Visualization of Urban Quality of Life at Neighbourhood Level in Enschede

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March, 2009

Course Title:	Geo-Information Science and Earth Observation for Environmental Modelling and Management
Level:	Master of Science (MSc.)
Course Duration:	September 2007 - March 2009
Consortium partners:	University of Southampton (UK) Lund University (Sweden) University of Warsaw (Poland) International Institute for Geo-Information Science and Earth Observation (ITC) (The Netherlands)
GEM thesis number:	2007-19

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By

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Thesis submitted to the International Institute for Geo-information Science and Earth Observation in partial fulfillment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation, Specialization: (Environmental modelling and management).

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I certify that although, I have conferred with others in preparing for this assignment, and drawn upon a range of sources cited in this work, the content of this thesis report is my original work.

Lalit Kumar Dashora

Abstract

Urban quality of life is usually measured by either subjective indicators using surveys of residents' perceptions, evaluations and satisfaction with urban living or by objective indicators using secondary data. The visualization of the urban quality of life has been a significant aspect of the research concerning the contemporary city and an increasingly support to urban planning and management. Urban quality of life is visualized by using geo-visualization tools specifically with GIS. This study aimed to visualize the perceived quality of life according to subjective indicators and inhabitant's perceptions and preference using participatory approach in the Wesselerbrink.

Wesselerbrink neighbourhood of Enschede city has been selected as study area. Wesselerbrink is one of the 56 neighbourhoods in The Netherlands which are prioritized for overall quality of life improvement. To improve the overall quality of life in the Wesselerbrink, geographic visualization of perceived quality of life is very essential. The geographic visualization of inhabitants preference gives a better understanding of what their local environment means to them, what is their opinion, whether they are really pleased with the present situation and what are their priority areas for future development and how they likes to see the Wesselerbrink in future.

GIS is one of the effective and supporting tools used in this research to visualize the inhabitant's perception about quality of life based on subjective indicators. The research shows that neighbourhoods are a well recognized unit of urban hierarchy in the Netherlands and have good policy support for development. The research also demonstrates that public participation and inhabitant's observations, perceptions and preferences play a significant role in ranking and analyze the urban areas. The research shows that visualization of perceived quality of life facilitates urban development process to improve overall quality of life.

Key words: Neighbourhood, Urban Quality of life, Visualization, Subjective indicators, GIS.

Acknowledgement

My first appreciation goes to the European Union and Erasmus Mundus course consortium (University of Southampton, UK; Lund University, Sweden; University of Warsaw, Poland and ITC, The Netherlands) for awarding me a prestigious scholarship to pursue this programme in 4 European countries. This has been a wonderful experience for me. I would like to send my sincere gratitude to Professor A.K. Skidmore (ITC), Professor P.M. Atkinson (University of Southampton), Professor P. Pilesjõ (Lund University), Professor K. Dabrowska-Zielinska (IGiK, Poland) and Mr. A. Kooiman (ITC).

I am most grateful to my primary supervisor Drs J.J. (Jeroen) Verplanke and secondary supervisor Ms. Ir. E.M.C. (Liza) Groenendijk for their continuous guidance; encouragement and patience from the beginning of this research work till the production of this thesis. I have gained a lot of scientific knowledge from them, and I shall always remember and be grateful for their contribution in this research work. I would love to work with them in future.

My sincere thanks to Mr. Mark Verhijde (DGPO, Municipality of Enschede South), Ms. Saskia Tenkate (STIPO, Consultant), Ms. Judy Janson (MSc. student, University of Twenty), Mr. Benno Hempen (Police station, Wesselerbrink), all elected members and residents of Wesselerbrink.

My special thanks to Dr. J. (Johannes) Flacke (ITC), Dr. J.A. (Javier) Martinez (ITC), Drs. E.J.M. (Emile) Dopheide (ITC) and Ir. V. (Bas) Retsios (ITC) for their direct or indirect support during this research.

I am thankful to Prof. Cecilia Wong (University of Manchester, UK), Prof. Rina Ghose (University of Wisconsin-Milwaukee, USA), Prof. Mirila Bonnes (University of Rome, Italy) and Dr. Claire Ellul (UCL, UK) for their precious comments and online discussion. I am also thankful to Ms. Laxmi Doma Lamu Sherpa her extreme help during this research.

I would also like to thank my all classmates and friends for their critical comments on my research work and their friendly support during this course.

Last but not least my deep gratitude goes to my wife Yogita Dashora for her immense patience and support during this course and my son Gaurang Dashora. I would also like to thank my parents and in-laws for their direct and indirect support during this course.

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List of acronyms

BCP:	Big Cities Policies
CCSD:	Canadian Council of Social Development
CBD:	Central Business District
EU:	European Union
EUKN:	European Urban Knowledge Network
FSI:	Floor Space Index
GIS:	Geographic Information System
IDW:	Inverse Distance Weighted Method
NGO:	Non Governmental Organisation
QOL:	Quality of Life
UNCHS:	United Nation Centre for Habitat Studies
UNDP:	United Nation Development Programme
UNHSP:	United Nations Human Settlement Programme

Chapter 1. Introduction:

1.1. Background and significance:

"The social and economic future of countries is increasingly being determined in their urban areas. Globally, the process of decentralization is shifting power and resources to cities and their citizens. . . . Two alternative scenarios are emerging: one of cities characterized by increasing poverty, social exclusion and decline; the other of inclusive cities characterized by equitable and sustainable growth." - Cities Alliance, 2000.

Cities are facing crisis of identity at the turn of the 21st century. Cities of yesterday have grown into metropolis and metropolises have turned into megalopolis. The phenomenon of urbanization is inescapable and irreversible. The ideas and vision of the 20th century regarding urban development are being questioned, both in terms of their nature and effectiveness (Abbott, 2003). Are urban planners prepared to deal with such a situation? Are the available techniques and tools are adequate enough to handle the situation? Biggest challenge of the 21st century posed to the urban planners is to understand and comprehend phenomenon called 'Neighbourhood Development' (Uttarwar, 2001). The issues of urban agglomeration and problems are very vast in nature. The dream of perfect, finite and closed cities can no longer exist. Throughout the world towns are proliferating, disorder is setting in all urban areas and suburbs are spreading out. The term suburb has been used by urban professional from a very long period and time to time it describes as geographically localized community within an urban agglomeration or city and also recognized as neighbourhood (Verburg *et al.,* 2004).

European Urban Knowledge Network (EUKN) describes that in Europe more than 75 percent of population lives in urban areas and which is responsible for more than 80 percent of overall economic activity. However employment opportunity and prosperity are not equally distributed within the cities. According to EUKN, European urban agglomeration consist municipality, districts, neighbourhoods, streets and this is the basic urban hierarchy in all over Europe. The fringe areas such as neighbourhood are often viewed as challenging and destructive within the urban fabric. Conventional practices of urban planning engaged in development, maintenance and enhancement of urban basic services at the different hierarchical level of urban fabric. On the other hand Geographic Information

System (GIS) based urban planning has been well performed in Europe and North America (French *et al*., 1990; Harris *et al*., 1993; Budic, 1994; Nedovic-Budic, 1998 and 1999). Also in current years, GIS played a vital role in visualization of urban quality of life studies (Ghose *et al.* 2002; Ghose *et al.* 2003; Randall, 2005; Rinner, 2007; Zlatanova *et al.* 2007).

