/U)^(U/N)
Adjusted Estrella	0.1972	1 - ((LogL-K)/LogL0)^(-2/N*LogL0)
McFadden's LRI	0.1566	R / U
Veall-Zimmermann	0.307	(R * (U+N)) / (U * (R+N))
N = # of observations, K = # of regressors		

Table 8.13 Goodness-of-Fit Measures for conditional logit model with socioeconomic interactions

However, as it was discussed before the mixed multinomial logit model is a better model to analyse the characteristics of the alternatives as well as the characteristics of the individual making the choice. As evidence to this discussion the McFadden's goodness of fit from the mixed multinomial logit model reveals a higher value of 0.1625 than the conditional logit model value of 0.1566 in this research.

Goodness-of-Fit Measures for Mixed Multinomial Logit Estimates with socio-econ interactions		
Measure	Value	Formula
Likelihood Ratio (R)	486.69	2 * (LogL - LogL0)
Upper Bound of R (U)	2994.4	- 2 * LogL0
Aldrich-Nelson	0.1839	R / (R+N)
Cragg-Uhler 1	0.2017	1 - exp(-R/N)
Cragg-Uhler 2	0.269	(1-exp(-R/N)) / (1-exp(-U/N))
Estrella	0.218	1 - (1-R/U)^(U/N)
Adjusted Estrella	0.205	1 - ((LogL-K)/LogL0)^(-2/N*LogL0)
McFadden's LRI	0.1625	R / U
Veall-Zimmermann	0.3165	(R * (U+N)) / (U * (R+N))
N = # of observations, K = # of regressors		

Table 8.14 Goodness-of-Fit Measures for mixed multinomial logit with socioeconomic interactions

Mixed Multinomial Logit model with socio-econ interactions					
The MDC Procedure					
Mixed Multinomial Logit Estimates					
Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Park_M	1	-0.003617	0.001099	-3.29	0.0010
Park_S	1	0.004005	.001680	2.38	0.0172
Bus Stop	1	-0.001434	0.000592	-2.42	0.0154
Local Shopping Centre_M	1	-0.003851	0.001146	-3.36	0.0008
Local Shopping Centre_S	1	-0.006656	0.002294	-2.90	0.0037
Tax	1	-2.035E-6	5.7937E-7	-3.51	0.0004
Park & Income 1	1	0.001049	0.000629	1.67	0.0950
Park & Income 3	1	0.001420	0.000746	1.90	0.0569
Park & Age 3	1	-0.001313	0.000859	-1.53	0.1063
Park & Education 3	1	-0.002180	0.000993	-2.20	0.0281
Park & Gender 2	1	-0.000818	0.000557	-1.47	0.1422
Park & Region 2	1	0.000764	0.000519	1.47	0.1410
Bus Stop & Income 1	1	-0.000980	0.000687	-1.43	0.0538
Bus Stop & Income 2	1	-0.002081	0.000808	-2.58	0.0100
Bus Stop & Education 3	1	-0.001565	0.000901	-1.74	0.0823
Local Shopping & Income 3	1	0.001099	0.000629	1.75	0.0805
Local Shopping & Education 3	1	0.002436	0.001088	2.24	0.0252

Table 8.15 Mixed Multinomial Logit model with socio-econ interactions

From table 8.15 the following interpretation can be made. For urban services it can be observed that the further they are to the house the less tax residents are willing to pay;

and this is significant on 0.01 significance level. People from the low income group (Income group 1)are not willing to pay more tax for having access to parks due to the income statues and personal preference limitation (significant on a 0.09 significance level) this is the same for the high income families (significant on 0.05 significance level). For this group distance to a park is not so important in buying a house or having a park in their neighbourhood. Households with age 54 and above are willing to pay more tax to have a better access to parks due to having more time to use since usually by this age their life has reached to certain stability and they can organize more time to use these facilities in a neighbourhood with family (significant on 0.10 significance level). Household with higher education are willing to pay more tax to have better access to parks this could be due to their greater knowledge of the role of park in individual quality of life (significant on 0.02 significance level). In Shiraz, female households are willing to pay more to have a park nearby since in the Iranian culture it is believed that female feel a greater responsibility than the male to the health and happiness of the kids and the family in general, although this it is not very significant with 0.14 significance level. Residents living in region 2 category which indicates a better region compare to region 1 category are not willing to pay more tax for having park in an accessible range. This could be due to a better distribution and quality of parks that is already exist in these region, which again is not very significant with 0.14 significance level.

With regards to the use of public transport people with middle class and low class of income prefer to be close to a public transport rather than using their private transportation and this is logical due to their income statues and price of public transport compare to personal transports (significant on 0.05 significance level for low income and 0.01 significance level for middle income group). In addition people with higher level of education also prefer to pay more tax to have access to bus stops since they understand the benefits of using it for themselves and the community they live at (significant on 0.08 significance level).

Finally in Shiraz city, residents from high class income group as well as residents with higher degree are not willing to pay more tax to have better access to local shopping centres (relatively significant on 0.08 and 0.02 significance level).

8.5 Advantages and disadvantages of Choice Modelling compare to other economic valuation techniques

Using Choice Experiment (CE) Modelling compared to other economic valuation techniques such as Contingent Valuation (CV) can prevent a research becoming very costly because they can look at more than two alternatives at the same time. CE does a better job than CV in measuring the marginal value of changes in the characteristics of environmental goods. Therefore it is often more useful from a management/policy perspective than focusing on either the gain or loss of the good, or on a discrete change in its attributes. In addition CE designs can reduce the extreme multi-collinearity problems in models based on variations in actual attribute values across sites which often troubles revealed preference analysis.

CE can also avoid some of the response difficulties. One of the common problems occurring is yea-saying. They are two views why yea-saying occurs. First there is the classically defined survey research yea-saying that is saying yes because one sees it as the socially desirable response. The second view on yeah-saying relates to strategic behaviour, for example if an individual has a valuation of 30 pounds and is asked if he would pay 80 pounds, then he may still say yes, since that is the only way he can register an environmental vote and he knows that the 80 pounds will not be collected from him. CE avoids this problem, since respondents get many chances in the interview to express a positive preference for a valued good over a range of payment amount. With line to this discussion a latent class logit model has been used to analyse different group of respondent for this research.

Latent class (LC) modelling was initially introduced by Lazarsfeld and Henry (1968) as a way of formulating latent attitudinal variables from dichotomous survey items. In contrast to factor analysis, which posits continuous latent variables, LC models assume that the latent variable is categorical, and areas of application are more wide-ranging. The methodology was formalized and extended to nominal variables by Goodman (1974a, 1974b), who also developed the maximum likelihood (ML) algorithm that serves as the basis for many of today's LC software programs. In LC objects are assumed to belong to one of a set of K latent classes, with the number of classes and their sizes not known a priori. In addition, objects belonging to the same class are similar with respect to the observed variables in the sense that their observed scores are assumed to come from the same probability distributions, whose parameters are, however, unknown quantities to be estimated. Using the relevant formulas, for this case study the three groups clusters shows the highest R^2 value (Table 8.16).

Latent classes	Log L	R^2
Two Groups	-1255.057	0.15744
Three groups	-1235.342	0.16835
Four Group	-1343.056	0.13409
Five Groups	-1243.913	0.15787

Table 8.16 Number of latent classes

These results shows that 33.3% of the respondents (group one) are not willing to pay more tax for having a better access to the services and the results are significant on 0.00 significance level. The results from group two are not significant and only 17.6% of the respondents are involved in this group. This group of respondent are willing to pay more even if the distance of their residential place to the services increases. Finally nearly 49% of the respondents are willing to pay more tax if the distance to services from their residential places decreases. The results from group one and three which is almost 83% of the respondents shows that the method avoids yea-saying the remaining 17% are from group two which the result was not significant.

Variable	Coefficient	Standard Error	b/St. Er.	$P\{\lvert Z\rvert > z\}$
Utility parameters in latent class--> 1				
Park 1	-.01517299	0.00285070	-5.323	.0000
Bus stop 1	-.01507877	0.00272372	-5.536	.0000
Local Shopping Centre 1	.00557348	0.00110671	5.036	.0000
Tax 1	.01630359	0.00573815	2.841	.0045
A_1	-2.38742621	0.49213726	-4.851	.0000
Utility parameters in latent class--> 2				
Park 2	-.04613072	0.45037828	-.102	.9184
Bus stop 2	.04051304	0.55592537	.073	.9419
Local Shopping Centre 2	.09808041	0.92313167	.106	.9154
Tax 2	-.44072702	4.86914332	-.091	.9279
A_2	-12.9265001	136.924749	-.094	.9248
Utility parameters in latent class--> 3				
Park 3	-.01945150	.00344673	-5.643	.0000
Bus stop 3	-.09207822	.01757418	-5.239	.0000
Local Shopping Centre 3	-.15670185	.02982722	-5.254	.0000
Tax 3	-.13349129	0.02648913	-5.039	.0000
A_3	7.75055215	1.43019551	5.419	.0000
Estimated latent class probabilities				
PrbCls_1	.33388431	0.02206911	15.129	.0000
PrbCls_2	.17611720	0.01579979	11.147	.0000
PrbCls_3	.48999849	0.01587343	30.86	.0000

Table 8.17 Results from the latent class logit model for three clusters

Although CE model has been very widely applied in the field of transport and marketing, but experience in environmental and other related contexts is still fairly limited. Several problem areas seem to be important:

In order to estimate the value of an environmental good as distinct from a change in one of its attributes, it is necessary to assume that the value of the whole is equal to the sum of the parts. There may be additional attributes of the good not included in the design which generate utility. In addition welfare value estimates obtained with CE are sensitive to study design. For example, the choice of attributes, the levels chosen to represent them, and the way in which choices are relayed to respondents may still impact on the values of estimates of consumers surplus and marginal utilities.

8.6 Conclusion

As already mentioned, the conditional logit estimator (McFadden, 1974) is a well-established tool for discrete choice analysis. Indeed it is by far the most common method used for such analysis (Train, 2009). The core feature that distinguishes it from alternative methods such as nested logit, is that it is based on the assumption of Independence of Irrelevant Alternatives (IIA). This assumption is equivalent to the statement that the unobserved components of utility are uncorrelated across alternatives. The IIA assumption is potentially overly restrictive in some contexts, as it can result in unrealistic substitution patterns.

A limitation of the conditional logit estimator, in comparison with mixed logit alternatives, is that it is only able to model heterogeneity in utility parameters as a function of interaction covariates. Where mean values and possibly some limited segment analysis are all that are needed for policy appraisal, as they often are, this is not a serious limitation of the technique. There are potential advantages to be gained, however, from statistically exploring the heterogeneity of values across the population, based on unobserved as well as observed person-specific variance. Such analysis might provide important insights about the preferences of the target population. However, as for the use of method, the outcomes shows that in a mixed model that includes both characteristics of the alternatives and the individual a better result can be achieved. The highest R^2 value was respectively for mixed multinomial logit model with socioeconomic interactions and then conditional logit model with socioeconomic interactions and finally the conditional logit model with no socioeconomic interaction.

As for the outcome of the research, the results show that willingness to pay for urban services does decline as distance increases. Also it was revealed that residents are willing to pay respectively more for parks than local shopping centre and for bus stops. Another interesting issue this study uncovered is how residents from different socioeconomic backgrounds are willing to pay for different services and how important is distance to certain services with regards to their socio-economic status. Since this study is the first economic valuation study done on Shiraz city, the study was not intended to actually define the extent of the market for each service, but to determine if there was even a basis for attempting to define the market and the value of the urban services and determine if distance affects willingness to pay. Therefore, it is critical that future research focus more specifically on relating the extend of benefits relative to the distribution of services. Finally this research and its findings can be very beneficial for policy makers to estimate the economic benefits of policy measures to improve the quality of life in cities and direct them towards sustainability. By employing the perspective of welfare economics to identify the structure of public preferences, including preference differences between socioeconomic groups, this study provides valuable information which should help to inform public policy deliberations over city management and land use planning. This kind of research can prioritize among different services to be developed in the neighbourhoods with residents from different socioeconomic background. By knowing which service is more preferred or demanded in the neighbourhood, and if the residents are willing to pay the relevant tax price, then the maintenance of those services can be easier for the local government and quality of the life of the residents will increase by providing the essential services within their preferred distance apart from their residential place. This kind of research can be seen as a win-win strategy for residents and local government and can be very beneficial in increasing and maintaining residents' quality of life and in grater perspective a city's sustainability.

Chapter 9: Conclusions

9.1 Introduction

In the past decades the increase in urban population growth has extended the level of human needs and demands for urban services. In line with this need, urban services, as an important city and environment element, play an undeniable role in the promotion of environmental quality in terms of social, environmental and economic dimensions of urban development. In this context, the development of urban services in Shiraz city is not yet commensurate with the needs of society in terms of quantity and quality. In addition the value of these services is undefined and has not been measured.

Distribution and accessibility of urban services plays an important role in people's movements, forming the city size shape and density and importantly living quality in the city. Travel to work, shopping centres, schools, leisure activities, parks and other public services affects community welfare, social equity and the environment in which we live. These effects can be argued socially, environmentally and economically and most importantly, consuming urban services not only have no disagreement with sustainable development objectives, unlike other market goods, but it helps promote the surrounding environmental quality.

For this reason this research focused on the value of urban services on the living environment by looking at urban services accessibility and its effects on housing market and the rent price of a residential property. In addition, this research evaluated the value of urban services using a choice experiment and measures people's willingness to pay for having a better access to preferred urban services. Conditional and mixed logit models was used to identify the demands of people living in urban areas of Shiraz for public services; people's value for access to these services in urban neighbourhoods. A SAS program was used to generate experimental designs and estimate the models and to explore the effect of socio-economic variables on choice. Finally latent class model was used to explore the market size and the structure for demand of urban services. In the remainder of this chapter a synopsis of objectives of the research is explained, and reflections on the research findings and its key contribution to knowledge and development of the society are presented. In addition some policies and practises that could be implemented by the government to improve and promote a better Urban Environmental Quality and Quality of Life are mentioned. Furthermore, some information about the limitation and critiques of these kinds of research are described which is followed by a final word about this research.

9.2 A synopsis of objectives of the research

The quality of the urban environment as a living space for the peoples of the world has emerged as an issue of fundamental concern for academic researchers, policy makers and citizens for the first time in the history of humankind as majority of the world's population lives in urban places. Whether developed or developing countries, urbanization is a complex socioeconomic process closely linked with the scientific and technological process of societies and it has deep repercussions on all aspects of life. It was also mentioned that public services have direct or indirect effect on the majority of the component of quality of life. Accessibility to health services for increasing the physical and mental status, or using public transport to reduce the pollution or having park to provide better climate or visual perception and scenic quality even having security station to provide a safe environment and etc. are few benefits of having access to public services. This made it even more crucial to conduct this research and evaluate the role of urban services in improving urban environmental quality which effects the quality of life and consequently promotes sustainable development. Therefore, it was clear that further research needs to be conducted to evaluate urban services in quality of life and finding the best method that fits for this purpose.

In addition this method was introduced to help local authorities and policy makers in effective decision making and efficient city management especially for Countries that are under development and facing rapid growth of urbanization. The research emphasised how rapid urbanization is followed by an intense demand for qualitative and quantitative development in physical dimensions and urban systems. A limitations in productive capacity, commensurate with rate of urbanization, not only makes it difficult to meet demand in different dimensions but it is also the cause of urban poverty, injustice, environmental degradation and lack of proper utilization. The researcher believes, as a fact, that urbanization in developing countries is inevitable and preventive policies are doomed to failure in controlling the urbanization process. For this reason an efficient urban management system is required to tackle and solve the problems of urbanization, using appropriate policies, methods and data to ensure that not only has the urban population got access to the labour market, housing and urban services, but also urban environments are organized to enhance the quality of life for its citizens. Consequently, this research assessed and defined a method

In addition this thesis will help the public and private sector with their new strategies to improve access to social and infrastructure services and reconsideration in the ways in which they should be provided. It was mentioned how traditionally, public sector was the main provider of these services and how public sector resources are insufficient for investing on these services, as well as the diversity and the importance of the quality of providing these services are beyond the capability of public sector. In addition the investment of the private sector in providing urban services requires an analysis of cost and benefits. In this thesis a new technique was introduced for valuing urban services and the amount of people willingness to pay for these services using a combination of "economic valuation techniques". The private sector as well as the public sector can benefit from the outcomes of this technique and evaluate the provision process and decide how to invest this technique and use it to evaluate individual preference and behaviour toward urban services. This technique was proven reliable in realising the value of urban services and resident's preferences among different urban services and how accessible they should be in a neighbourhood scale.

In this line the main objective of this these was to present how environmental evaluation technique can be used as a tool to help the urban management system, developers, city officials, planners, realtors and researchers etc. with their policy making, effective decision making and efficient city management procedures. It provides a perfect representation of how much people are actually willing to pay for urban services and thus how important is each service is in their quality of life.

9.3 Presentation of the Research Findings and hypotheses

The research findings reflect the three research objectives (Section 1.2). This discussion does not aim to summarise the previous chapters, but seeks to link together the research objectives, the findings and the author's learning experiences.

This research illustrates the potentially important role that urban services and neighbourhood attributes play as drivers of localized house-price variation. In addition it demonstrates that it is possible to uncover stable, plausible, and meaningful valuations of urban services from variation in the housing market, as well as using choice modelling and willingness to pay to assess demand for urban services.

Households' willingness to pay for the goods and services provided by places within cities lies at the heart of standard urban economic theory about the structure of cities and the 'sorting' of different types of people into different locations. In the theory outlined by

Tiebout (1956), people face a trade-off between the local taxes they have to pay for public services and the quality of local services on offer, and sort themselves into different communities accordingly. In bid–rent models of monocentric cities, it is willingness to pay for proximity to city centres that bids up land prices towards the centre of the city and sorts those who are willing to pay for central city proximity from those who prefer more space towards the suburbs. The reaction of housing costs to local amenities is a manifestation of these processes at work. If, as has been shown, improvements in the quality of neighbourhoods and local public services influence housing costs, then these factors become important determinants of city residential structure. These linkages need to be taken seriously when designing and targeting policy aimed at neighbourhood improvement and the quality of local public services.

This research views quality of life as a subset of social equity, one that is concerned primarily with level of disparity in access to opportunities or material circumstances, such as urban transport, health, education, good quality of space and the built environment that is easy and safe to use. Therefore, it explored two key issues: first, the effect of urban services on environmental quality and quality of life, and second the value of urban services.

To assess how services affect the quality of the living environment of the households, this research evaluated the impact of urban services on rent price for residential units. In addition the life satisfaction approach was used as a complementarily method. Using a hedonic regression, a set of subjective and objective housing and neighbourhood characteristics was revealed to be significantly related with a residential unit rent price. This research found that subjective characteristics such as neighbourhood traffic, road condition, recycle collection, cleanness and population in addition to some objective characteristics such as availability to access to a park and gardens as well as police and security centre, all within 800 meter of access, increases the rent price of a residential unit. In other words the research identified that a residential unit in Shiraz with the same property characteristics can have different rental price with regards to its location and the neighbourhood that is located. This implied that housing markets in the regions do function well and can reveal considerable information about what individuals believe to be important. On the other hand, Life Satisfaction was shown to be correlated with region satisfaction, and objective and subjective variables are relevant determinants of region satisfaction. The impact of these variables on general life satisfaction can be measured through their effect on region satisfaction. The results from region satisfaction regressions analysis also exposed a set of subjective neighbourhood characteristics such as safety, noise pollution, street sidewalk condition, cleanness, lightning condition at night, and the quantity and quality of green spaces to be significant in residents' satisfaction from the region. In addition objective characteristic such as having access to religious centre, parks, healthcare centres, leisure-related venues and a commercial centre within 800 meters are shown to be significant variables in overall region satisfaction. Although housing markets function reasonably well, it is clear that they do not function perfectly. This suggests that not all characteristics are priced appropriately at all times. Both set of results should be considered relevant and be taken into account by policy makers.

The results from Hedonic analysis and life satisfaction revealed that access to urban services as an objective variable in addition to subjective variable can increase residents satisfaction and people are willing to pay more (in this case as a rent price) to be accommodated within an accessible range of urban services such as parks. In other words, whether based on the reflection of local amenities and characteristics in property prices or on subjective level of satisfaction, the two approaches suggest the environmental quality is of great importance for the environment that the residents of Shiraz are living in. Different objective and subjective environmental characteristic can be monetized and this should enhance urban public policy making and indicate policies that will improve the QoL. Information on the significant variables in the analysis could be collected on regular basis to monitor the evaluation and impact of these urban public policy interventions.

Furthermore, the results indicate that using both approaches could be used to answer the very important policy question of how to finance provision of public services. Amenities that are reflected in housing prices are amenable to financing through property taxes, and those reflected by the LS approach may be financed through general taxation.

In order to answer the second research question for this thesis and value urban services, this research used choice experiment model to analyse people's willingness to pay for a particular urban services. For this research the three most preferred urban services such as bus stops, parks and green area, and local shopping centres were chosen, and people's WTP for better access to these services was evaluated. The outcome of the research revealed that willingness to pay for urban services does decline as distance increases. Also it was revealed that residents are willing to pay respectively more for parks than local shopping centre and for bus stops. Another interesting issue this study uncovered is how residents from different socioeconomic backgrounds are willing to pay for different services, and how important distance is to certain services with regards to their socio-economic status. By knowing which service is more preferred or demanded in the neighbourhood, and if the residents are willing to pay the relevant tax price, then the maintenance of those services can be easier for the local government. Quality of life of the residents will increase by providing the essential services within their preferred distance from their residence.

However, since this study is the first economic valuation study done on Shiraz city the finding of this research is important in order to establish basis for attempting to define the market and the value of the urban services; and to determine that the relationship between distance and willingness to pay does exist.

9.3.1 Hypotheses

In this thesis, the following hypotheses were formally examined.

H1: (Null) Properties with exact characteristics have different rental price with regards to their location and available urban service in the neighbourhood.

The null hypothesis H1 is accepted. To assess how services affect the quality of the living environment of the households, this research evaluated the impact of urban services on rent price for residential units. Using a hedonic regression, a set of subjective and objective housing and neighbourhood characteristics was revealed to be significantly related with a residential unit rent price. In other words the research identified that a residential unit in Shiraz with the same property characteristics can have different rental price with regards to its location and the neighbourhood that is located. The results (summarized in table 7.6) indicate that better neighbourhood quality and accessibility to services increases the rent value. Using a hedonic price regression, the average estimated rent value in each region is compared to the average rent value in Shiraz to provide an implicit price of objective and subjective characteristics for each region. For a better understanding the results are presented in an example format of a dwelling with two bedrooms and two bathrooms. On the bases of only the regions objective characteristics, this dwelling in region 1 can have 13 percent higher rent than Shiraz average value and if the identical dweller was located in region 8 the rental value had a 3.7 percent decrease of rental price. Inclusion of regions subjective characteristics variable in the equation, larger differences can be observed.

This implied that housing markets in the regions do function well and can reveal considerable information about what individuals believe to be important (shown in table 7.6 of this thesis).

H2: (Null) Calculating the willingness to pay for urban services will provide a reliable measure to identify resident's priorities among services and its value in the real market.

The null hypothesis H2 is accepted. This research uses the Choice experiment technique to estimate willingness to pay for three different services such as parks, public transportation and local shopping centre. The data from the CE questionnaire was analysed in three stages. The first stage uses the conditional logit model which estimate the distance to urban services coefficients and then derives WTP values as a ratio of the attribute coefficient to the price coefficient, with a model in which the WTP distribution is estimated directly from utility in the money space. In the second stage the socioeconomic variables are added to distance to urban services attribute and price attribute to present how these variables can affect the model and goodness of fit using the conditional logit model. In the third stage all the socioeconomic variables, combined with the urban services attributes and the price attribute, are analysed using the mixed multinomial logit model to compare the results with conditional logit model. The finding reveal that all three different methods show that people are willing to pay more respectively for parks, local shopping centre and bus stops in Shiraz city and difference in the amount of willingness to pay for each services shows exactly how important each of them are and how residents are prioritising among different services. In addition the results show that the mixed multinomial logit model is a better model for analysing the characteristics of the alternatives as well as the characteristics of the individual making the choice. As evidence to this discussion the McFadden's goodness of fit from the mixed multinomial logit model reveals a higher value compare to the conditional logit model (shown in tables 8.14 and 8.15 of this thesis).

9.4 Research Contribution to knowledge

This research is innovative in merging different methods to evaluate the role of urban services and its market size, by using economic valuation techniques and a life satisfaction approach. This research viewed quality of life as a subset of social equity, one that is concerned primarily with level of disparity in access to opportunities or material circumstances, such as income, health, education, good quality of space and the built environment that is easy and safe to use. The research rightly recognises that QoL is about creating and maintaining a sense of place by creating an environment that is inviting, enjoyable and accessible equitably for all residents. In the literature review I was unable to find concrete evidence of economic evaluation study on urban environmental quality and quality of life in any formal literature in the context of Iran. However, emphasis on the importance of promoting quality of life and sustainable development was mentioned in other alternative publications in Iran such as social networking sites, blogs and web pages of urban planners, environmentalists, sociologists and economists. This reveals that while this topic is represented in social media it has not yet moved into more formal publications, such as journals, and hence this research study represents a way in which that topic would move into formal publication. This can be seen as making contribution to knowledge.

In addition this research provided a framework and a method to evaluate environmental characteristics of neighbourhood particularly focusing on accessibility to urban services that affects the residential quality of life. The literature review showed that although the concept of UEQ and QoL and its relation with urban services have been discussed and argued (for example the work of Lora P. et. al. (2010)), there has been relatively only a very small amount of research conducted to evaluate urban services in terms of assigning money value to it. The development of a common approach towards QoL has not reached any consensus among the researchers in this field. This is due to different reasons, first the fact that life condition and satisfaction with life inevitably vary across individuals in all groups within the society. Second, different definitions and interpretations of the concept has been raised, for example, should it aim to increase some aggregate measure of happiness in society or to aim for some form of equity and justice, where all individuals are regarded equally? If the latter, what sort of equality should we promote equality of happiness, resources, or capability? This brief account cannot hope to fully represent the extensive, complex and often highly abstract debates in the literature about the proper focus of well-being measurement. In addition, this research responded to the recognition that 'GNP is an insufficient measure of the well-being of citizens' and commissioned a study of 'the distribution of welfare in terms of using 'objective and subjective' indicators.

This research presented a key source of insights regarding the importance of availability of urban services and their vital role in human well-being. Economically, services can help to provide a reliable and firm economy in order to be able to manage the financial requirements of any social, environmental and also economic improvements for the city. However, services can have social effects on QoL and SD through providing equal accessibility to the residents, equity among all the users from different income groups. It helps people to participate in society and increase their social relations. It also increases the level of knowledge and understanding of different life domains. It provides places for entertainments, leisure, sports, enhance the hygiene and health level in the community and promotes a longer life expectancy. Conservation of cultures, values and beliefs of a community are also provided, including the opportunity to become familiar with other nations culture, believes and values, and also to present one's own to visitors. Services have an important role in the environment quality, limiting the city's pollution level by producing more green areas and providing public transport for example, to minimize carbon emissions. These green areas and other environmental friendly services create a better environment for the citizens and produce aesthetic landscapes in the city. Implicit in the provision of public amenities such as parks, recreational facilities and social and cultural services are beneficial to residents' well-being. They provide venues for health-promoting activity as well as informal meeting-places, outside home and work, where social relationships can be formed and maintained material and social deprivation encompasses a lack of access to material goods, facilities and amenities and/or a lack of access to the customs, activities and relationships of an ordinary social life.

This thesis highlighted the matter of varying opportunity structures across different localities, impacts residents' perceptions of their neighbourhood, their satisfaction with the social and physical attribute of place and the nature of the social relations that occur in different places. People's feelings about residential housing, and the market value of housing, are affected by proximity to valued public amenities. It measure the value of having access to services.

It presented that by mapping the physical manifestations of opportunity structures across urban environments contextual effects of place can be measured which than provides a way to the geographical location of most public resources to be determined by resource allocation decisions based on equity and efficiency considerations. From a policy and planning perspective, the spatial distribution of public services and facilities this can help to improve the social inequities be mitigating or at least offsetting the compensatory distribution of services. In addition, this thesis contributed in understanding the factors and forces that add to the isolation and hardship faced by groups of people living in particular places. However, this thesis urged that urban segregation is complementary to the issue of urban service distribution and environmental quality. On the one hand having access and be approximated to the services and on the other hand the quality of these services becomes the context in which different neighbourhood stereotypes are generated. The discussion and comparison of urban services availability in a neighbourhood and its quality can influence different important topics in a society and residents quality of life.

This research supports the contention that a better understanding of the meaning of Urban Environmental Quality requires systematic study of the interrelationships between objective measures of environmental phenomena and people's responses to them. Furthermore, it suggests that such study can occur within the context of QoL research. This argument begins with a review of quality of life research that acknowledges linkages between objective and subjective measures. Kamp et al.(2003) believes that subjective indicators allow us to gain insight into the well-being/satisfaction of a person, and insight into what people consider important.

Subjective indicators contribute to the commitment of people to their environment, and to the creation of public support. Objective indicators are necessary for aspects of the environment that are hard to evaluate, they form the point of departure for environmental policy and enable the validation of subjective measures. Therefore, the first and obvious step in the formulation of a comprehensive definition is to acknowledge the strengths of each position and to agree that any general definition must include both dimensions. This conclusion has, in fact been endorsed by many previous QoL researchers (Romney, 1994; Raphael, 1996; Kamp I. et al., 2003; Schoch, 2006) and does seem the common-sense view. After all, if QoL is to embrace the totality of human life then both objective and subjective dimensions must surely be included. Therefore, suitable subjective and objective indicators within the context of QoL and access to urban services have been identified for this research.

In addition this research contributed to the knowledge by providing a good understanding of methodological appreciation of the merits of three HP, LSA and CE approaches. This research presented CE as a survey-based technique of nonmarket valuation which respondents were asked directly what they would be willing to pay for a change in an environmental amenity. This is often an unfamiliar situation and gives rise to problems of strategic responses.

However, the LSA approach can overcome the two basic problems in CE which are the unfamiliarity of the task and the problem of strategic behaviour. The LSA is not affected by either of these problems. It does not rely on respondents' ability to consider all relevant consequences of a change in the provision of a public good. In fact, people may not even consciously notice a relationship between environmental conditions like fine particulate matter in an urban region and their subjective wellbeing. It suffices if they state their own life satisfaction with some degree of precision. This considerably reduces subjects' cognitive burden and costs of information processing.

Furthermore, this research showed that the LSA explicitly captures individual welfare in the absence of market equilibrium. The HM invokes the assumption of weak complementarily between an environmental good and a private good such as housing and can be used if the former is a qualitative characteristic of the latter. In such a situation, the housing market functions as a market for the environmental good, and information on environmental-good demand is embedded in the prices and consumption level of housing. House price differentials between locations with different environmental conditions serve as implicit prices for the environmental good. In equilibrium, they correspond to the individuals' MWTP for the environmental good. Thus, the main problems of the HM arise from its dependence on the equilibrium assumption. This assumption is met only if there are a sufficiently wide variety of houses, if prices adjust rapidly, if households have full information, and if transaction and moving costs are zero. The LSA can recover the full utility consequences independently of the degree of capitalization in the housing and labour market. For all other public goods, compensating variation in the private markets has to be accounted for. If they are not, the LSA captures only the residual effect. Anticipating one of the main conclusions, the discussion suggests that, if anything, the LSA works best if there is no market equilibrium.

Another conceptual problem of revealed preference methods is that individuals' behaviour in private markets always reflects expected future risks (even if expectations are based on current or past risks). In contrast, in most applications of the LSA, the welfare consequences of risks are identified primarily on the basis of actual events, i.e., when the risk materializes. The LSA is, therefore, less affected by distorted risk perceptions. As mentioned above, the LSA can also capture effects of externalities that affect individuals' life satisfaction through a process unnoticed by the individuals themselves. For example, it can capture the welfare consequences of health effects, even if individuals are ignorant about the causes. Moreover, most survey respondents are long-term residents in a particular location, and they are arguably better informed about prevailing pollution levels than are prospective house buyers and renters who consider moving to that location.

Having said that, the life satisfaction approach is nevertheless based on a series of assumptions regarding the nature of the happiness data on which the method's credibility critically relies. Specifically, the approach assumes that subjective well-being data provide information regarding the individual's global evaluation of her life and that this evaluation is comparable across individuals (Frey et al., 2009). An additional concern is that variables such as income, employment and marital status that are commonly included as exogenous variables in a life satisfaction equation may in fact be endogenous. Therefore, comparing the results from all three different methods can overcome the disadvantage of each method individually and provides further insights. Where all approaches suggest that a particular issue is important, it is likely that all approaches underestimate true valuations. If a characteristic is found to be significant in one approach, it implies that markets are not fully reflecting individuals' true valuation. On the other hand, finding that a characteristic is not significant in that approach does not necessarily imply that there is no public policy concern.