According to Musterd *et al.* (2008) urban development policies in western European countries with special reference to The Netherlands have specific consideration for neighbourhood development with their physical, social and economical development. After 1994, the BIG Cities polices are good initiation towards neighbourhood development. Neighbourhoods as functional units of any city have some physical and socio-economic characteristics which have been completely changed over the last hundred years (Verburg *et al.*, 2004). These physical and socio-economic characteristics have a direct and significant impact on quality of life of the inhabitants (Talen *et al.,* 2007). Over a time these characteristics of urban areas are described and benefited from urban planning policies. As described by Mohan *et al.* (2006*)* in survey of English housing between years 2002-03 there is direct relationship between socio-economic parameters and neighbourhood quality of life.

1.2. Research problem:

Urban areas are become undisputable centers of economic as well as political growth of any country affirming themselves as the most attractive territorial situation for the creation of wealth as well as employment, and has one of the most creative and innovative environments. However, the urban areas are facing significant challenges related to negative aspects of the urban development, such as physical and environmental degradation, social exclusion and insecurity, traffic congestion and which show the ways to low urban quality of life. Urban quality of life has a significant impact of what type of urban development take place as well as how its inhabitants perceiving it. The evaluation of the urban quality of life has been an essential feature of the research concerning the contemporary city and an increasingly support to urban planning and management. Urban quality of life is usually measured by either *subjective indicators* using surveys of residents' perceptions, evaluations and satisfaction with urban living which is also known as perceived quality of life or by *objective indicators* using secondary data and visualized by using geo-visualization tools specifically such as GIS.

Study area of this research is Wesselerbrink neighbourhood of the Enschede city. Wesselerbrink is one of the fast growing neighbourhoods and can be seen as one of potential growth center of Enschede city. This neighbourhood was developed according to the residential requirement of 1960s (Municipality of Enschede, 2008). Wesselerbrink is also a one of the priority neighbourhoods in the Netherlands, where neighbourhood development work is ongoing to improve the overall quality of life. To improve the quality of life in Wesselerbrink visualization of present perceived quality of life is very essential. The visualization process with public participation and local inhabitant's preference gives a better understanding of what their local environment means to them, what is their opinion, whether they are pleased with the present situation and what are their priority areas for future development and how would they like to see the Wesselerbrink in future.

1.3. Research objectives:

1.3.1. Main objective:

The main objective of the research is to visualize the perceived quality of life in the Wesselerbrink neighbourhood of Enschede according to subjective indicators and inhabitant's preferences. To achieve the main research objective following specific objectives and research questions have been formulated.

1.3.2. Specific objectives and research questions:

The specific objectives with research questions are given in table-1.1 below:

Table 1-1 Specific objectives and research questions

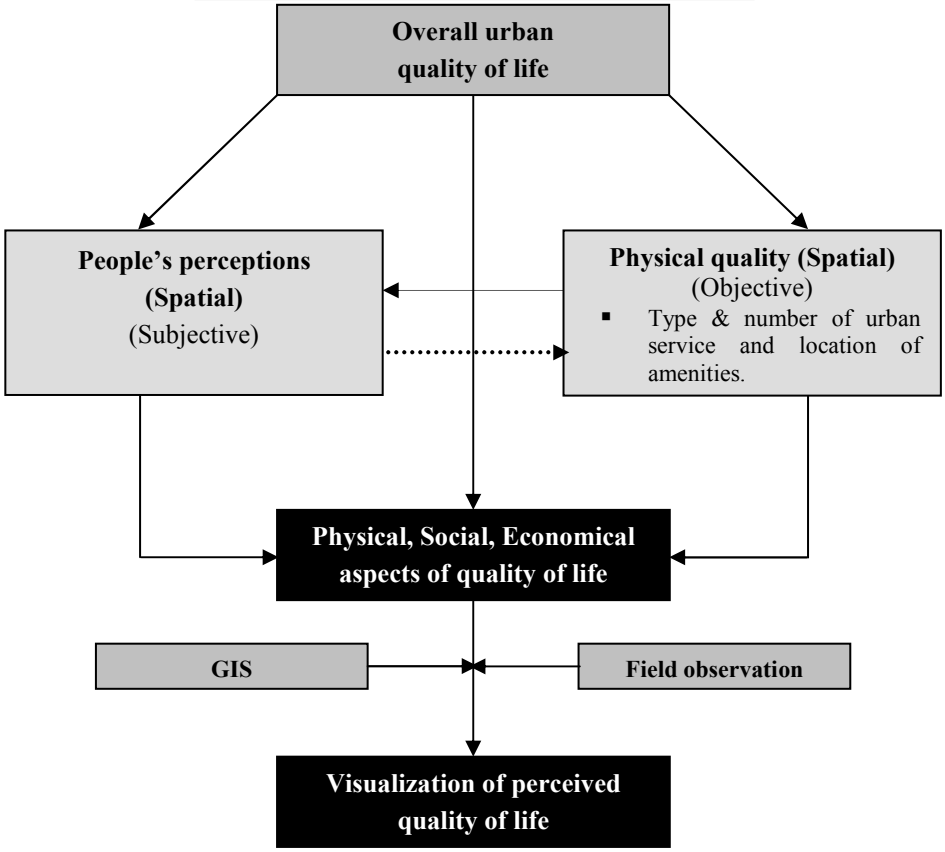
Specific objectives	Research question
▪ To review the urban development policies with special reference to neighbourhood development in The Netherlands	▪ What are the specific definitions and concepts of neighbourhood? ▪ What are the policies for urban development in The Netherlands? ▪ How urban development processes take place at neighborhoods level in The Netherlands? ▪ How do people in Wesselerbrink perceive the 'neighborhood'? ▪ Are people of Wesselerbrink aware of these policies?

Specific objectives	Research question
▪ To develop subjective indicators of quality of life using a participatory approach	▪ How are the different indicators for neighbourhood development derived? ▪ How are inhabitants involved in quality of life indicators selection and weighting using participatory approaches? ▪ Is there a difference between observed quality (according the secondary information) and perceived quality (according inhabitants perception)? ▪ Is there spatial variation of perception within the neighbourhood?
▪ To use GIS as a supporting tool to visualize the perceived quality of life in Wesselerbrink	▪ How to visualize the spatial variation of perception? ▪ How can GIS play a vital role in supporting the visualization of neighbourhood quality of life? ▪ What sorts of GIS based analysis and techniques are appropriate to analyze the present quality of life at neighbourhood level?
▪ To visualize the present situation of perceived quality of life in Wesselerbrink	▪ How can this visualization be useful to show up the difference between perceived and observed quality of life in the Wesselerbrink? ▪ How can this visualization be useful in future to develop the Wesselerbrink?

1.4. Research justification and conceptual framework:

Research justification of this study is based on the well-known statement that is "If you want to know how the shoe fits, ask the person who is wearing it, not the one who made it" (Community Planning, 2008). Overall urban quality of life has positive relationship with available urban services, amenities and also with inhabitant's perceptions, which finally determine the aspects of urban quality of life such as physical, economical and social. Simultaneously level of quality of life also maximizes or minimize from high to low or vice-versa based on physical location, type and number of urban services and inhabitant's perceptions on it. People's perceptions about quality of life are significant based on their daily experience. Spatial visualization of inhabitant's perceptions about quality of life using GIS supports municipal authorities to pinpoint the urban problem and serve better to improve the overall quality of life. The conceptual framework of this study is shows in figure 1.1.

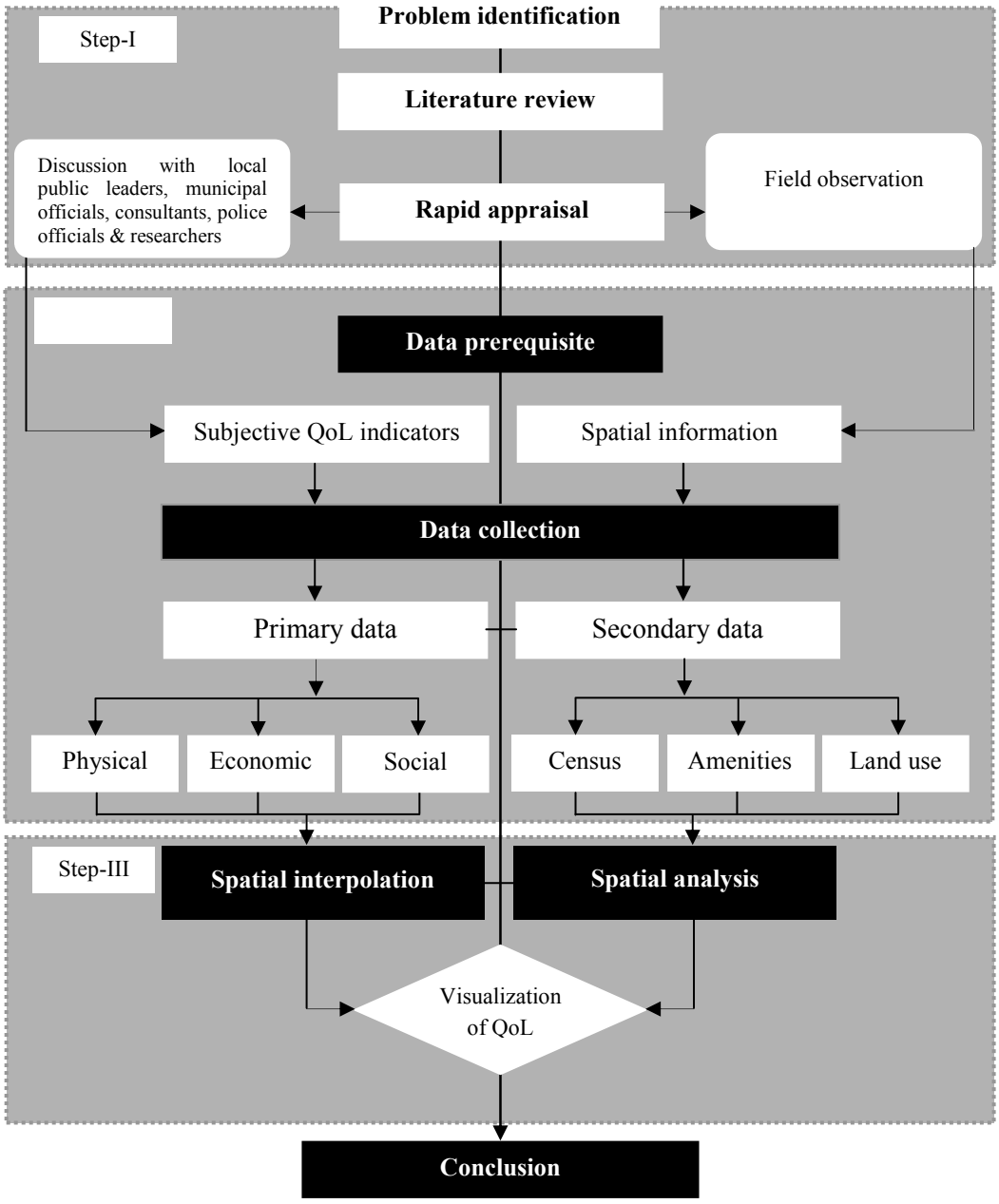
Figure 1-1Conceptual framework



1.5. Research methodology:

The research methodology is designed to be carried out in three phases i.e. pre fieldwork phase, fieldwork phase and post field phase which discussed later in following methodology chapter. Figure 1.2 shows the research methodology.

Figure 1.2 Methodology



1.6. Research design:

1.6.1. Research data:

To achieve the objectives and respond to the research questions, following primary and secondary data was obtained from the study area and web sources.

1.6.1.1. Primary data:

- Data on subjective quality of life indicators for the Wesselerbrink neighbourhood, which were collected using primary survey questionnaire and interviews of inhabitants in study area.

1.6.1.2. Secondary data:

- National urban policy and neighbourhood policy.
- Census data such as total population, number of households, density, age wise distribution etc.
- Data on location of urban basic services and amenities.
- High resolution satellite images: QuickBird (panchromatic 60-70 centimeter resolution and multispectral imagery at 2.4 and 2.8 meter resolutions).
- Digital spatial data (country, province, region, city and neighbourhood boundaries, road, location of available urban amenities and services).

1.6.2. Research matrix:

Table 1-2 Research matrix

Objectives	Data requirements	Source/methods
To review the urban development policies with special reference to neighbourhood development in The Netherlands.	• Urban development policies in Western Europe and The Netherlands at neighbourhood level • Big cities policies, The Netherlands	**Sources:** Ministry of Housing Spatial Planning, and the Environment, Govt. of The Netherlands & literature review **Methods:** Secondary survey

Objectives	Data requirements	Source/methods
To develop the subjective indicators of quality of life using a participatory approach.	• Literature on QoL indicators • Rapid appraisal discussion • Local observation and discussions	**Sources:** • Dutch census • EU, EUKN, UNCHS • Rapid appraisal • Local observation and discussion • ITC library **Method:** Literature review
To use GIS as a supporting tool in visualization of the perceived quality of life in Wesselerbrink.	• Available case studies and literatures on use of GIS in visualization of urban quality of life.	**Source:** • Web source • ITC library **Method:** Secondary survey
To visualize the present situation of perceived quality of life in Wesselerbrink.	• Data based on primary survey about perceived quality of life. • Data related to available amenities and services	**Sources:** • Primary survey information • Data archive, ITC **Methods:** • Spatial interpolation • Spatial analysis

1.7. Research limitations:

Limitations of this research are mentioned below:

- Visualization of people's perceptions and subjective indicators based research gives us very fruitful information on quality of life. However some time it can not be validate due to less availability of validation or secondary data on subjective indicators. This study also has same limitation which is unavailability of specific objective data (secondary data) at neighbourhood level to validate the research.

1.8. Structure of thesis:

Chapter 1: Introduction:
This chapter presents conceptual and methodological aspects of the research. It describes the research problem, main objective, specific objectives, research questions, justification, conceptual framework, research methodology, research data, detailed methodology and research approach.