All the above statements suggest that the this PhD research has contributed to knowledge by merging different methods to evaluate the role of urban services and its market size, by using economic valuation techniques and life satisfaction approach. This shows the contribution to knowledge of this methodology.

This research contributes to knowledge in terms of identifying sustainable development indicators that can promote sustainable development and help policy makers to make the best and efficient decisions. In terms of public discourse, the QoL and sustainability debates have been held at some distance from each other. This research tried to demonstrate how these two are highly connected to each other and share the same belief as Chambers et al., (2000) that "to make sustainability happen, we need to balance the basic conflict between the two competing goals of ensuring a quality of life and living within the limits of environment." Therefore, this research emphasises and argues that QoL is highly correlated with UEQ and alternatively, believes that UEQ is the sustainable development objective in the steering of societal change, especially through changes in the way the economy functions. Therefore environmental quality is the key common point between sustainable development and QoL. This research focused on promoting UEQ by providing the preferred services at an easy accessible range in the neighbourhood. Distribution and accessibility of urban services plays an important role in people's movements, forming the city size, shape and density and importantly living quality in the city. Travel to work, shopping centres, schools, leisure activities, parks and other public services affects community welfare, social equity and the environment in which we live.

This kind of research helps to identify sustainable development indicators as they are essential for understanding, promoting and operationalising sustainable development. Using these measurements and assessment tools, policies can be set out for sustainable development.

In addition this research and its results has been presented, published and received good feedback at different conferences and seminars at different Universities such as "The first international conference on sustainable development and the future" hosted by the British University in Egypt in 2010, the "Urban public space – economics and management" hosted by University of Economic of Katowice in 2011, Workshop at Catholic University of Leuven, at Newcastle University seminars and recently in 2013 it has been presented at a Choice Modelling workshop at University of Technology Sydney hosted by Centre of Study of Choice (CenSoC) which was directed by Prof. Jordan Louviere and Prof. Joffre Swait.

9.5 Implications for policy and practice

The finding of this study will enable policy makers at both the national and local levels to identify which urban areas are disadvantaged, and to determine what actions will be most effective for improving the QoL there. The information generated may help individuals and firms make more informed decisions concerning where to live or locate and what to demand as a community from local and central governments.

The results of studies on quality of life are required for evaluating policies, locational ranking and formulating urban management and planning strategies. They can assist in understanding and prioritization of social issues for planners and urban managers in order to facilitate upgrading citizen quality of life. The measurement of quality of life (QOL) can be used as an environmental quality diagnosis of previous policy strategies, and is a required foundation for drafting future spatial and urban planning policies (Lee, 2008). In addition studies of quality of life can clarify the problematic areas, reasons of residence dissatisfaction, citizen's priorities in life, result of social- demographic factors on quality of life, and monitoring and evaluating the efficiency of policies and strategies in life quality.

It is both important and feasible for municipalities to monitor residents' QoL. The monitoring system should include both baselines and follow-up surveys for a representative sample of district citizens. The indicators to be collected should consist mainly of two types, which can be used simultaneously and complementarily: 1) Information on objective indicators, such as, number of bus stops, access to train station, distance to urban services, number and places of robberies and attempted robberies, frequency of street cleaning, and conditions of park and other services; and 2) subjective information such as the level of satisfaction with municipality provided services. Given that QoL involves factors in addition to income and other socioeconomic indicators, the resulting data should be used to construct an urban and district-level QoL index that municipal officials may use to guide their activities and set priorities, as well as to monitor interventions. Furthermore, QoL estimations should be undertaken in all municipalities for benchmarking purposes.

As the above findings show, this research and its findings can be very beneficial for policy makers to estimate the economic benefits of policy measures to improve the quality of life in cities and direct them towards sustainable development. By employing the perspective of welfare economics to identify the structure of public preferences, including preference differences between socioeconomic groups, this study provides valuable information which should help to inform public policy deliberations over city management and land use planning. This kind of research can prioritize among different services to be developed in the neighbourhoods with residents from different socio-economic background.

This kind of research can be seen as a win-win strategy for residents and local government and can be very beneficial in increasing and maintaining residents' quality of life and in grater perspective a city's sustainability.

9.6 Limitations of the Research

The limitations of economic values must be fully appreciated when using the resulting monetary amounts. Ethical and technical limitations are especially important in environmental management.

9.6.1 Ethical issues

It is not always feasible or desirable to convert all environmental benefits and costs into monetary values. Some benefits and costs may be difficult to identify because of a lack of knowledge about ecosystems. Information could be lost in the process of translating the diverse benefits of a resource into a single monetary value. In addition the benefit to society of environmental resources is too complex to be captured by a single money value and to attempt to do so is to trivialise the importance of the environment.

The main moral limitations to economic valuation of the environment are as follows:

Certain conventions about equity and morality are assumed in an economic analysis. For example, most economic studies assume that the values given to a resource should be limited by people's ability to pay for them, and that the current distribution of wealth is acceptable. Some people's economic votes therefore have a higher value than others because a rich person is more likely to be willing to pay more to protect (or degrade) an environment than a poor person.

Monetary valuation is generally part of an assessment undertaken in a cost-benefit framework. Cost-benefit analysis typically focuses on efficiency in a narrow economic way and often does not address issues of social equity or other social concerns.

9.6.2 Technical issues

Despite advances in the sciences and economics, there remain a number of unresolved technical problems with monetary valuation. Whilst revealed preference data has been used frequently to determine an individual's utility functions, the technique exhibits a number of severe limitations. The most prominent of these limitations are:

- Revealed preference techniques infer individuals' preferences from observed choices made within the market place. This means that responses can only be observed in response to current market conditions. It can be difficult to observe the effect of sufficiently large variations in the variables of interest using revealed preference data (Pearmain et al., 1991; Madden, 1993). Revealed preference data is typically restricted in the width of variation of current or past product/service attribute levels. As a result, researchers can only calculate accurately a small section of a consumer utility function.

- Given that revealed preference data is based on observed behaviour, the use of these techniques proves difficult when forecasting demand for new services or products (Pearmain et al., 1991; J. Louviere et al., 2000) It is not possible to observe individual's behaviour in response to market conditions that do not yet exist.

Clearly the use of revealed preference techniques for identifying consumer preferences and/or forecasting demand in some scenarios is difficult. It is largely as a result of these problems encountered using revealed preference techniques that researchers have developed alternative methods of estimating consumer utility functions such as CE. Although CE model has been very widely applied in the field of transport and marketing, experience in environmental and other related contexts is still fairly limited. Several problem areas seem to be important:

In order to estimate the value of an environmental good as distinct from a change in one of its attributes, it is necessary to assume that the value of the whole is equal to the sum of the parts. There may be additional attributes of the good not included in the design which generate utility.

In addition welfare value estimates obtained with CE are sensitive to study design. For example, the choice of attributes, the levels chosen to represent them, and the way in which choices are relayed to respondents may still impact on the values of estimates of consumers surplus and marginal utilities.

A final limitation with this economic valuation technique is that choice/rank complexity can be a problem for the respondents. Swait and Adamowicz (1996) found an inverted U-shaped relationship between choice complexity and variance of underlying utility amounts; whilst Mazotta and Opaluch (1995) found that increased complexity leads to increase random errors.

All these limitation requires more research and study in different areas for better understanding of the full value of non-market goods.

9.7 Overview and Conclusions

It is clear from this research that urban services have the ability to contribute positively to some of the key agendas in urban neighbourhood’s sustainable development. The research suggests that environmental enhancement through the maintenance and extension of urban services can make places more attractive and pleasant and increase peoples' quality of life by providing quality of environments. As a result this thesis concludes that urban services action plans should be inextricably bound into processes of economic, environmental and social regeneration. Raising awareness of the value of urban services, and their potentially key role in urban renewal, represents perhaps the best argument for a significant increase in resources, investment and political attention for urban services.

Therefore, valuation of the various amenities, social and psychological services of urban areas should be integrated into project assessment procedure and be properly accounted for in policy decisions and urban planning strategies. Alternative valuation exercises should be directed towards public debate, discursive and deliberative processes, able to articulate discussion of aesthetic, spiritual and moral values and to accommodate post-materialistic needs and value orientation. Public valuation about user's satisfactions and needs is important to urban management. In this respect, representation and participation of citizens in all aspects of urban life are critical, as a sustainable city has to be created by people themselves. How can a city be sustainable if it does not meet the needs of its citizens? It is suggested that sustainability indicators for urban development should include more parameters about urban services as well as indexes reflecting citizens' satisfaction and perception of their living environments. Results obtained also show that some differences in the reasons, activities and feelings experienced for urban services are significantly related to people's socio-economic status. City planners and urban designers should therefore take into account this variability, by managing urban services in a diversified way, so as to fulfil the needs and expectations of all the segments of the population (children, families, elderly people, etc.).

Valuation and assessment of these urban services and benefits is of crucial importance in order to justify and legitimise strategies for urban sustainability. It is argued that valuation of their worth to society must start from the appraisal of the needs, wants and beliefs of the individuals composing that very society. Public involvement, citizens' participation, and the qualitative and quantitative appraisal of their needs and interests, will help urban communities to articulate commonly shared values which, in turn, can serve as reference criteria for local planners to envision more sustainable city strategies.

For further research on CE, HP and LSA, two areas can be highlighted. First, important insights will be gained by additional comparisons between methods. For example, subjective well-being data would allow us to test the crucial assumption of the travel cost approach that travelling to a recreational site provides no direct utility or disutility. One potential avenue to test would be an analysis along the lines of the DRM study of Kahneman et al. (2004). Interestingly, they report commuting to be (one of) the least pleasant activities. Alternatively, subjective well-being data could be used to quantify the non-pecuniary costs of defence and prevention behaviour that is relevant for the defence expenditure approach. The second area for future research relates to improvements of the methods. One major issue that need more attention is better estimates of the effect of income on life satisfaction. So far, estimates based on exogenous changes in income are rare. Many correlates in subjective well-being are actually choice variables, and choices involve trade-offs. Thus, it should be no surprise if—at least at the margin—the raw effect of the choice variable on life satisfaction is small. Another issue concerns the subjective well-being measures. It can be argued that existing measures of subjective well-being, particularly global self-report of life satisfaction, is well suited for the purpose of valuing public goods. Yet there is still the concern that these measures and the estimates based thereupon are systematically biased because of conceptual problems and contextual factors such as question order effects and the lack of intergroup comparability. The LSA for example would greatly benefit if these problems were taken seriously in the development of the next generation of subjective well-being measures.

Appendix A

A.1 Hedonic pricing questionnaire

Questioner No: ------

Urban Services & Sustainability

Postgraduate research
Newcastle University

Introduction:

This research uses people's willingness to pay for a house unit, as an indicator, to assess the type of public services and the desired distance they will travel to reach that service as a measure of accessibility. People preference of both public services and distance of accessibility will be defined. Then using the hedonic pricing model, which is one of the revealed preference methods in valuating non-market goods, we will calculate the influence of different variables such as building condition, neighbourhood quality and accessibility to services, on the house price value, to optimise the quality of public services in choosing the place to live which is one of the important factors influencing the quality of life of residence. Latter, in addition to the 'traditional' measure (count of facilities in an aerial unit), we will consider a potential measure (based on the gravity model), average travel distance, and distance to the nearest services as an indicators of accessibility. We will then assess the distribution of people preferred services and demonstrate the under covered area by individual services, using the GIS system, to observe the residence accessibility to the particular services. In other wards we will assess the equity of spatial distribution of individual services that have been preferred. This way we can easily define and improve places which its residence are not properly having accessed to common public services in order to increase the quality of life in a equate manner in a city.

Neighbourhood and Environmental Characteristics		
	Do you consider your neighbourhood safe?	**Very safe** **Safe** **Normal** **Unsafe** **Very unsafe** 1 2 3 4 5
	Do you consider your neighbourhood as a high-density neighbourhood?	**High-density** Normal **Low-density** 1 2 3
	Do you consider your neighbourhood crowded?	**Very crowded**, Crowded, **Normal**, Privet, **Very privet** 1 2 3 4 5
	What is the current <u>traffic</u> level in your neighbourhood?	**Very High**, High, **Normal**, Low, **Very low** 1 2 3 4 5
	What do you think of the <u>noise pollution</u> level in your neighbourhood?	**Very High**, High, **Normal**, Low, **Very low** 1 2 3 4 5
	What do you think of the <u>air pollution</u> level in your neighbourhood?	**Very High**, High, **Normal**, Low, **Very low** 1 2 3 4 5
	How do you rate the road condition in your neighbourhood?	**Very good**, Good, **Normal**, Poor, **Very poor** 1 2 3 4 5
	How do you rate the sidewalk condition in your neighbourhood?	**Very good**, Good, **Normal**, Poor, **Very poor** 1 2 3 4 5
	Do you consider your neighbourhood safe to walk and cycle?	**Very safe**, Safe, **Normal**, Unsafe, **Note safe at all** 1 2 3 4 5
	How many times does your recycles been taken in the week?	**Not at all** All days 0 1 2 3 4 5 6 7
	How often do you see your neighbourhood gets clean by the government?	**Not at all** All days 0 1 2 3 4 5 6 7
	Do you consider your neighbourhood a green one with trees and flowers planted?	**Very green**, Green, **Normal**, Few, **Desert** 1 2 3 4 5
	What is the current condition of lighting in the nights?	**Very lighted**, Lighted, **Normal**, Dark, **Complete darkness**, 1 2 3 4 5
	How is the condition of other structure?	**Very good**, Good, **Normal**, Poor, **Very poor** 1 2 3 4 5
	Overall how satisfied are you with the current situation of your neighbourhood?	**Very satisfied** Totally unsatisfied 1 2 3 4 5 6 7 8 9 10

Neighbourhood and Environmental	**Can you please rank the following Neighbourhood and Environment attributes from the most to the least important attribute in choosing the house? (1=the most important, 12=the least important)**	**1- Safety** **2- Uncrowdedness** **3- Low traffic** **4- Low level of noise pollution** **5- Low level of air pollution** **6- Low density** **7- Green neighbourhood** **8- Good road conditions** **9- Suitable walk and cycle pathways** **10- Cleanness of the neighbourhood** **11- Lighted neighbourhood at nights** **12- A neighbourhood with modern structures**	

Location and Accessibility Characteristics

Where is your house located

Address: -------
Postcode: -------   Point on the map: -------

Which municipality region would that be?

Please Complete the table below

Pleas Choose 3 of the following public services which you would like to have it near your house and please identify that what is the preferred time to reach to that services.