Chapter 2: Neighbourhood planning:
This chapter presents the theoretical background with respect to neighborhood's planning using specific definitions and concepts. This chapter also describes a review of the urban development policies with special reference to neighbourhood development in The Netherlands. In this chapter subjective indicators of quality of life at neighbourhood level reviewed and also selected for the study. The chapter focuses on the role of public participatory approach and GIS which helps in visualization of the urban quality of life.

Chapter 3: Methods and approach:
This chapter presents a brief overview and introduction about study area, Wesselerbrink neighbourhood. This chapter contains the information generates from secondary data about study area which have direct relation with urban quality of life such as population composition, land use, housing status and urban amenities etc. This chapter presents the detailed methodology of survey. This chapter contains methods of analysis of the primary survey as well as secondary data to get research findings based on GIS based spatial interpolation methods. Results from different analysis have been discussed in next chapter i.e. Visualization of quality of life.

Chapter 4: Visualization of quality of life:
This chapter deals with discussion on the findings of this research based on methodology discussed in previous chapter. In this chapter results and findings of the research are presented and discussed with the major steps in order to make the results and discussion more comprehensible and to achieve the objective and sub objective of the research.

Chapter 5: Conclusion:
This chapter presents conclusions of the research. Results on visualization of perceived quality of life in Wesselerbrink neighbourhood are summarized in this chapter.

Chapter 2. Neighbourhood Planning:

This chapter presents the theoretical background with respect to neighborhood's planning using specific definitions and concepts. This chapter also describes a review of the urban development policies with special reference to neighbourhood development in The Netherlands. In this chapter subjective indicators of quality of life at neighbourhood level reviewed and also selected for the study. The chapter focuses on the role of public participatory approach and GIS which helps in visualization of the urban quality of life.

2.1. Neighbourhood: what is it and why does it matter

"Why to worry about deprived neighbourhoods? … We are concerned about the profound human cost of poverty on individuals and families who struggle not only to survive, but to participate fully as citizens… Neighbourhood poverty has a devastating human cost and also damages the economic and social vitality of an entire region, affecting the quality of life for everyone." - United Way and CCSD, 2004

The history of the functions of neighbourhoods shows that neighbourhoods play a significant role in day to day life of the inhabitants, which is highly dynamic (Choguill, 2008). A neighbourhood is perceived in several different ways. One can speak of a continuum or a scale with on the one end views that underline the extreme importance of the neighbourhood and on the other end views that state the neighbourhood in this period is without any significance. An observed science such as urban planning is supposed to confront contested ideas with reality in order to find out to what extent the various views correspond with observed data. The neighbourhood shaped the territorial outline, within which almost all inhabitants used to live their daily lives. Within the neighbourhood one can establish work, housing, social relations and, to the extent that time allowed, recreation also. Such types of neighbourhoods are well explained by Frankenberg (1969).

The phrase neighbourhood has been in the urban dweller's dictionary for a very long time, with many of the same characteristics regardless of the culture to which one is referring and it explains in many ways such as informally, formally and analytically. According to May (1996) neighbourhood is a complex division of urban areas which is defined in a different way by diverse groups such estate agents, urban planners or some

social groups according to their requirements. This sort of neighbourhood classification shows complexity in scales, multiple location names for the same place, overlapping neighbourhoods and indeterminate boundaries, which are known as informal neighbourhoods. May (1996) describes that it is very essential to remove this complexity from urban system to establish a sustainable neighbourhood. Campari (1996) illustrates a neighbourhood in similar manner, which focused on types of formal boundaries of neighbourhood in urban areas. According to Campari (1996) governmental agencies such as postal authorities or municipalities used to make hard boundaries for a formal neighbourhood in an urban area which termed 'administrative artifact boundaries'. The utilization of formally standardized neighbourhood zone reflects that several quite distinct social areas are split or grouped together by formal boundaries. In recent years Geo-demographic techniques have been used in analytical neighbourhood identification which was earlier part of social geography (Campari, 1996). This type of analytical approaches has not influence by informal neighbourhood building whereas highly influenced by formal neighbourhood concepts. Both formal and analytical neighbourhoods tend to be based on small areas defined for mail delivery or census enumeration and are thus space-filling, whereas informal neighbourhoods need not cover the entire urban fabric, and are more likely to provide separate labels for unpopulated areas.

The basic neighbourhood theory was established by Clarence Perry in 1924 which is based on Howard's 'Garden Cities' concept (Choguill, 2008 pp. 42). The neighbourhood describes by Perry "Since the public school, more nearly than any other local institution, touches all families within its sphere of service, it is a common denominator of neighbourhood life and seems therefore the best available basis for determining the size of the local community unit" (Perry, 1924, as cited in Novick, 1979). According to Choguill (2008, pp. 43) "Neighbourhoods are, however, more than just a sub-area of the city. They are in fact a collection of neighbours, that is, people who live within the sub area. Sociologists and planners have made a number of interesting observations concerning the way the size of a neighboring population affects the interaction of people within that population". Neighbourhood concept differently describes by Ghose *et al.* (2002, pp. 5) "Neighborhoods are residential areas which form the physical and social environment within and outside itself, where people conduct their

daily activities and therefore neighborhood quality has a direct and significant impact on the quality of life of its residents". Ostenford (2004, pp. 319) illustrates neighbourhood as "The neighbourhood is seen in many different ways. As a matter of fact one can speak of a continuum or a scale with the one end views that underline the extreme importance of the neighbourhood and on the other end views that state that the neighbourhood in this era is without any relevance". Power (2004, pp.2) describes neighbourhood as "A neighbourhood is a delineated area within physical and social boundaries, where people identify by their home and where they live out and organize their private lives".

Apart from these definitions, a number of different definitions that also defined neighbourhood such as "a geographically localized community located within a larger city or suburb" (Wikipedia, 2008) or "a separately identifiable area within a community retaining some quality or character which distinguishes it from other areas" (Real estate dictionary, 2008) or "an area where the residents are drawn and held together by common and beneficial interests" (Partners-Mortgage, 2008). The very important thing in these definitions is that neighbourhoods have their own separate identity within an urban fabric. Even though these definitions of a neighbourhood may be in terms of different ethnic group, occupational sector or socio-economic class, it need not necessarily be so. There is no specific population size mentioned in these definitions, or not any specific civic functions that neighbourhoods have to deliver. These are simply a sub-division of the urban area. However some of the literatures have been very much concerned with defining neighbourhoods with following four different approaches within urban fabric:

- Functional approach: In functional approach, neighbourhood describes as area of the regular of day to day life such as shopping; the urban basic services provision for sustainable urban development such as schools, libraries, hospitals and public transport; social control and informal observation such as the monitoring of the neighbourhood street and youth and children's.
- Fixed boundary approach. Fixed boundary approach for describe a neighbourhood based on some fixed administrative boundaries, for instance postal codes or census zones, is one of the alternative approaches which most of the time used in research to make a

boundary around neighbourhoods. The limitation of this type of approach is that it may not consider the neighbourhood based on natural boundaries or people's preference.

- Homogeneity approach: Homogeneity approach for neighbourhood building is based on homogeneity. This homogeneity can be based on preference such as language, cultural background, ethnicity and nationality or basic requirement such as income, affordable housing or market. In this approach neighbourhood describe based on people who have similar thoughts, values and way of living often lives together.
- Inhabitant's experience approach: Inhabitants experience approach is based on subjective features of neighbourhood development. This describes that neighbourhood also have some different types of boundaries other than above discussed such as social or symbolic. These types of boundaries easily explain by the inhabitants such as for many inhabitants, neighbourhood is place of their identity or some time sense of pride.