Public services	rank	Preferred time to reach
parks and forest		
Educational centre		
Public transport system		
Health care centre		
Post office		
Mosque		
Sport centers		
Local centre		
Public library		
Security centers		
Others		

Overall, are you satisfied with the current location of your house?	**Verv satisfied** Totallv unsatisfied 1 2 3 4 5 6 7 8 9 10
Overall, are you satisfied with the current accessibility to the public services?	**Very satisfied** Totally unsatisfied 1 2 3 4 5 6 7 8 9 10
Are you satisfied with the public transport system provided near you?	**Very satisfied** Totally unsatisfied 1 2 3 4 5 6 7 8 9 10
Which option is more important for you to walk or cycle to the public services? (please rank from the most important to the least)	1- Safety 2- Distance 3- Path way condition 4- Time 5- I will never walk or cycle to a public services
Are you willing to pay a tax per year to increase your accessibility to public services?	Yes ☐ No ☐ How much? ------- How much is your current tax per year?-----
Overall rank the three following characteristics ?(form most important to least important)	1- Physical characteristics 2- Location and accessibility characteristics 3- Neighbourhood and environmental characteristics

A1.1 Hedonic Pricing Model Attributes

Physical Characteristics	**Do you own the house or you have rent it?**	**Yes own the house house** ☐	**No rent the** ☐
	How much you bought/rent the house?	-------	
	Type of the house?	Dwelling ☐	Apartment ☐
	Number of stories?		
	Number of the units in the Apartment?	-------	
	Year of built?	-------	
	Size of the lot?(for house)	-------	
	Floor area?	-------	
	Does it have a yard? If yes what is the area?	Yes ☐ No ☐	Area-------
	No. bedrooms	-------	
	No. bathrooms	-------	
	Does it have a garage?	Yes ☐ No ☐	How many ------ -
	Does it have a store?	Yes ☐ No ☐	
	Does it have a swimming pool or any other facilities?	Yes ☐ No ☐	
	Does it have utilities (water, gas, electricity and landline)?	Yes ☐ No ☐	
	Heating/cooling system?	Yes ☐ No ☐	
	Does it have an alarm?	Yes ☐ No ☐	
	Does it have a lift?	Yes ☐ No ☐	
	Does it have a central antenna?	Yes ☐ No ☐	
	In what direction is you house facing?	North to South ☐	East to West ☐
	Are you happy with the direction?	Yes ☐ No ☐	
	Are you happy with the design of the house?	Yes ☐ No ☐	
	Are you happy with the material that has been used in the house?	Yes ☐ No ☐	

Physical Characteristics		
	Overall, how satisfied are you with the condition of the building, design and construction of the house? (except the condition of the neighbourhood-environment and location-accessibility)	**Very satisfied** **Totally unsatisfied** 1 2 3 4 5 6 7 8 9 10
	Can you please rank the following <u>Physical</u> attributes from the most to the least important attribute in choosing the house? **(1=the most important, 12=the least important)**	1- Size 2- No. Bedrooms 3- No. Bathrooms 4- Utilities 5- The age 6- Design and structure 7- Garage 8- Store and other facilities 9- Lift 10- Yard 11- No. Units 12- Facing direction
	Condition of the House	Very poor Poor Normal Good Very good 1 2 3 4 5

Sustainability		
	Do you know what sustainable city is?	**Yes** **No**
	How is responsible in having a sustainable city?	1- Local government 2- Regional government 3- Residence 4- The community (people &government) 5- Other 6- I don't know
	Do you think that public services can help the community to achieve sustainable city?	**Totally agree** Totally disagree 1 2 3 4 5 6 7 8 9 10
	Do you agree that public services can help with the following issues? 1- Travel time and money 2- Decrease in energy use 3- Decrease in pollution 4- Increase of the quality of life	1- Yes 2- No 3- I don't know
	Do you think the city of shiraz is Sustainable?	**Totally agree** Totally disagree 1 2 3 4 5 6 7 8 9 10

A1.2 Socio-Economic Attributes

Gender	Male ☐ Female ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Subject	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

A.2 Outcome of the SPSS

A2.1 Outcome for Houses

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA COLLIN TOL

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT LN_Property_Value

/METHOD=ENTER neighborhood_safety neighborhood_population neighborhood_road_condition neighborhood_cleaning neighborhood_greenness

neighborhood_lightning_condition Age_Property Floor_Area Area_of_Yard No_Bedrooms_House No_Bathroom_House Bathroom_1

Bathroom_2 Bathroom_3 Bathroom_4_more No.Garage direction_satisfaction Region_3 Region_5 Region_7 Region_8 Region_9 Distance_to_Scho

ol Distance_to_Cemetery Distance_to_Administrative Distance_to_Industrial_centres Distance_to_park_service

Distance_to_Bus_stop Distance_to_police Distance_to_museums Distance_to_sport Distance_to_Commercial_centres Distance_to_Ghasrodasht

_garden

/SCATTERPLOT=(*ZRESID ,*ZPRED)

/RESIDUALS HIST(ZRESID) NORM(ZRESID)

/SAVE RESID ZRESID

/OUTFILE=MODEL('H:\PhD\PHD\Data\Iran Data collection\Questioner data\400House.xml').

Regression

Notes

Output Created		31-Dec-2010 18:16:11
Comments		
Input	Data	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400.sav
	Active Dataset	DataSet1
	Filter	Type_of_the_house=1 (FILTER)
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	180
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT LN_Property_Value /METHOD=ENTER neighborhood_safety neighborhood_population neighborhood_road_condition neighborhood_cleaning neighborhood_greenness neighborhood_lightning_condition Age_Property Floor_Area Area_of_Yard No_Bedrooms_House No_Bathroom_House Bathroom_1 Bathroom_2 Bathroom_3 Bathroom_4_more No.Garage direction_satisfaction Region_3 Region_5 Region_7 Region_8 Region_9 Distance_to_School Distance_to_Cemetery Distance_to_Administrative Distance_to_Industrial_centres Distance_to_park_service Distance_to_Bus_stop Distance_to_police Distance_to_museums Distance_to_sport Distance_to_Commercial_centres Distance_to_Ghasrodasht_garden /SCATTERPLOT=(*ZRESID ,*ZPRED) /RESIDUALS HIST(ZRESID) NORM(ZRESID) /SAVE RESID ZRESID /OUTFILE=MODEL('H:\PhD\PHD\Data\Iran Data collection\Questioner data\400House.xml').
Resources	Processor Time	00:00:00.952
	Elapsed Time	00:00:05.333
	Memory Required	28636 bytes

	Additional Memory Required for Residual Plots	656 bytes
Files Saved	Model File	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400House.xml
Variables Created or Modified	RES_1	Unstandardized Residual
	ZRE_1	Standardized Residual

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Distance_to_Ghasrodasht_garden, neighborhood_population, Bathroom_2, neighborhood_road_condition, Region_3, Distance_to_Bus_stop, Distance_to_School, neighborhood_cleaning, Region_8, Bathroom_4_more, Distance_to_Cemetery, Distance_to_police, Region_9, Bathroom_3, neighborhood_greenness, Distance_to_sport, neighborhood_safety, neighborhood_lightning_condition, No.Garage, Distance_to_museums, Distance_to_park_service, Distance_to_Commercial_centres, direction_satis	.	Enter

	faction, Region_5, Age_Property, No_Bedrooms_House, Distance_to_Administrative, Distance_to_Industrial_centres, Area_of_Yard, Region_7, Floor_Area, Bathroom_1, No_Bathroom_House		

a. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954[a]	.909	.889	.2470542

a. Predictors: (Constant), Distance_to_Ghasrodasht_garden, neighborhood_population, Bathroom_2, neighborhood_road_condition, Region_3, Distance_to_Bus_stop, Distance_to_School, neighborhood_cleaning, Region_8, Bathroom_4_more, Distance_to_Cemetery, Distance_to_police, Region_9, Bathroom_3, neighborhood_greenness, Distance_to_sport, neighborhood_safety, neighborhood_lightning_condition, No.Garage, Distance_to_museums, Distance_to_park_service, Distance_to_Commercial_centres, direction_satisfaction, Region_5, Age_Property, No_Bedrooms_House, Distance_to_Administrative, Distance_to_Industrial_centres, Area_of_Yard, Region_7, Floor_Area, Bathroom_1, No_Bathroom_House
b. Dependent Variable: LN_Property_Value

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	89.405	33	2.709	44.388	.000[a]
	Residual	8.911	146	.061		
	Total	98.316	179			

a. Predictors: (Constant), Distance_to_Ghasrodasht_garden, neighborhood_population, Bathroom_2, neighborhood_road_condition, Region_3, Distance_to_Bus_stop, Distance_to_School, neighborhood_cleaning, Region_8, Bathroom_4_more, Distance_to_Cemetery, Distance_to_police, Region_9, Bathroom_3, neighborhood_greenness, Distance_to_sport, neighborhood_safety, neighborhood_lightning_condition, No.Garage, Distance_to_museums, Distance_to_park_service, Distance_to_Commercial_centres, direction_satisfaction,

Region_5, Age_Property, No_Bedrooms_House, Distance_to_Administrative, Distance_to_Industrial_centres, Area_of_Yard, Region_7, Floor_Area, Bathroom_1, No_Bathroom_House
b. Dependent Variable: LN_Property_Value

Coefficients[a]

Model		Unstandardized Coefficients	
		B	Std. Error
1	(Constant)	19.193	.349
	neighborhood_safety	-.019	.020
	neighborhood_population	.061	.024
	neighborhood_road_condition	-.040	.021
	neighborhood_cleaning	-.012	.010
	neighborhood_greenness	-.043	.022
	neighborhood_lightning_condition	-.054	.027
	Age_Property	-.004	.002
	Floor_Area	.001	.000
	Area_of_Yard	.002	.000
	No_Bedrooms_House	.076	.019
	No_Bathroom_House	-.083	.023
	Bathroom_1	.025	.073
	Bathroom_2	.073	.071
	Bathroom_3	.287	.096
	Bathroom_4_more	.186	.190
	No.Garage	.058	.021
	direction_satisfaction	-.180	.052
	Region_3	-.326	.070
	Region_5	-.590	.078
	Region_7	-.550	.087
	Region_8	-.539	.137
	Region_9	-.381	.106
	Distance_to_School	.019	.027
	Distance_to_Cemetery	.069	.029
	Distance_to_Administrative	.013	.022
	Distance_to_Industrial_centres	.039	.023
	Distance_to_park_service	.016	.020
	Distance_to_Bus_stop	.043	.052
	Distance_to_police	-.024	.019
	Distance_to_museums	.081	.055
	Distance_to_sport	-.018	.022
	Distance_to_Commercial_centres	-.039	.020
	Distance_to_Ghasrodasht_garden	-.074	.023

Coefficients[a]

Model		Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)		54.959	.000		
	neighborhood_safety	-.027	-.938	.350	.733	1.365
	neighborhood_population	.076	2.547	.012	.706	1.416
	neighborhood_road_condition	-.054	-1.898	.060	.772	1.296
	neighborhood_cleaning	-.035	-1.225	.223	.782	1.278
	neighborhood_greenness	-.059	-1.948	.053	.677	1.477
	neighborhood_lightning_condition	-.059	-2.011	.046	.712	1.405
	Age_Property	-.064	-1.978	.050	.597	1.675
	Floor_Area	.202	5.000	.000	.381	2.623
	Area_of_Yard	.277	7.506	.000	.455	2.200
	No_Bedrooms_House	.215	4.116	.000	.227	4.406
	No_Bathroom_House	-.188	-3.530	.001	.218	4.591
	Bathroom_1	.015	.342	.733	.324	3.084
	Bathroom_2	.049	1.024	.307	.272	3.674
	Bathroom_3	.114	2.983	.003	.427	2.341
	Bathroom_4_more	.041	.976	.331	.346	2.890
	No.Garage	.085	2.745	.007	.652	1.533
	direction_satisfaction	-.110	-3.456	.001	.611	1.636
	Region_3	-.135	-4.644	.000	.731	1.368
	Region_5	-.251	-7.572	.000	.565	1.771
	Region_7	-.234	-6.305	.000	.452	2.213
	Region_8	-.120	-3.943	.000	.672	1.489
	Region_9	-.112	-3.595	.000	.636	1.572
	Distance_to_School	.020	.674	.501	.715	1.400
	Distance_to_Cemetery	.070	2.398	.018	.730	1.369
	Distance_to_Administrative	.019	.597	.552	.601	1.664
	Distance_to_Industrial_centres	.059	1.702	.091	.519	1.926
	Distance_to_park_service	.024	.783	.435	.653	1.531
	Distance_to_Bus_stop	.025	.824	.411	.695	1.439
	Distance_to_police	-.036	-1.258	.211	.751	1.331
	Distance_to_museums	.045	1.469	.144	.674	1.485
	Distance_to_sport	-.026	-.821	.413	.624	1.602
	Distance_to_Commercial_centres	-.061	-1.935	.055	.631	1.585
	Distance_to_Ghasrodasht_garden	-.135	-3.136	.002	.333	3.005

a. Dependent Variable: LN_Property_Value

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index
1	1	22.019	1.000
	2	1.808	3.490
	3	1.203	4.279
	4	1.155	4.366
	5	1.104	4.466
	6	1.039	4.604
	7	.932	4.860
	8	.842	5.115
	9	.722	5.522
	10	.335	8.104
	11	.317	8.339
	12	.281	8.856
	13	.256	9.274
	14	.209	10.276
	15	.194	10.656
	16	.189	10.798
	17	.168	11.456
	18	.159	11.783
	19	.128	13.116
	20	.119	13.591
	21	.114	13.874
	22	.109	14.219
	23	.088	15.817
	24	.087	15.913
	25	.079	16.742
	26	.063	18.676
	27	.057	19.647
	28	.056	19.917
	29	.051	20.792
	30	.041	23.311
	31	.034	25.562
	32	.029	27.336
	33	.013	40.401
	34	.002	99.528

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		(Constant)	neighborhood_safety	neighborhood_population	neighborhood_road_condition	neighborhood_cleaning
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.00	.00	.00
	3	.00	.00	.00	.00	.00
	4	.00	.00	.00	.00	.00
	5	.00	.00	.00	.00	.00
	6	.00	.00	.00	.00	.00
	7	.00	.00	.00	.00	.00
	8	.00	.00	.00	.00	.00
	9	.00	.00	.00	.00	.00
	10	.00	.01	.00	.00	.00
	11	.00	.00	.00	.01	.00
	12	.00	.00	.00	.00	.01
	13	.00	.08	.00	.01	.01
	14	.00	.00	.01	.01	.00
	15	.00	.00	.01	.01	.01
	16	.00	.00	.01	.00	.61
	17	.00	.17	.06	.00	.00
	18	.00	.01	.00	.00	.02
	19	.00	.01	.00	.01	.01
	20	.00	.02	.06	.00	.02
	21	.00	.09	.01	.01	.04
	22	.00	.16	.01	.01	.00
	23	.00	.05	.00	.01	.01
	24	.00	.07	.25	.00	.01
	25	.00	.06	.00	.13	.01
	26	.00	.06	.00	.00	.03
	27	.00	.02	.03	.04	.05
	28	.00	.00	.01	.01	.00
	29	.00	.03	.08	.64	.00
	30	.00	.00	.13	.03	.00
	31	.00	.00	.19	.00	.04
	32	.00	.00	.02	.00	.01
	33	.03	.14	.08	.01	.05
	34	.97	.01	.03	.07	.06

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		neighborhood_greenness	neighborhood_lightning_condition	Age_Property	Floor_Area	Area_of_Yard
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.00	.01	.01
	3	.00	.00	.01	.00	.00
	4	.00	.00	.00	.00	.00
	5	.00	.00	.01	.00	.00
	6	.00	.00	.00	.00	.00
	7	.00	.00	.00	.00	.00
	8	.00	.00	.00	.00	.00
	9	.00	.00	.01	.00	.00
	10	.01	.00	.00	.01	.10
	11	.01	.00	.22	.04	.00
	12	.01	.00	.00	.06	.08
	13	.00	.01	.03	.00	.01
	14	.00	.00	.08	.01	.20
	15	.00	.02	.16	.00	.07
	16	.01	.02	.00	.01	.00
	17	.02	.00	.04	.02	.05
	18	.01	.01	.03	.10	.00
	19	.01	.00	.05	.36	.09
	20	.01	.00	.00	.04	.02
	21	.06	.05	.02	.00	.01
	22	.00	.00	.01	.03	.00
	23	.00	.00	.01	.01	.01
	24	.17	.00	.12	.01	.00
	25	.00	.03	.08	.09	.01
	26	.09	.05	.00	.01	.01
	27	.01	.54	.07	.00	.00
	28	.07	.00	.01	.01	.14
	29	.06	.02	.02	.02	.01
	30	.26	.19	.00	.04	.03
	31	.03	.03	.00	.05	.04
	32	.09	.00	.00	.06	.09
	33	.03	.02	.00	.00	.01
	34	.04	.01	.00	.01	.01

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		No_Bedrooms_House	No_Bathroom_House	Bathroom_1	Bathroom_2	Bathroom_3
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.02	.00	.01
	3	.00	.00	.00	.00	.07
	4	.00	.00	.03	.02	.01
	5	.00	.00	.00	.00	.01
	6	.00	.00	.00	.00	.00
	7	.00	.00	.04	.04	.07
	8	.00	.00	.01	.00	.12
	9	.00	.00	.02	.00	.04
	10	.00	.00	.01	.01	.00
	11	.00	.00	.00	.00	.01
	12	.02	.00	.02	.00	.04
	13	.00	.00	.03	.00	.00
	14	.02	.04	.00	.00	.00
	15	.02	.01	.07	.08	.09
	16	.00	.00	.01	.00	.00
	17	.00	.00	.01	.01	.00
	18	.01	.05	.10	.05	.02
	19	.01	.01	.06	.06	.04
	20	.01	.01	.09	.07	.00
	21	.00	.06	.13	.06	.01
	22	.03	.00	.00	.02	.02
	23	.00	.01	.04	.02	.01
	24	.00	.01	.00	.01	.00
	25	.02	.02	.03	.00	.00
	26	.02	.00	.00	.00	.00
	27	.00	.05	.01	.07	.06
	28	.01	.01	.07	.08	.01
	29	.00	.01	.07	.03	.03
	30	.03	.04	.01	.00	.00
	31	.19	.24	.01	.12	.07
	32	.51	.42	.04	.14	.20
	33	.02	.00	.01	.06	.02
	34	.07	.00	.05	.03	.03