According to Sastry *et al. (*2002) inhabitants who involved more in neighbourhood activities such as administrative meetings or social gathering have a different perception about their neighbourhood compare to other who are not involved. This is very much clear from above description that neighbourhood can't be bound by one single definition. This is changed over the time with different research, policy which supports neighbourhood renewal plan, situation and people's perceptions; however Ghose (2002) definition about neighbourhood is adopted for this study for further discussion.

2.2. Neighbourhood development policies in the Netherlands:

The Netherlands is well known as "policy-dense" country with special reference to urban, regional and socio-economic development (Musterd *et al.* 2008, pp. 78). The Netherlands have a very long history of urban development policies which have specific attention to different level of urban development such as smaller scale (neighbourhood level) to larger scale (city level) (Musterd *et al.* 2008). Urban development issues have been benefited from last half a century by these urban policies in the Netherlands. The Netherlands experience with urban development policies in the last few decades automatically poses the uniqueness of the Netherlands case with compared to other western European countries. The urban development

policies in the Netherlands were presented in different time period in which Central Business District's (CBD) to neighbourhoods were considered to be key features. Three types of approaches have been focused in the preliminary phase of policies:

- Urban renewal and renovations based on physical development,
- Urban policies with special reference to economic development of cities,
- Approaches based on social development to solve social setbacks.

Over the time the focus of these policies has been changed to different aspects and big cities policies come to the ground. These policies are based on integrated development approach for physical, economic and social development (Musterd *et al.* 2008). The table 2.1 presents a picture of policies in different time period with different main goals.

Table 2-1 Urban policies in the Netherlands

Name of Policy	Main Goal	Period	Orientation	Slogan
Creating CBD's	Stronger urban economy	To 1970	Efficiency	New jobs
Urban Renewal	Improving urban housing	1970–1980	Social justice	New housing for neighbourhood
City Renewal	Stronger urban economy	1980–1990	Efficiency	Stop urban degradation
Multiple Problem	Help disadvantaged neighbourhoods	1985–1990	Social justice	Stop cumulating problems
Social Renewal	More social cohesion	1990–1994	Social justice	Higher participation
Big Cities Policy I	Mixed neighbourhoods	1994–1998	Social justice	Immigration of high incomes
Big Cities Policy II	Stable neighbourhoods	1998–2004	Social justice	Prevent leaving neighbourhood
Big Cities Policy III	Stronger neighbourhoods	2004–2009	Efficiency	Powerful cities
Big Cities Policy +	Integrated neighbourhoods	From 2007	Social justice	Prevent parallel Societies

Source: Musterd *et al.* 2008

CBD development was the prime focus of urban policies before World War-II in the Netherlands as well as other parts of Europe (Musterd *et al.* 2008). According to Ostenford (2004) CBD was the center of the cities and accessible from all means of infrastructure. The motto of these policies was

to build strong economic CBD with new jobs opportunity. Policy which was presented between1970-80 much focused on new housing development in outskirts of cities. The orientation of this policy was social justice. In this period CBD was no more attraction of the new business firms and requirement of space was reduced. This policy was known as 'Urban Renewal' with main goal of improving urban housing. In this policy urban renewal was concentrated on building of new houses and, in a later stage, on the improvement of existing houses, not for new residents, but for the poor residents already living in that area. In 1980, a policy was launched with the similar name that was 'City Renewal' but with different main goal. This policy was based on main goal of rebuild the urban economy to stop urban economic degradation. This policy was very different from the previous all policies (Musterd *et al.* 2008). 1985, policy makers realized situation that too much focus was on economic development which leads towards social decline. This is first time neighbourhood was recognized as an important part of urban structure (Musterd *et al.* 2008). The main goal of this policy was to help disadvantage neighbourhood in development of their social net.

In the 1994 the newly elected government of The Netherlands was very much keen to set-up the new policies which was fully focused on urban issues in big cities and the policy was known and 'Big City Policy' (Dekker *et al.* 2004). This Big City Policy (BCP) got a very good response and results and in continuation of this BCP-II, III and III+ launched by government (Dekker *et al.* 2004). These BCP's are playing a very significant role to upgrade the low income urban neighbourhood. The BCP-I was very much focused with an aim to build mixed neighbourhood with restructuring the relatively low income neighbourhood. This was put into practice through demolish the low income housings and replaced by mixed good looking expensive houses to make neighbourhood more attractive (Dekker *et al.* 2004). The similar goal was replicate in follow-up policy of BCP-I, which known as BCP-II. This was launched in 1998. BCP-II was more focused towards provision of housing for low income group which was having motto of prevent leaving neighbourhood (Marissing *et al.* 2006). BCP-II was very much effective to reduce the inhabitant's migration in search of better and affordable housing in other neighbourhood. In follow-up of BCP-I and II the two similar sorts of policies was launched in year of 2004 and 2007 to build a stronger and integrated neighbourhood which were known as BCP-III and

BCP-III+. After 1970, in all urban policies social issues were core. Almost all BCP's are based on three main dimensions of society (Musterd *et al.* 2008). The present study is also based on the three dimensions i.e. physical, social and economic. Table 2.2 presents a clear picture of different urban policies and their various policy actions with different time period. Neighbourhoods are well recognizes as one if the main elements of urban fabric after 1970.

Table 2-2 Urban policies, social issues & policy actions in the Netherlands

Name of policy	Period	Definition social of issues	Policy actions
Creating CBD's	To 1970	Stronger urban economy	Demolition of old quarters
Urban Renewal	1970–1980	Bad housing	New housing for neighbourhood residents
City Renewal	1980–1990	Unemployment/ strength of economy	Improvement of economic climate
Multiple Problem	1985–1990	Disadvantaged in several respects	Moderate social policies, no physical upgrading
Social Renewal	1990–1994	Lack of social cohesion	Moderate social policies stimulating participation
Big Cities Policy I	1994–1998	Homogeneous poor neighbourhood (segregated)	Neighbourhood restructuring, attract better-off
Big Cities Policy II	1998–2004	Housing career within neighbourhood	Creating opportunities in the neighbourhood
Big Cities Policy III	2004–2009	Ethnic concentrations/ integration	Neighbourhood restructuring, social mix
Big Cities Policy +	From 2007	Ethnic and social integration	Neighbourhood restructuring, social mix, housing association involvement

Source: Musterd *et al.* 2008

After 1994 the urban development policies in the Netherlands are more focused towards neighbourhood restructuring such as physical, social and economical betterment, which also supports to improve the neighbourhood quality of life. These policies support the neighbourhood to be part of urban hierarchy. The redevelopment of neighbourhood is also supported by the above mentioned policies using different spatial plans. Spatial planning system in the Netherlands describes in following section.

2.3. Spatial planning system in the Netherlands:

The Netherlands is very much similar to many other European countries, which experienced numbers of urban setback over a time of period. In the last 50 years The Netherlands has provide evidence of well established spatial planning system with support of long term sustainable policies which is well recognize as 'The Dutch Model' nowadays. The Dutch spatial planning system is a unique and sophisticated, which is having long rich history (Valk, 2002). The Comprehensive Summary of the 4th report of Physical Planning in the Netherlands describes the main aim of Dutch urban planning system is to improve the 'quality of life' at different hierarchy of urban system, such as city to neighbourhood level. According to Valk, 2002 quality of life in urban areas in the Netherlands is associated with three main parameters:

- Sustainability,
- Livability, and
- The quality of the spatial environment.

These three parameters are very much related with physical, social and economical environment within an area (Valk, 2002). The Netherlands is well known for its 'decentralized unitary state' status (Valk, 2002). It is having 'three-tier system' of administrative hierarchy in spatial planning. Table 2.3 shows the different level of hierarchy in government and spatial plans.

Table 2-3 Hierarchy of government and spatial plans in the Netherlands

Hierarchy of government	Legal spatial plan	Area	Content
Central government	Planning core decision	All of the country	Broad national policy guidelines
Provinces (12)	Regional structural plan	Province or part	Provincial planning policy
Municipalities (500)	Local structure plan	Municipality	Municipal policy guidelines
	Land allocation plan	Part of a municipality	Maps & regulations

Source: Valk, 2002

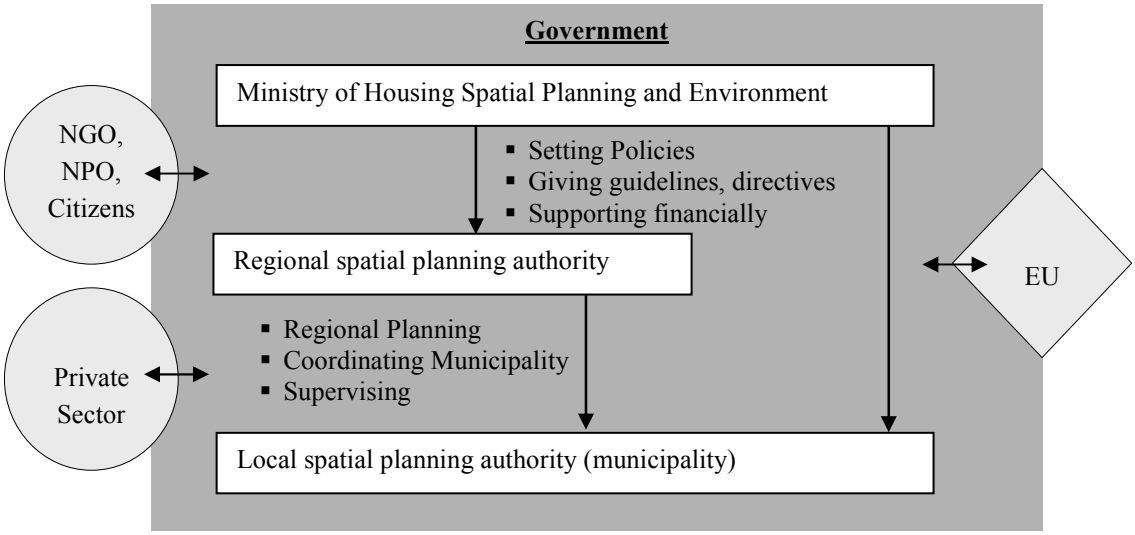
In The Netherlands, central government works from Hague city not from Amsterdam which is the capital of the Netherlands. The Netherlands divide in 12 regions and near by 500 municipalities. The hierarchy of government is three levels. This three level hierarchy contains central government, regional government and municipal government (Ministry of Housing, Spatial planning and the Environment). According to Valk (2002) in the Netherlands regional and local government have statutory powers which are very similar to local government system of United States of America. These statutory powers are also same for all size of municipality, for instance Enschede municipality have similar statutory powers as Amsterdam municipality (Valk, 2002).

In the Netherlands current spatial planning is the result of 'Housing Act-1901'. This act was enforced to implement the first local level spatial plan which was mandatory to all municipalities in 1901 (Valk, 2002). After this in year of 1931 the Housing Act-1901 was amended and another level of spatial plan introduced which was recognized as 'Regional Level Spatial Plan'. This regional plan was introduced just before national level spatial plan which was known as 'National Spatial Planning Act'. In 1965, the three-tier system of spatial planning was well established in The Netherlands. At present the Ministry of Housing Spatial Planning and Environment (VROM) is the prime authority to prepare and implement the spatial plan in The Netherlands. The spatial plan in The Netherlands is reviewed at least in each 10 years.

Figure 2.1 below describes the structure of government with hierarchy and their functions. This is well known as "Polder Model" (Schreuder, 2001). According to Schreuder (2001) this model is having 3-D representation. The first and central dimension in this model is central government which plays a key role with coordination of different ministries and regional and municipal government. The second dimension of this model represents relationship between government and NGO, private sectors and citizens which is very important. The third dimension represents the international relationship between European Union and government.

The urban policies which discussed in previous section, implement in urban areas through these physical plans. The Netherlands have a good hierarchy of these plans. At neighbourhood level municipalities are responsible to implement it.

Figure 2.1: 'Polder Model' of planning in the Netherlands



Source: Schreuder, 2001

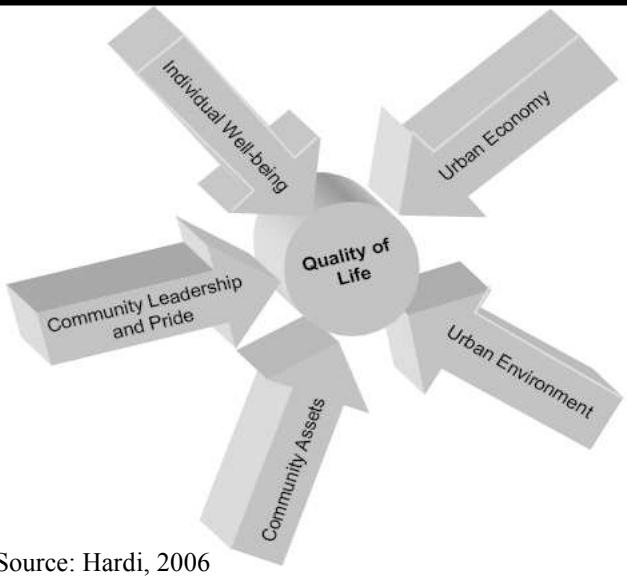
2.4. Quality of life indicators: relevance and selection

2.4.1. Neighbourhood quality of life indicators: relevance

The multi-indicators based studies have become a world wide phenomenon since the early 1990s (Wong, 2006). An indicator as a word is fairly comprehensible to most people such as 'to indicate' or 'point out'. According to Wong (2006) 'indicators are statistic, which provides some type of information to a particular phenomenon of concern'. In recent years quality of life studies in urban areas based on multi indicators have been well accepted and admired in academic circle as well as in mainstream policy agenda (Ghose, 2002 and Wong, 2006). Quality of life indicators have been defined by different people from different background such as economist have a tendency to use income level and house prices in their measurement (Ghose, 2002) where as a urban planner defines as public services, crime, traffic and amenities (Findlay *et al.* 1989). According to Wong (2006) quality of life in urban areas needs improvement in the present situation rather than build the new. According to Seik (2000) Urban quality of life is usually measured by either *subjective indicators or qualitative indicators* using surveys of residents' perceptions, evaluations and satisfaction with urban living which is also known as perceived quality of life or by *objective indicators or quantitative indicators* using secondary data.