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions Bathroom_4_more	No.Garage	direction_satisfaction	Region_3	Region_5
1	1	.00	.00	.00	.00	.00
	2	.04	.00	.00	.00	.02
	3	.06	.00	.00	.17	.00
	4	.01	.00	.00	.01	.08
	5	.00	.00	.00	.02	.01
	6	.00	.00	.00	.00	.12
	7	.01	.00	.00	.00	.07
	8	.07	.00	.00	.35	.00
	9	.06	.04	.00	.06	.11
	10	.04	.28	.00	.06	.08
	11	.02	.01	.00	.03	.02
	12	.07	.25	.00	.04	.01
	13	.00	.07	.00	.02	.00
	14	.03	.06	.00	.01	.00
	15	.02	.02	.01	.01	.03
	16	.01	.00	.00	.02	.00
	17	.00	.00	.00	.01	.06
	18	.01	.00	.00	.01	.08
	19	.01	.01	.01	.02	.01
	20	.00	.01	.03	.01	.09
	21	.00	.00	.01	.01	.00
	22	.02	.00	.01	.02	.02
	23	.01	.00	.01	.01	.01
	24	.03	.07	.03	.00	.00
	25	.00	.03	.07	.01	.05
	26	.01	.01	.17	.04	.02
	27	.00	.00	.01	.00	.00
	28	.00	.00	.49	.00	.01
	29	.00	.00	.00	.00	.00
	30	.00	.03	.04	.00	.01
	31	.23	.04	.06	.00	.01
	32	.21	.00	.03	.03	.06
	33	.00	.02	.02	.02	.01
	34	.03	.01	.01	.00	.01

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		Region_7	Region_8	Region_9	Distance_to_School	Distance_to_Cemetery
1	1	.00	.00	.00	.00	.00
	2	.01	.00	.02	.00	.00
	3	.03	.01	.01	.00	.00
	4	.11	.00	.01	.00	.00
	5	.00	.44	.02	.00	.00
	6	.02	.01	.37	.00	.00
	7	.10	.00	.00	.00	.00
	8	.00	.01	.02	.00	.00
	9	.01	.08	.05	.00	.00
	10	.03	.05	.07	.01	.00
	11	.00	.07	.05	.04	.00
	12	.01	.03	.03	.00	.00
	13	.01	.05	.01	.14	.00
	14	.00	.01	.01	.19	.00
	15	.10	.00	.00	.01	.00
	16	.00	.00	.03	.01	.00
	17	.09	.00	.08	.08	.00
	18	.00	.00	.01	.06	.00
	19	.00	.00	.02	.00	.00
	20	.00	.00	.02	.00	.00
	21	.01	.01	.01	.01	.01
	22	.17	.00	.01	.00	.00
	23	.00	.00	.00	.09	.00
	24	.00	.03	.01	.08	.00
	25	.02	.02	.01	.00	.01
	26	.14	.03	.06	.09	.02
	27	.01	.01	.00	.00	.04
	28	.03	.04	.02	.11	.00
	29	.02	.02	.03	.00	.04
	30	.00	.06	.01	.00	.00
	31	.00	.01	.01	.07	.18
	32	.04	.00	.00	.00	.32
	33	.01	.01	.00	.00	.30
	34	.01	.00	.01	.01	.07

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions			
		Distance_to_Administrative	Distance_to_Industrial_centres	Distance_to_park_service	Distance_to_Bus_stop
1	1	.00	.00	.00	.00
	2	.00	.00	.00	.00
	3	.00	.00	.00	.00
	4	.00	.00	.00	.00
	5	.00	.00	.00	.00
	6	.00	.00	.00	.00
	7	.00	.00	.00	.00
	8	.00	.00	.00	.00
	9	.00	.00	.00	.00
	10	.00	.01	.00	.00
	11	.05	.00	.00	.00
	12	.03	.00	.00	.00
	13	.01	.00	.02	.00
	14	.04	.00	.00	.00
	15	.13	.00	.00	.02
	16	.00	.00	.00	.00
	17	.14	.00	.00	.01
	18	.00	.00	.02	.03
	19	.06	.00	.14	.01
	20	.02	.02	.15	.01
	21	.01	.00	.07	.05
	22	.10	.01	.06	.15
	23	.05	.10	.01	.20
	24	.10	.01	.02	.01
	25	.05	.01	.01	.04
	26	.06	.11	.18	.00
	27	.00	.14	.02	.02
	28	.00	.02	.17	.22
	29	.01	.01	.00	.14
	30	.09	.31	.00	.00
	31	.00	.16	.03	.01
	32	.00	.01	.07	.00
	33	.02	.03	.00	.07
	34	.00	.03	.01	.00

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions Distance_to_police	Distance_to_museums	Distance_to_sport
1	1	.00	.00	.00
	2	.00	.00	.00
	3	.00	.00	.00
	4	.00	.00	.00
	5	.00	.00	.00
	6	.00	.00	.00
	7	.00	.00	.00
	8	.00	.00	.00
	9	.00	.00	.00
	10	.00	.00	.00
	11	.01	.00	.01
	12	.00	.00	.00
	13	.00	.00	.00
	14	.01	.00	.00
	15	.00	.00	.00
	16	.00	.00	.01
	17	.00	.00	.00
	18	.18	.00	.00
	19	.00	.00	.06
	20	.00	.00	.00
	21	.08	.00	.00
	22	.10	.00	.00
	23	.27	.00	.12
	24	.01	.00	.00
	25	.08	.00	.22
	26	.00	.00	.21
	27	.00	.00	.01
	28	.05	.00	.03
	29	.05	.00	.08
	30	.06	.00	.00
	31	.04	.01	.11
	32	.00	.00	.02
	33	.01	.33	.11
	34	.05	.65	.00

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions	
		Distance_to_Commercial_centres	Distance_to_Ghasrodasht_garden
1	1	.00	.00
	2	.00	.00
	3	.00	.00
	4	.00	.00
	5	.00	.00
	6	.00	.00
	7	.00	.00
	8	.00	.00
	9	.00	.01
	10	.00	.00
	11	.02	.00
	12	.02	.00
	13	.07	.01
	14	.00	.00
	15	.00	.00
	16	.01	.00
	17	.03	.02
	18	.02	.01
	19	.00	.00
	20	.16	.09
	21	.09	.02
	22	.16	.01
	23	.02	.01
	24	.12	.01
	25	.06	.04
	26	.01	.05
	27	.08	.03
	28	.01	.05
	29	.02	.02
	30	.04	.36
	31	.02	.07
	32	.02	.02
	33	.00	.03
	34	.01	.13

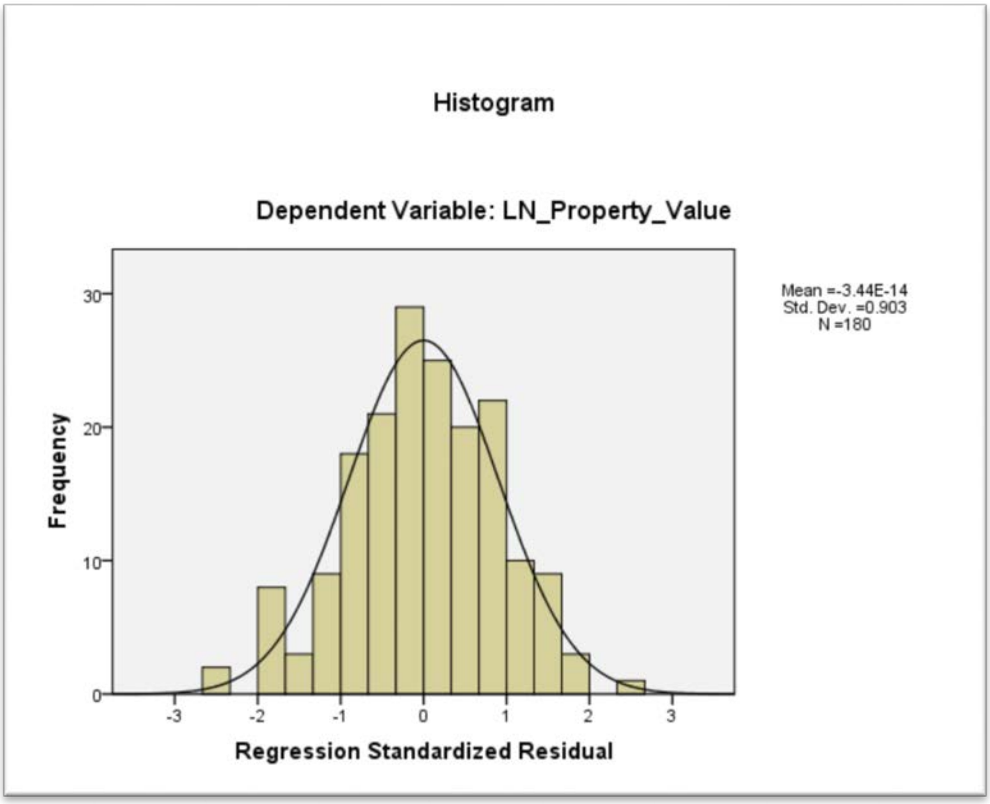
a. Dependent Variable: LN_Property_Value

Residuals Statistics[a]

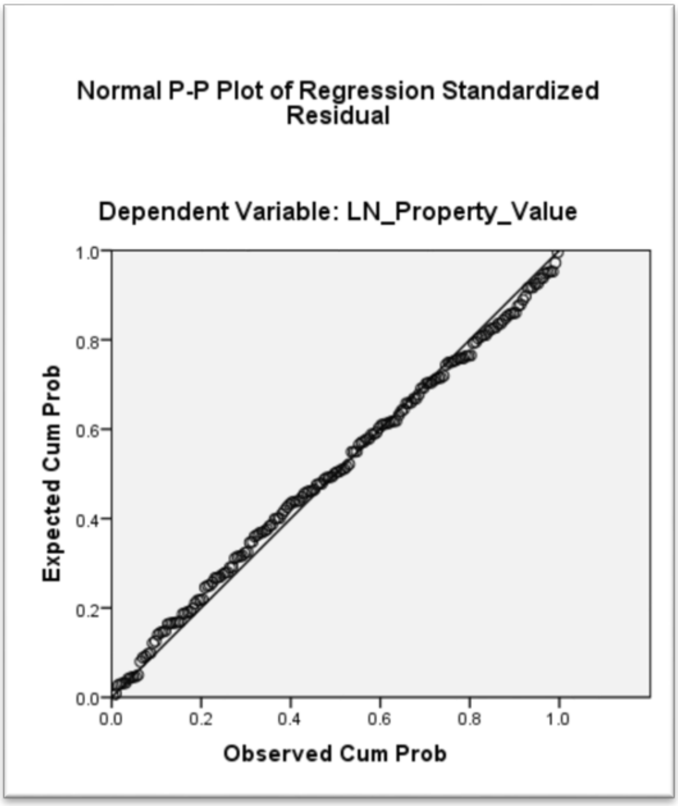
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	17.961437	22.081200	19.468441	.7067321	180
Residual	-.6584649	.6455697	.0000000	.2231219	180
Std. Predicted Value	-2.132	3.697	.000	1.000	180
Std. Residual	-2.665	2.613	.000	.903	180

a. Dependent Variable: LN_Property_Value

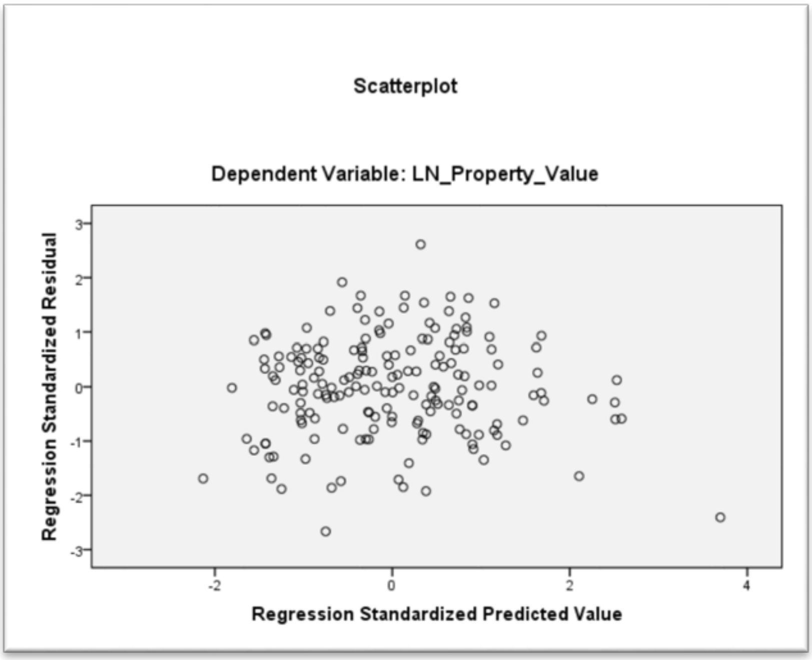
Charts



Histogram
Dependent Variable: LN_Property_Value
Mean =-3.44E-14
Std. Dev. =0.903
N =180
Frequency
30
20
10
0
-3
-2
-1
0
1
2
3
Regression Standardized Residual