According to Valk (2002) in the Netherlands quality of life is associated to three main indicators, such as sustainability, livability and the quality of the spatial environment. Sustainability and livability refers to the quality of the physical and social environment in a territory. The sustainability, livability and spatial quality are linked to a well-maintained physical environment (townscape, landscape, neighbourhood and public space), a clean and healthy environment, a safe environment, an environment that allows residents freedom of choice (mobility, living conditions, amenities) and finally variation and opportunities for identification. Common indicators for the determination of the quality of life are: employment adequate housing, safety, a healthy environment, clean air and water and adequate level of urban basic services. Hardi (2006) explains the different dimensions of quality of life in 'City of Winnipeg Quality of Life Indicators'. These five dimensions are related to social, economical and physical aspects of urban area which shows in figure 2.2.

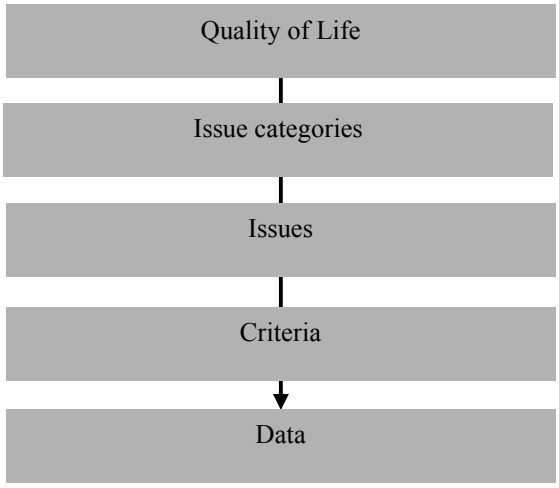
Figure 2.2: Five dimensions or urban quality of life



Source: Hardi, 2006

Hardi (2006) also describes the multi stakeholder's process which was used in selection of quality of life indicators in City of Winnipeg quality of Life project and analyzed the quality of life framework with multiple elements. Figure 2.3 shows the quality of life framework in City of Winnipeg quality of Life project.

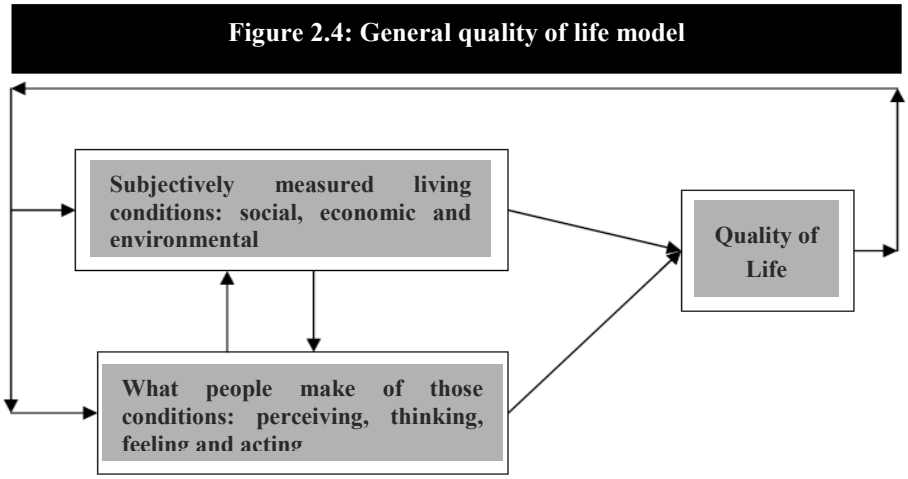
Figure 2.3: Quality of life framework



Source: Hardi, 2006

Michalos (2003) describes that quality of life has significant relationship with subjectively measured living conditions such as social, economic, environmental and how people perceive, think, feel and react about these living conditions. Figure 2.4 shows the general quality of life model which was presented by Michalos (2007) in the conference on Measuring and Fostering the Progress of Societies.

Figure 2.4: General quality of life model



Source: Michalos, 2007

According to Malczewski (1999) there is no universal techniques are available for development or selection of indicators however describes three different methods.

- Examination of relevant literature
- Analytical case studies
- Survey of opinion

2.4.2. Neighbourhood quality of life indicators: selection

Different research, case studies and guidelines on quality of life, such as QoL project in UK, QoL project in New Zealand and QoL in Winnipeg (Canada), guidelines of United Nations Human Settlement Programme (UNCHS), Wong (2006) and Rinner (2007) were reviewed for selection of indicator themes. The subjective quality of life indicator themes and indicators were pre-selected by this review and later discussed in rapid appraisal round for final selection. The table 2.4 shows the different types of subjective quality of life indicator themes were used in research, case studies, guidelines and also discussed by subject experts.

Table 2-4 Subjective quality of life indicators themes

QoL Project UK	QoL Project New Zealand	QoL Project Winnipeg	Urban Indicators Guidelines of UNHSP	Wong, C. 2006	Rinner, C. 2007
Economic	Economic	Urban Economy	Economic Development	Economic	Economic
Social	Social and Cultural	Community Assets	Social Development	Social	Social
Environment	Physical and Environment	Urban Environment	Shelter Development	Environment	Physical
		Individual Well-being	Environment Management	Natural Resources	
		Community Leadership & pride	Governance		

The table 2.4 represents a clear picture of the subjective indicator themes of quality of life which shows that in above studies much emphasizes was put on physical, economical and social indicators themes in comparison of other indicator themes, such as environmental. Different indicators were selected by reviewing above mentioned case studies under each indicator themes.

Table 2.5 below shows the quality of life indicators with their respective indicator themes. These indicators are discussed and prioritized afterward in rapid appraisal rounds to know their applicability in study area with inhabitants and public leaders of Wesselerbrink, municipal officials, knowledge consultants, police officials and current researchers.

Table 2-5 Neighbourhood quality of life indicator themes and indicators

Indicators themes		Indicator	
Physical		Road asphalt quality (paving) Road marking and traffic sign Street cleanness Side walks Traffic quality and congestion Vehicle parking Trees and landscaping	Parks and natural areas The facilities in the parks Graffiti issues Playing areas for children Noise pollution Air pollution Housing quality
Social	**Safety**	Safety at home Safety at street (brink) Safety at public transportation Safety at parks	
	Service accessibility	Health care facilities Food store or supermarket Parks Post office School Public transportation	Libraries/public readings facilities Cinema or cultural centre Community centre Recycling facilities
	Community Participation/ Involvement	Interaction with neighbors Participation in neighbourhood meetings Contact with municipal officials Participation in city council meetings	
Economical		Housing availability (rent/purchase) Housing cost (rent/purchase) Travel cost (public transport/own vehicle) Income and income source Housing quality (construction) Job opportunity Business opportunity	

2.5. Public participation:

2.5.1. Public participation: concept

Public participation describes by Hodge (2003) is that public participation is a process of taking decision in which community or group of people or a individual can take decision for development of there surroundings, neighbourhood, region or country. Smith (1993, pp. 23) also explains the public participation is a continuous process which "allows those affected by a decision to have an input into that decision". In the present study public participation is refers to using the inhabitant's opinion about the quality of life in the area where they are living, the facilities which they are getting and improvement in present situation. Basically this is the public involvement in neighbourhood development process. Here the word '*public*' in public participation stands for inhabitants who are residing in study area. Innes *et al.* (2000, pp. 39) describe the purpose of public participation in development projects is "to integrate well developed citizen opinion into collective actions and decisions".