Normal P-P Plot of Regression Standardized Residual
Dependent Variable: LN_Property_Value
Expected Cum Prob
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob




```
EXAMINE VARIABLES=ZRE_1
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

Explore

Notes

Output Created		31-Dec-2010 18:16:38
Comments		
Input	Data	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400.sav
	Active Dataset	DataSet1
	Filter	Type_of_the_house=1 (FILTER)
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	180
Missing Value Handling	Definition of Missing	User-defined missing values for dependent variables are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ZRE_1 /PLOT HISTOGRAM NPPLOT /STATISTICS DESCRIPTIVES /CINTERVAL 95 /MISSING LISTWISE /NOTOTAL.
Resources	Processor Time	00:00:00.765
	Elapsed Time	00:00:00.955

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Standardized Residual	180	100.0%	0	.0%	180	100.0%

Descriptives

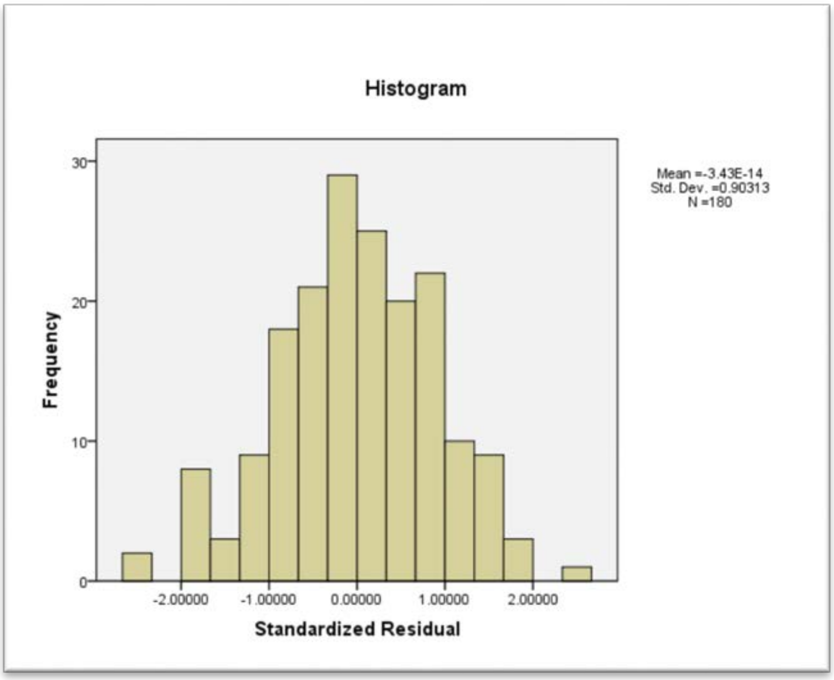
			Statistic	Std. Error
Standardized Residual	Mean		.0000000	.06731528
	95% Confidence Interval for Mean	Lower Bound	-.1328336	
		Upper Bound	.1328336	
	5% Trimmed Mean		.0127712	
	Median		.0050613	
	Variance		.816	
	Std. Deviation		.90312926	
	Minimum		-2.66526	
	Maximum		2.61307	
	Range		5.27833	
	Interquartile Range		1.26334	
	Skewness		-.192	.181
	Kurtosis		.076	.360

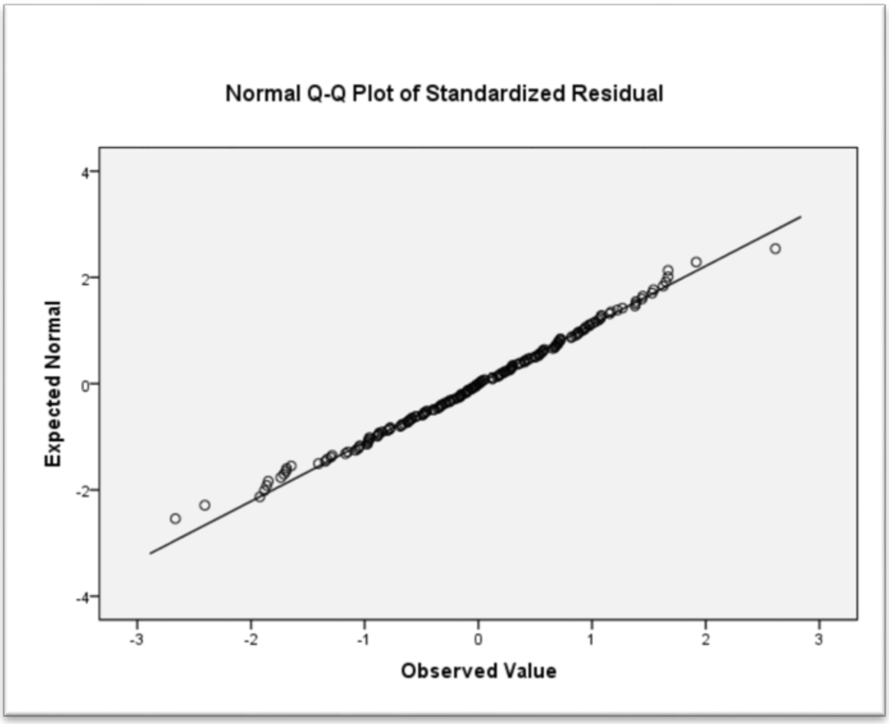
Tests of Normality

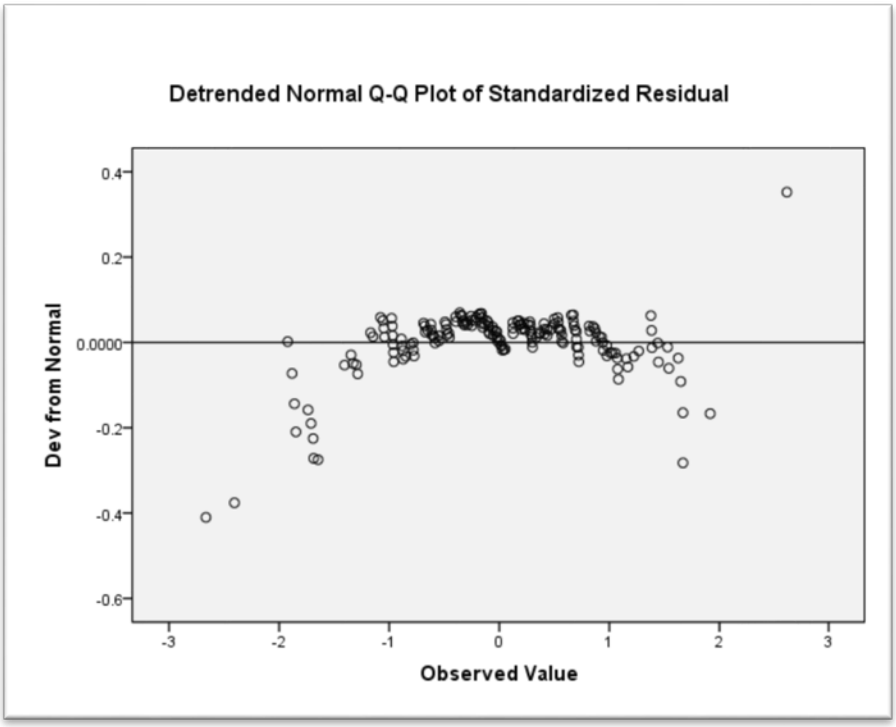
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	.030	180	.200[*]	.995	180	.853

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

Standardized Residual


Histogram
Mean =-3.43E-14
Std. Dev. =0.90313
N =180
Frequency
30
20
10
0
-2.00000
-1.00000
0.00000
1.00000
2.00000
Standardized Residual


Normal Q-Q Plot of Standardized Residual
Expected Normal
4
2
0
-2
-4
-3
-2
-1
0
1
2
3
Observed Value



A 2.2 Outcome for Apartments

Regression

Notes

Output Created		30-Dec-2010 17:36:10
Comments		
Input	Data	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400.sav
	Active Dataset	DataSet1
	Filter	Type_of_the_house=2 (FILTER)
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	220
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT LN_Property_Value /METHOD=ENTER neighborhood_safety neighborhood_recycle_collection neighborhood_lightning_condition neighborhood_other_structures_condition Age_Property Unit_Floor_Area No_Bedrooms_Unit No.Garage Store Other_Facilities Lift House_direction Distance_to_Cemetery Distance_to_School

		Distance_to_Religious Distance_to_Administrative Distance_to_Industrial_centres Distance_to_cultivation Distance_to_park_service Distance_to_Bus_stop Distance_to_police Distance_to_museums Distance_to_Commercial_centres Distance_to_Ghasrodasht_garden Region_3 Region_5 Region_7 Region_8 Region_9 Alarm Bathroom_Density /SCATTERPLOT=(*ZRESID ,*ZPRED) /RESIDUALS HIST(ZRESID) NORM(ZRESID) /SAVE RESID ZRESID /OUTFILE=MODEL('H:\PhD\PHD\Data\Iran Data collection\Questioner data\400APT.xml').
Resources	Processor Time	00:00:00.952
	Elapsed Time	00:00:04.539
	Memory Required	26060 bytes
	Additional Memory Required for Residual Plots	672 bytes
Files Saved	Model File	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400APT.xml
Variables Created or Modified	RES_1	Unstandardized Residual
	ZRE_1	Standardized Residual

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Bathroom_Density, Distance_to_park_service, No.Garage, neighborhood_safety, neighborhood_lightning_condition, neighborhood_recycle_collection, Region_9, Distance_to_police, Distance_to_museums, Region_7, Distance_to_Commercial_centres, Region_5, Distance_to_Bus_stop, Region_3, Other_Facilities, Distance_to_School, Distance_to_Cemetery, Age_Property, Unit_Floor_Area, Alarm, Lift, neighborhood_other_structures_	.	Enter

	condition, Distance_to_Religious, Distance_to_Administrative, House_direction, Distance_to_Industrial_centres, Store, Region_8, Distance_to_Ghasrodasht_garden, Distance_to_cultivation, No_Bedrooms_Unit		

a. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.979[a]	.958	.951	.1210354

a. Predictors: (Constant), Bathroom_Density, Distance_to_park_service, No.Garage, neighborhood_safety, neighborhood_lightning_condition, neighborhood_recycle_collection, Region_9, Distance_to_police, Distance_to_museums, Region_7, Distance_to_Commercial_centres, Region_5, Distance_to_Bus_stop, Region_3, Other_Facilities, Distance_to_School, Distance_to_Cemetery, Age_Property, Unit_Floor_Area, Alarm, Lift, neighborhood_other_structures_condition, Distance_to_Religious, Distance_to_Administrative, House_direction, Distance_to_Industrial_centres, Store, Region_8, Distance_to_Ghasrodasht_garden, Distance_to_cultivation, No_Bedrooms_Unit
b. Dependent Variable: LN_Property_Value

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.922	31	2.030	138.554	.000[a]
	Residual	2.754	188	.015		
	Total	65.677	219			

a. Predictors: (Constant), Bathroom_Density, Distance_to_park_service, No.Garage, neighborhood_safety, neighborhood_lightning_condition, neighborhood_recycle_collection, Region_9, Distance_to_police, Distance_to_museums, Region_7, Distance_to_Commercial_centres, Region_5, Distance_to_Bus_stop, Region_3, Other_Facilities, Distance_to_School, Distance_to_Cemetery, Age_Property, Unit_Floor_Area, Alarm, Lift, neighborhood_other_structures_condition, Distance_to_Religious, Distance_to_Administrative, House_direction, Distance_to_Industrial_centres, Store, Region_8, Distance_to_Ghasrodasht_garden, Distance_to_cultivation, No_Bedrooms_Unit
b. Dependent Variable: LN_Property_Value

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error
1	(Constant)	17.792	.167
	neighborhood_safety	-.019	.008
	neighborhood_recycle_collection	-.006	.005
	neighborhood_lightning_condition	.011	.011
	neighborhood_other_structures_condition	-.047	.012
	Age_Property	-.005	.001
	Unit_Floor_Area	.006	.000
	No_Bedrooms_Unit	.045	.021
	No.Garage	.046	.020
	Store	-.053	.023
	Other_Facilities	-.074	.038
	Lift	-.043	.021
	House_direction	-.059	.022
	Distance_to_Cemetery	.026	.012
	Distance_to_School	.001	.014
	Distance_to_Religious	-.001	.011
	Distance_to_Administrative	.015	.009
	Distance_to_Industrial_centres	.051	.011
	Distance_to_cultivation	.016	.013
	Distance_to_park_service	.010	.009
	Distance_to_Bus_stop	-.050	.037
	Distance_to_police	.007	.009
	Distance_to_museums	.092	.018
	Distance_to_Commercial_centres	-.010	.009
	Distance_to_Ghasrodasht_garden	-.072	.009
	Region_3	-.307	.035
	Region_5	-.386	.046
	Region_7	-.507	.050
	Region_8	-.526	.063
	Region_9	-.265	.043
	Alarm	.014	.024
	Bathroom_Density	-.067	.027

Coefficients[a]

Model		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		Beta			Tolerance	VIF
1	(Constant)		106.435	.000		
	neighborhood_safety	-.036	-2.293	.023	.892	1.121
	neighborhood_recycle_collection	-.021	-1.280	.202	.803	1.246
	neighborhood_lightning_condition	.016	.956	.340	.813	1.231
	neighborhood_other_structures_condition	-.071	-3.925	.000	.682	1.467
	Age_Property	-.067	-3.588	.000	.641	1.560
	Unit_Floor_Area	.557	20.122	.000	.291	3.438
	No_Bedrooms_Unit	.065	2.207	.028	.260	3.853
	No.Garage	.046	2.360	.019	.587	1.702
	Store	-.049	-2.352	.020	.523	1.913
	Other_Facilities	-.033	-1.971	.050	.784	1.276
	Lift	-.039	-2.091	.038	.631	1.584
	House_direction	-.054	-2.698	.008	.565	1.769
	Distance_to_Cemetery	.037	2.136	.034	.748	1.338
	Distance_to_School	.001	.067	.947	.798	1.253
	Distance_to_Religious	-.003	-.137	.891	.628	1.593
	Distance_to_Administrative	.035	1.794	.074	.599	1.669
	Distance_to_Industrial_centres	.107	4.831	.000	.459	2.179
	Distance_to_cultivation	.028	1.240	.216	.438	2.281
	Distance_to_park_service	.020	1.173	.242	.761	1.314
	Distance_to_Bus_stop	-.026	-1.325	.187	.584	1.713
	Distance_to_police	.014	.846	.399	.825	1.212
	Distance_to_museums	.099	5.269	.000	.631	1.585
	Distance_to_Commercial_centres	-.020	-1.096	.275	.650	1.539
	Distance_to_Ghasrodasht_garden	-.174	-7.772	.000	.444	2.252
	Region_3	-.172	-8.903	.000	.597	1.674
	Region_5	-.147	-8.403	.000	.728	1.374
	Region_7	-.193	-10.117	.000	.612	1.633
	Region_8	-.180	-8.311	.000	.474	2.110
	Region_9	-.114	-6.194	.000	.653	1.530
	Alarm	.011	.581	.562	.631	1.584
	Bathroom_Density	-.052	-2.498	.013	.520	1.922

a. Dependent Variable: LN_Property_Value

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index
1	1	23.804	1.000
	2	1.111	4.629
	3	1.087	4.680
	4	1.045	4.773
	5	1.025	4.819
	6	.928	5.064
	7	.446	7.307
	8	.337	8.399
	9	.294	8.991
	10	.240	9.959
	11	.213	10.581
	12	.185	11.348
	13	.145	12.800
	14	.134	13.353
	15	.127	13.691
	16	.118	14.230
	17	.106	14.955
	18	.100	15.447
	19	.083	16.942
	20	.076	17.748
	21	.062	19.580
	22	.055	20.715
	23	.050	21.924
	24	.043	23.552
	25	.039	24.686
	26	.038	25.119
	27	.035	26.052
	28	.028	29.298
	29	.017	37.103
	30	.015	40.149
	31	.014	41.327
	32	.002	105.264

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions (Constant)	neighborhood_safety	neighborhood_recycle_collection	neighborhood_lightning_condition	neighborhood_other_structures_condition
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.00	.00	.00
	3	.00	.00	.00	.00	.00
	4	.00	.00	.00	.00	.00
	5	.00	.00	.00	.00	.00
	6	.00	.00	.00	.00	.00
	7	.00	.00	.00	.00	.00
	8	.00	.00	.00	.00	.00
	9	.00	.00	.00	.00	.00
	10	.00	.02	.59	.00	.00
	11	.00	.01	.00	.01	.01
	12	.00	.00	.02	.01	.01
	13	.00	.00	.07	.00	.02
	14	.00	.54	.01	.00	.00
	15	.00	.18	.00	.02	.01
	16	.00	.00	.00	.03	.01
	17	.00	.03	.01	.02	.03
	18	.00	.03	.00	.01	.03
	19	.00	.08	.00	.05	.00
	20	.00	.03	.05	.09	.07
	21	.00	.00	.00	.12	.00
	22	.00	.00	.01	.04	.12
	23	.00	.02	.00	.11	.07
	24	.00	.00	.04	.18	.13
	25	.00	.01	.13	.27	.33
	26	.00	.01	.01	.00	.06
	27	.00	.01	.00	.00	.03
	28	.00	.00	.00	.01	.01
	29	.00	.00	.00	.00	.00
	30	.00	.00	.00	.01	.00
	31	.01	.00	.00	.00	.00
	32	.99	.04	.04	.01	.07

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		Age_Property	Unit_Floor_Area	No_Bedrooms_Unit	No.Garage	Store
1	1	.00	.00	.00	.00	.00
	2	.02	.00	.00	.00	.00
	3	.00	.00	.00	.00	.00
	4	.00	.00	.00	.01	.00
	5	.00	.00	.00	.00	.00
	6	.00	.00	.00	.01	.00
	7	.37	.00	.00	.08	.00
	8	.00	.00	.01	.00	.00
	9	.09	.00	.00	.09	.00
	10	.00	.00	.00	.03	.00
	11	.14	.03	.02	.10	.00
	12	.05	.01	.00	.17	.01
	13	.05	.00	.00	.02	.00
	14	.00	.02	.01	.00	.00
	15	.00	.00	.00	.03	.01
	16	.03	.02	.00	.05	.00
	17	.02	.00	.00	.04	.01
	18	.01	.00	.00	.02	.02
	19	.00	.02	.02	.00	.04
	20	.01	.00	.00	.04	.05
	21	.00	.00	.01	.07	.03
	22	.06	.01	.00	.01	.00
	23	.00	.00	.00	.02	.22
	24	.00	.00	.00	.08	.45
	25	.06	.02	.01	.00	.04
	26	.01	.00	.00	.00	.00
	27	.01	.00	.01	.00	.00
	28	.04	.01	.00	.00	.00
	29	.00	.77	.81	.00	.00
	30	.01	.04	.06	.02	.04
	31	.02	.01	.02	.00	.01
	32	.00	.03	.01	.13	.03

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions Other_Facilities	Lift	House_direction	Distance_to_Cemetery	Distance_to_School
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.00	.00	.00
	3	.00	.00	.00	.00	.00
	4	.00	.00	.00	.00	.00
	5	.00	.00	.00	.00	.00
	6	.00	.00	.00	.00	.00
	7	.00	.00	.00	.00	.00
	8	.00	.00	.00	.00	.02
	9	.00	.00	.00	.00	.00
	10	.00	.00	.00	.00	.02
	11	.00	.01	.00	.00	.00
	12	.00	.00	.00	.00	.18
	13	.00	.00	.00	.01	.40
	14	.00	.01	.00	.00	.06
	15	.00	.01	.01	.00	.07
	16	.00	.01	.01	.00	.05
	17	.00	.01	.00	.00	.00
	18	.00	.02	.02	.00	.04
	19	.00	.00	.00	.00	.02
	20	.00	.00	.14	.01	.00
	21	.00	.35	.00	.01	.00
	22	.00	.24	.07	.00	.00
	23	.00	.08	.45	.01	.00
	24	.01	.01	.02	.02	.01
	25	.01	.12	.17	.05	.01
	26	.00	.01	.01	.03	.01
	27	.00	.00	.04	.20	.02
	28	.00	.00	.02	.47	.02
	29	.03	.01	.00	.05	.00
	30	.20	.02	.02	.05	.00
	31	.46	.07	.01	.06	.03
	32	.29	.01	.00	.03	.01

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions			
		Distance_to_Religious	Distance_to_Administrative	Distance_to_Industrial_centres	Distance_to_cultivation
1	1	.00	.00	.00	.00
	2	.00	.00	.00	.00
	3	.00	.01	.00	.00
	4	.00	.00	.00	.00
	5	.00	.00	.00	.00
	6	.00	.00	.00	.00
	7	.00	.00	.00	.00
	8	.05	.00	.00	.00
	9	.02	.13	.00	.00
	10	.00	.00	.00	.00
	11	.02	.01	.01	.00
	12	.00	.06	.02	.00
	13	.03	.02	.02	.00
	14	.01	.11	.00	.00
	15	.19	.11	.00	.00
	16	.02	.11	.01	.00
	17	.52	.03	.01	.00
	18	.01	.25	.01	.00
	19	.00	.00	.05	.00
	20	.00	.13	.02	.00
	21	.00	.00	.02	.04
	22	.02	.00	.08	.01
	23	.01	.00	.09	.01
	24	.01	.00	.08	.00
	25	.00	.00	.13	.00
	26	.00	.00	.04	.16
	27	.01	.00	.23	.27
	28	.01	.00	.13	.03
	29	.00	.00	.00	.00
	30	.05	.01	.01	.06
	31	.00	.01	.01	.34
	32	.02	.00	.03	.07

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions			
		Distance_to_park_service	Distance_to_Bus_stop	Distance_to_police	Distance_to_museums
1	1	.00	.00	.00	.00
	2	.00	.00	.00	.00
	3	.00	.00	.00	.00
	4	.00	.00	.00	.00
	5	.00	.00	.00	.00
	6	.00	.00	.00	.00
	7	.00	.00	.00	.00
	8	.00	.00	.01	.00
	9	.00	.00	.00	.00
	10	.01	.00	.00	.00
	11	.04	.00	.00	.00
	12	.00	.00	.00	.00
	13	.10	.00	.00	.00
	14	.00	.00	.00	.00
	15	.08	.00	.10	.00
	16	.00	.00	.02	.00
	17	.01	.00	.07	.00
	18	.26	.01	.01	.00
	19	.06	.01	.46	.00
	20	.06	.00	.06	.00
	21	.17	.04	.00	.00
	22	.02	.03	.10	.00
	23	.00	.02	.02	.00
	24	.03	.03	.11	.00
	25	.02	.00	.00	.00
	26	.01	.51	.01	.01
	27	.03	.06	.00	.01
	28	.00	.16	.00	.02
	29	.00	.00	.01	.02
	30	.01	.02	.00	.59
	31	.04	.03	.00	.16
	32	.04	.06	.00	.18

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions Distance_to_Commercial_centres	Distance_to_Ghasrodasht_garden	Region_3	Region_5	Region_7
1	1	.00	.00	.00	.00	.00
	2	.00	.00	.18	.06	.00
	3	.00	.00	.07	.00	.06
	4	.00	.00	.03	.20	.01
	5	.00	.00	.01	.14	.34
	6	.00	.00	.09	.24	.13
	7	.00	.00	.18	.00	.00
	8	.01	.01	.07	.10	.00
	9	.07	.00	.00	.01	.04
	10	.00	.00	.00	.00	.00
	11	.01	.02	.02	.01	.02
	12	.02	.06	.00	.00	.01
	13	.08	.01	.00	.00	.00
	14	.04	.00	.01	.01	.01
	15	.04	.01	.00	.01	.01
	16	.34	.08	.01	.04	.03
	17	.15	.00	.01	.00	.01
	18	.02	.16	.00	.00	.02
	19	.04	.00	.04	.01	.00
	20	.00	.00	.05	.00	.06
	21	.01	.11	.02	.00	.01
	22	.00	.24	.03	.04	.02
	23	.00	.00	.00	.00	.00
	24	.00	.01	.00	.01	.00
	25	.00	.00	.00	.03	.00
	26	.01	.03	.04	.01	.06
	27	.06	.04	.00	.01	.00
	28	.08	.02	.00	.00	.00
	29	.00	.02	.00	.00	.00
	30	.00	.05	.02	.00	.06
	31	.00	.02	.08	.01	.05
	32	.01	.08	.03	.04	.04

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions			
		Region_8	Region_9	Alarm	Bathroom_Density
1	1	.00	.00	.00	.00
	2	.13	.03	.00	.00
	3	.15	.15	.00	.00
	4	.03	.25	.00	.00
	5	.04	.04	.00	.00
	6	.00	.02	.00	.00
	7	.00	.00	.00	.00
	8	.13	.06	.00	.10
	9	.00	.19	.00	.00
	10	.00	.00	.00	.00
	11	.01	.01	.00	.04
	12	.01	.01	.00	.00
	13	.00	.02	.00	.01
	14	.01	.00	.00	.03
	15	.01	.01	.00	.00
	16	.00	.03	.00	.09
	17	.00	.00	.00	.09
	18	.00	.02	.01	.00
	19	.01	.01	.00	.10
	20	.02	.00	.03	.18
	21	.00	.01	.00	.02
	22	.11	.04	.04	.02
	23	.00	.00	.02	.00
	24	.02	.00	.11	.00
	25	.01	.00	.09	.06
	26	.10	.04	.10	.00
	27	.01	.00	.10	.09
	28	.07	.03	.36	.02
	29	.00	.00	.00	.05
	30	.01	.02	.00	.00
	31	.09	.00	.13	.00
	32	.03	.00	.00	.06

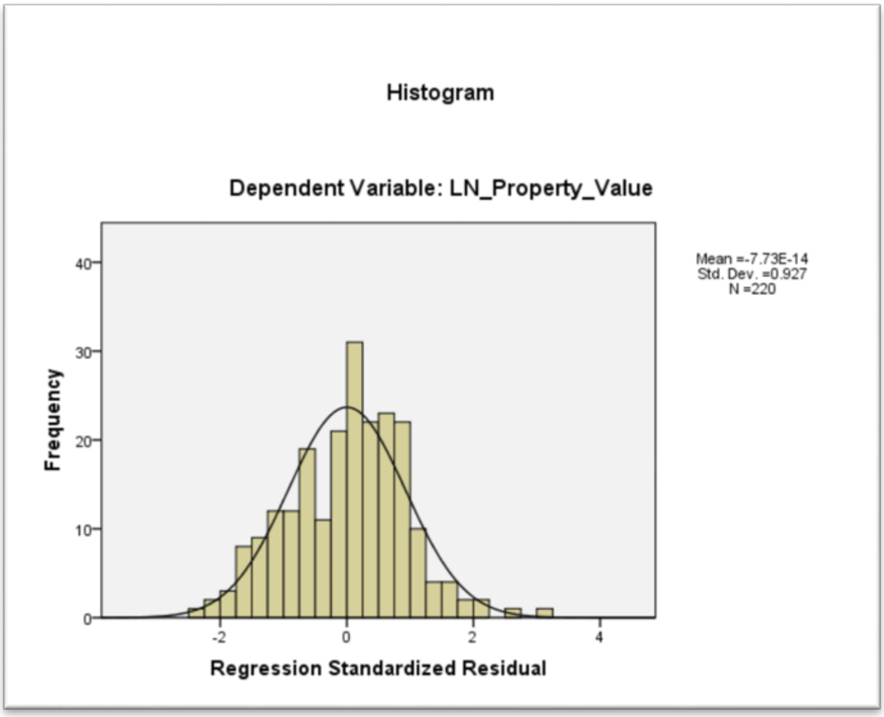
a. Dependent Variable: LN_Property_Value

Residuals Statistics[a]

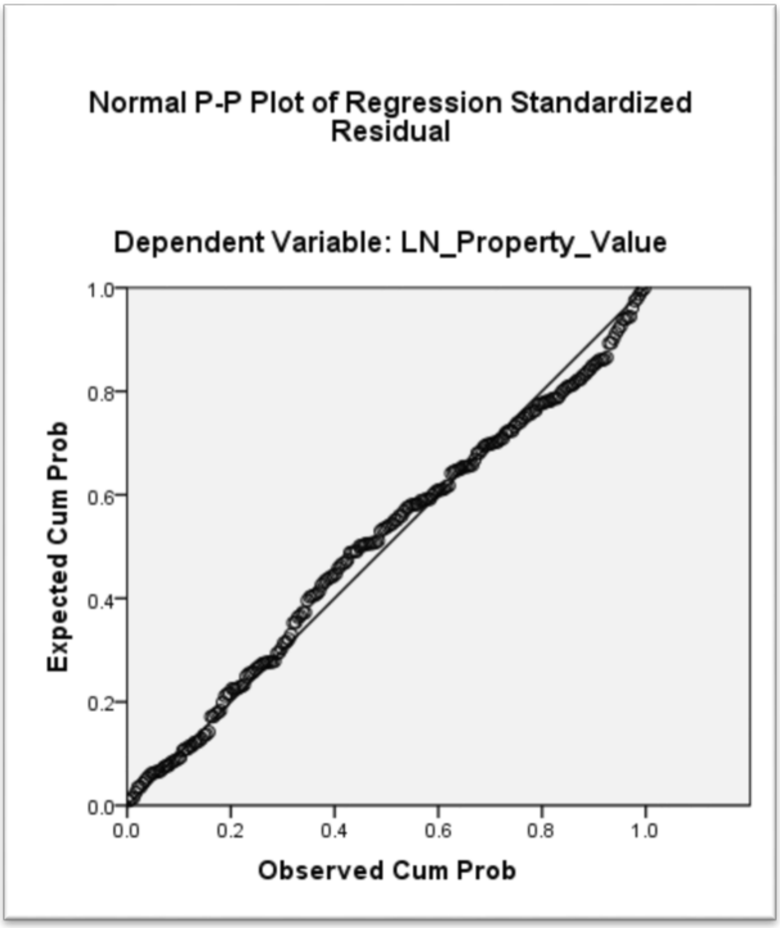
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	17.233755	20.133583	18.518303	.5360196	220
Residual	-.2873873	.3773221	.0000000	.1121423	220
Std. Predicted Value	-2.396	3.013	.000	1.000	220
Std. Residual	-2.374	3.117	.000	.927	220

a. Dependent Variable: LN_Property_Value

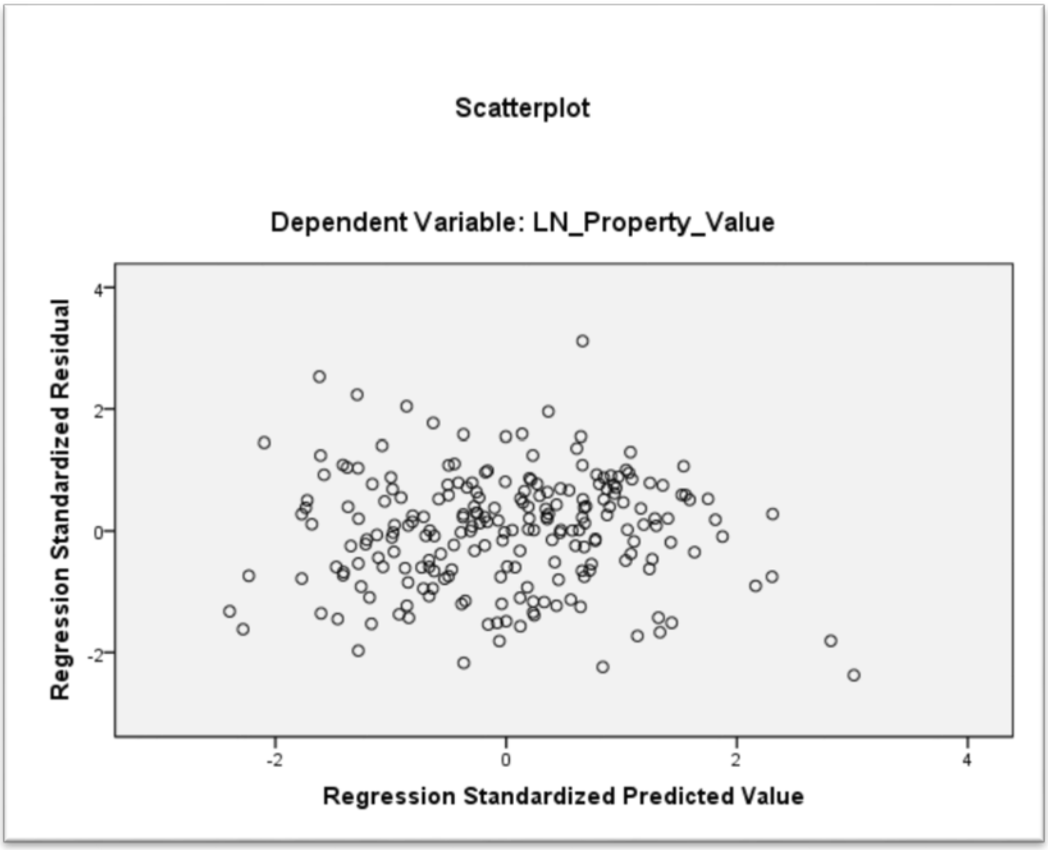
Charts



Histogram
Dependent Variable: LN_Property_Value
Mean =-7.73E-14
Std. Dev. =0.927
N =220
Frequency
Regression Standardized Residual
0
10
20
30
40
-2
0
2
4



Normal P-P Plot of Regression Standardized Residual
Dependent Variable: LN_Property_Value
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0




```
EXAMINE VARIABLES=ZRE_1
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

Explore

Notes

Output Created		30-Dec-2010 17:37:11
Comments		
Input	Data	H:\PhD\PHD\Data\Iran Data collection\Questioner data\400.sav
	Active Dataset	DataSet1
	Filter	Type_of_the_house=2 (FILTER)
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	220
Missing Value Handling	Definition of Missing	User-defined missing values for dependent variables are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ZRE_1 /PLOT HISTOGRAM NPPLOT /STATISTICS DESCRIPTIVES /CINTERVAL 95 /MISSING LISTWISE /NOTOTAL.
Resources	Processor Time	00:00:00.811
	Elapsed Time	00:00:00.888

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Standardized Residual	220	100.0%	0	.0%	220	100.0%

Descriptives

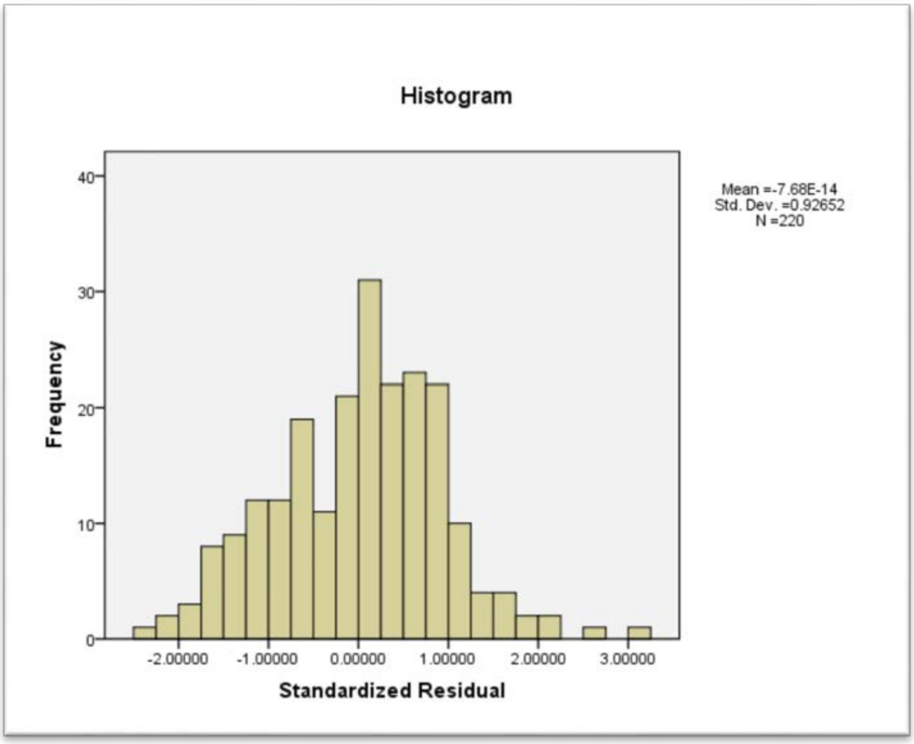
			Statistic	Std. Error
Standardized Residual	Mean		.0000000	.06246626
	95% Confidence Interval for Mean	Lower Bound	-.1231120	
		Upper Bound	.1231120	
	5% Trimmed Mean		-.0044059	
	Median		.0934075	
	Variance		.858	
	Std. Deviation		.92652441	
	Minimum		-2.37441	
	Maximum		3.11745	
	Range		5.49186	
	Interquartile Range		1.26581	
	Skewness		-.025	.164
	Kurtosis		.176	.327

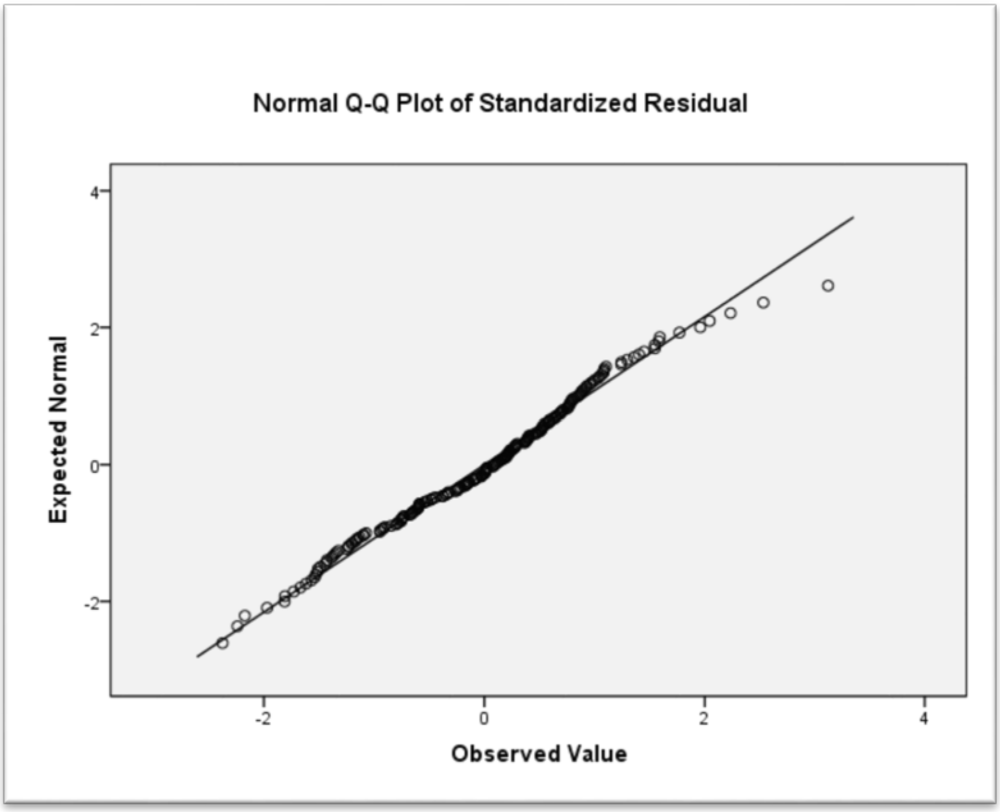
Tests of Normality

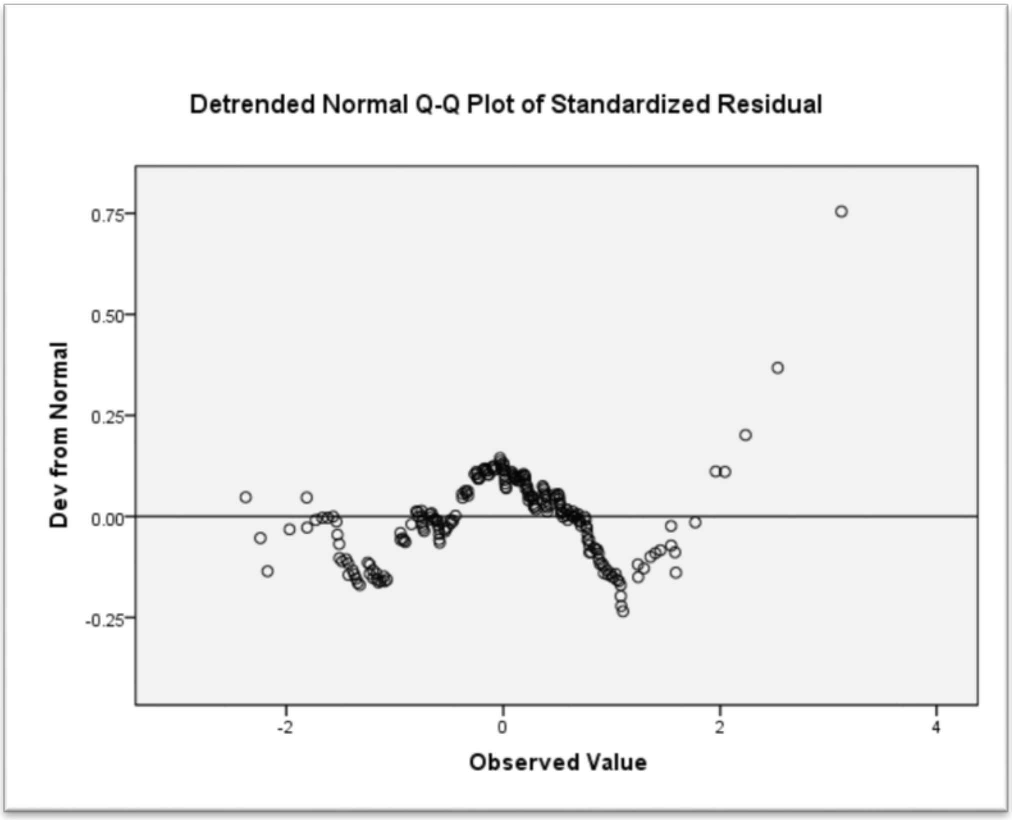
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	.060	220	.054	.990	220	.141

a. Lilliefors Significance Correction

Standardized Residual




Normal Q-Q Plot of Standardized Residual
Expected Normal
Observed Value
4
2
0
-2
-2
0
2
4


Detrended Normal Q-Q Plot of Standardized Residual
Dev from Normal
Observed Value
0.75
0.50
0.25
0.00
-0.25
-2
0
2
4

Appendix B

B.1 Choice Experiment Questionnaire

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No. 1

	Choice A	Choice B
park	1200	500
Public transport	800	500
Local centres	500	800
Tax	80%	-5%

I am happy with the current situation_____

Choice set No.2

	Choice A	Choice B
park	800	500
Public transport	1200	800
Local centres	500	800
Tax	40%	100%

I am happy with the current situation_____

Choice set No.3

	Choice A	Choice B
park	1200	800
Public transport	1200	800
Local centres	800	1200
Tax	-10%	0%

I am happy with the current situation

Choice set No.4

	Choice A	Choice B
park	1200	500
Public transport	800	1200
Local centres	1200	500
Tax	-10%	20%

I am happy with the current situation

Choice set No.5

	Choice A	Choice B
park	800	1200
Public transport	500	1200
Local centres	1200	500
Tax	-10%	100%

I am happy with the current situation

Choice set No.6

	Choice A	Choice B
park	800	500
Public transport	1200	800
Local centres	800	500
Tax	40%	-5%

I am happy with the current situation

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No. 7

	Choice A	Choice B
park	500	1200
Public transport	500	800
Local centres	500	800
Tax	40%	60%

I am happy with the current situation_____

Choice set No.8

	Choice A	Choice B
park	500	800
Public transport	500	800
Local centres	1200	500
Tax	80%	40%

I am happy with the current situation_____

Choice set No.9

	Choice A	Choice B
park	1200	800
Public transport	500	1200
Local centres	800	1200
Tax	40%	20%

I am happy with the current situation_____

Choice set No.10

	Choice A	Choice B
park	1200	500
Public transport	500	1200
Local centres	1200	800
Tax	60%	0%

I am happy with the current situation_____

Choice set No.13

	Choice A	Choice B
park	800	1200
Public transport	800	1200
Local centres	1200	800
Tax	20%	100%

I am happy with the current situation

Choice set No.14

	Choice A	Choice B
park	500	800
Public transport	500	800
Local centres	1200	800
Tax	0%	-5%

I am **happy** with the current situation

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No. 11

	Choice A	Choice B
park	500	800
Public transport	500	800
Local centres	500	800
Tax	-10%	80%

I am happy with the current situation_____

Choice set No.12

	Choice A	Choice B
park	500	800
Public transport	800	500
Local centres	1200	500
Tax	100%	80%

I am **happy** with the current situation_____

Choice set No.15

	Choice A	Choice B
park	500	1200
Public transport	800	500
Local centres	800	800
Tax	60%	-10%

I am happy with the current situation_____

Choice set No.16

	Choice A	Choice B
park	500	1200
Public transport	1200	500
Local centres	1200	800
Tax	-10%	60%

I am happy with the current situation_____

Choice set No.19

	Choice A	Choice B
park	800	500
Public transport	1200	800
Local centres	500	1200
Tax	60%	80%

I am happy with the current situation_____

Choice set No.20

	Choice A	Choice B
park	1200	800
Public transport	800	500
Local centres	800	1200
Tax	0%	100%

I am happy with the current situation_____

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No.17

	Choice A	Choice B
park	500	800
Public transport	1200	500
Local centres	800	1200
Tax	0%	-5%

I am happy with the current situation_____

Choice set No. 18

	Choice A	Choice B
park	500	1200
Public transport	500	800
Local centres	800	1200
Tax	-5%	100%

I am happy with the current situation_____

Choice set No.21

	Choice A	Choice B
park	1200	500
Public transport	500	1200
Local centres	500	800
Tax	0%	-10%

I am happy with the current situation_____

Choice set No.22

	Choice A	Choice B
park	800	500
Public transport	1200	800
Local centres	1200	500
Tax	0%	20%

I am happy with the current situation

Choice set No.23

	Choice A	Choice B
park	800	500
Public transport	800	500
Local centres	500	1200
Tax	20%	60%

I am happy with the current situation_____

Choice set No.24

	Choice A	Choice B
park	500	1200
Public transport	800	500
Local centres	800	500
Tax	40%	0%

I **am** happy with the current situation_____

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No.25

	Choice A	Choice B
park	1200	800
Public transport	1200	500
Local centres	1200	500
Tax	20%	100%

I am happy with the current situation______

Choice set No. 26

	Choice A	Choice B
park	800	500
Public transport	1200	800
Local centres	1200	500
Tax	100%	60%

I **am** happy with the current situation______

Choice set No.27

	Choice A	Choice B
park	500	1200
Public transport	1200	800
Local centres	500	1200
Tax	60%	-5%

I am happy with the current situation______

Choice set No.28

	Choice A	Choice B
park	1200	800
Public transport	1200	500
Local centres	1200	800
Tax	-5%	%80

I am happy with the current situation______

Choice set No.31

	Choice A	Choice B
park	800	1200
Public transport	1200	800
Local centres	800	500
Tax	80%	40%

I am happy with the current situation______

Choice set No.32

	Choice A	Choice B
park	800	1200
Public transport	1200	500
Local centres	500	800
Tax	-5%	20%

I am happy with the current situation______

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married ☐ Married ☐ Widow ☐ Other ☐
No. kids	--------
Income	--------
Total household's income	--------

Questioner No: ------

Preferred Choice set:

Urban Services & Sustainability

Postgraduate research
Newcastle University

Below there are 6 choice sets. Please choose a set from each that you prefer form the choice set.

Choice set No. 29

	Choice A	Choice B
park	1200	800
Public transport	1200	800
Local centres	800	500
Tax	-5%	-10%

I am happy with the current situation_____

Choice set No.30

	Choice A	Choice B
park	1200	500
Public transport	1200	500
Local centres	800	1200
Tax	-10%	40%

I am happy with the current situation_____

Choice set No.33

	Choice A	Choice B
park	500	800
Public transport	800	500
Local centres	500	800
Tax	80%	20%

I am happy with the current situation_____

Choice set No.34

	Choice A	Choice B
park	1200	800
Public transport	1200	800
Local centres	500	800
Tax	80%	0%

I am happy with the current situation_____

Choice set No.35

	Choice A	Choice B
park	1200	800
Public transport	500	800
Local centres	500	800
Tax	20%	60%

I am happy with the current situation_____

Choice set No.36

	Choice A	Choice B
park	1200	800
Public transport	1200	500
Local centres	1200	500
Tax	40%	100%

I am **happy** with the current situation_____

Socio-economic Attributes

Gender	**Male** ☐ **Female** ☐
Age	--------
Education	Diploma ☐ Upper diploma ☐ Bachelor ☐ Master ☐ PhD. ☐
Address	--------
Occupation	Student ☐ Private employee ☐ Government employee ☐ Not employed ☐ Retired ☐
Marriage statues	Not married Married Widow Other
No. kids	--------
Income	--------
Total household's income	--------

B.2 Program Ran for Analyzing the Choice Experiment Model

```
/************* read in data file  ***************/
data a;
infile'H:\PhD\PHD\Data\SAS\CE_TOTAL2.csv'firstobs=2dlm=','missov
er;
inputid park transport localc tax choice gender age educ address
job marital kids inc hholdinc region;
run;
data test(drop=hholdinc); set a;
if id <3.1; run;
procprintdata=test;
title'questionnaire data for first 2 respodents';
run;
data a; set a;
pid=id;
 age1=0; age2=0; age3=0;
 inc1=0; inc2=0; inc3=0;
 edu1=0; edu2=0; edu3=0;
 gen1=0; gen2=0;
 reg1=0; reg2=0;
hinc=hholdinc/1000;
if age<=35then age1=1;
if36<=age<53then age2=1;
if age ge 53then age3=1;
if hinc le 700then inc1=1;
if701<=hinc<1500then inc2 =1;
if1501<=hinc<100000then inc3=1;
if educ=1or educ=2then edu1=1;
if educ=3then edu2=1;
if educ=4or educ=5then edu3=1;
```

```
if gender=1then gen1=1;
if gender=2then gen2=1;
if region=4or region=3or region=2or region=7or region=8then
reg1=1;
if region=9or region=1or region=6or region=5then reg2=1;
run;
```

```
data a; set a;
label
id=id
park=dist to park
transport=transport
localc=dist to local centre
kids=number of kids;
run;
```

```
/********* select data for socio-econ descriptive stats **************/
/********* one record per individual                    **************/
data se; set a;
qnumb=int(id);
qn=pid-qnumb;
run;
```

```
data se1 (keep=id pid qnumb qn choice gender age educ
job marital kids inc hinc region);
set se;
if choice=1; run;
data se2; set se1;
if qn<0.15; run;
procprintdata=se2;
title' socio-econ data';
run;
```

```
procmeansdata=se2;
title'means for some socio-econ variables';
var hinc;
run;
```

```
procfreqdata=se2;
title'frequency disributions for socio-econ variables';
table hinc;
run;
```

```
/********** full data set some frequency distributions ********/

procfreqdata=a;
title'some cross tabulations';
tables choice*inc;
tables choice*age;
tables choice*educ;
tables choice*region;
tables choice*job;
tables choice*marital;
tables choice*gender;
run;
```

```
/************ interactions  ************/
data a; set a;
parki1=park*inc1; parki2=park*inc2; parki3=park*inc3;
parka1=park*age1; parka2=park*age2; parka3=park*age3;
parke1=park*edu1; parke2=park*edu2; parke3=park*edu3;
parkg1=park*gen1; parkg2=park*gen2;
parkr1=park*reg1; parkr2=park*reg2;
```

```
transporti1=transport*inc1; transporti2=transport*inc2;
transporti3=transport*inc3;
transporta1=transport*age1; transporta2=transport*age2;
transporta3=transport*age3;
transporte1=transport*edu1; transporte2=transport*edu2;
transporte3=transport*edu3;
transportg1=transport*gen1; transportg2=transport*gen2;
transportr1=transport*reg1; transportr2=transport*reg2;
localci1=localc*inc1; localci2=localc*inc2;
localci3=localc*inc3;
localca1=localc*age1; localca2=localc*age2;
localca3=localc*age3;
localce1=localc*edu1; localce2=localc*edu2;
localce3=localc*edu3;
localcg1=localc*gen1; localcg2=localc*gen2;
localcr1=localc*reg1; localcr2=localc*reg2;
run;
```

```
/************** conditional logit analysis  *******/
procmdcdata=a;
title'conditional logit model';
modelchoice = park transport localc tax
                 /type=clogit nchoice=2covest=hessoptmethod=qn;
id pid;
run;
```

```
/************** CL with SE interactions  *******/
procmdcdata=a;
title'CL model with socio-econ interactions';
modelchoice = park transport localc tax
                Parki1 Parki3 parka3 parke3 parkg2 parkr2
                      transporti1 transporti2 transporte3
                localci2 localce3
                  /type=clogit nchoice=2covest=hessoptmethod=qn;
id pid;
run;
```

```
/************** mixed logit analysis  *******/
procmdcdata=a;
title'MXL model';
modelchoice = park transport localc tax
                Parki1 Parki3 parka3 parke3 parkg2 parkr2
                      transporti1 transporti2 transporte3
                localci2 localce3
                  /type=mixedlogit mixed=(normalparm= park
localc)
nchoice=2covest=hess optmethod=qn;
id pid;
run;
```

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