2.5.2. Public participation: benefits

Smith (1993) describes that public participation has its own benefits in development activities and planning process. These benefits are given below:

- The participation of public in developmental process is the enhanced way to reflect the opinion of public. This gives social legality or acceptance to development process.
- The public participation provides an opportunity to utilize the local public knowledge and understanding.
- This local knowledge which accumulates by public participation can be vey valuable input in the preparation, implementation and evaluation of development process. At smaller scale for instance city or neighbourhood level the participation is very important.
- It is well recognized that understanding of local inhabitants about their own surroundings is much better than officials of urban local bodies or authorities.
- The local inhabitants also can be useful to work as 'neighbourhood-watch' to overcome the nuisances and illegal development in their surroundings.

The public participation is very essential in this study to know the local relevance of subjective indicators themes, indicator and perception on it.

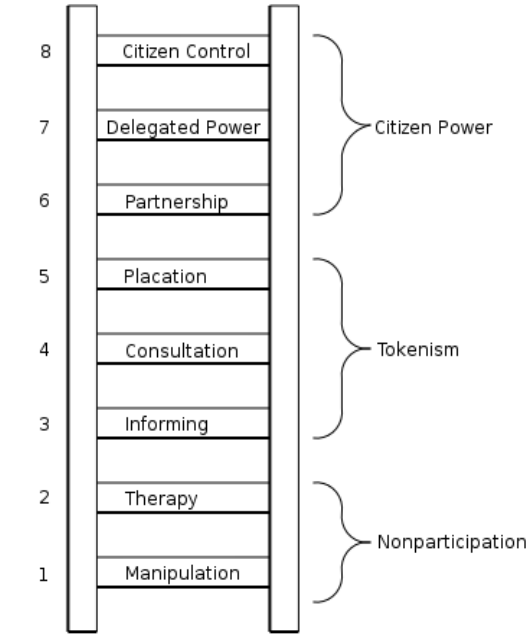
2.5.3. Public participation: stages

The public participation process has different steps or levels of involvement of inhabitants which describes very well by Arnstein (1969), Wiedemann and Femers (1993) by using participation level matrix.

2.5.3.1. Arnstein's ladder of participation:

Arnstein (1969) describes the public participation process using ladder of participation. In this ladder, Arnstein (1969) used 8 steps or levels of participations. Figure 2.5 shows the Arnstein's Ladder.

Figure 2.5: Arnstein's ladder of participation



Source: Arnstein, 1969

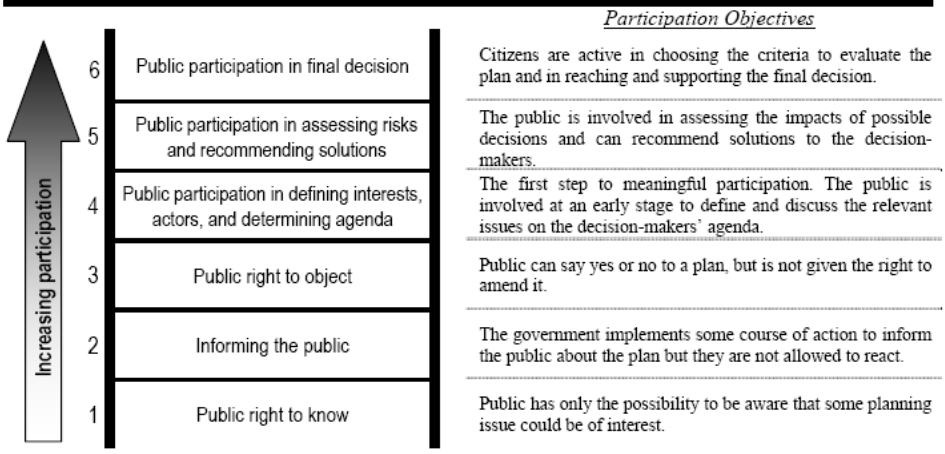
Arnstein (1969) used a ladder to explain the public participation in eight different steps which shows least participation to maximum level of participation. This is known as Arnstein ladder. In figure 2.5, two lowest steps are shown as nonparticipation. These two base steps which are recognized as manipulation and therapy having objectives only to educate or to develop awareness in the public. The next three steps in ladder are recognized as tokenism and which are informing, consultation and placation. These three steps allows public to inform them with one-way flow of information or consultation in neighbourhood meetings or survey with them or getting their advice in future plan but without any guarantee that their

advice or suggestion will be implement. This is also known as minimum amount of share power. The last three steps of ladder recognized as partnership, delegated power and citizen control. These last steps of ladder shows maximum level of participation which reflects in the decision making process where citizen influences the decision. This level also provides citizen to some level of managerial powers. According to Hodge (2003) public participation in development process have different ranges of participation which is from least to maximum. This also depends on how critical decision making process.

2.5.3.2. Wiedemann and Femers ladder of participation:

Wiedemann and Femers (1993) presents the public participation ladder. The ladder of participation shows the increment in participation while going upwards. In today's context this is the most applicable. In the first three steps public involve only after taking any decision. The objective of the first three steps is only to develop the awareness in the people about the government development plans and policies.

Figure 2.6 Wiedemann and Femers' ladder of participation

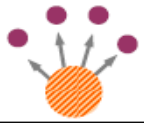


Source: Wiedemann and Femers, 1993

Significant participation starts after third step in ladder. Public invites in early stage of decision making process and discuss about related issues in step four. In next two steps of ladder public involve in impact assessment of development plans and even after that in evaluation of final plan. According to Wiedemann and Femers (1993) public participation can not be a goal but this is a tool to achieve the certain goals. Figure 2.7 presents the different

type of interaction (one to many and many to many) and model (broadcast and participative) of public participation which was discussed by Wiedemann and Femers (1993).

Figure 2.7: Model in public participation

Objective of Participation	Flow of information and share of power in decision-making	Type of interaction	Model
Public participation in final decision		Many-to-many interaction	Partcipative model
Public participation in assessing risks and recommending solutions			
Public participation in defining interests, actors, and determining agenda			
Public right to object		One-to-many interaction	Broadcast model
Informing the public			
Public right to know			

Source: Wiedemann and Femers, 1993

2.5.4. Public participation: relevance to this study

In the present study public participation means to know the inhabitant's perceptions about quality of life in the neighbourhood where they are living, amenities and services which they are getting from municipality. Public participation is also necessary in this research to know the applicability of selected quality of indicator themes and indicators in Wesselerbrink neighbourhood level. Participation is also needed to know the priority of these indicators. This participation is known as 'Tokenism' or second level of participation according to Arnstein ladder (Figure 2.5). Based on Wiedemann and Femers ladders (Figure 2.6) this is forth level of participation which is a real start of meaning full participation. This level of participation is also known as 'many-to-many interactions' of participative model where inhabitants involve in indicators selection, prioritization and express their views about perceptions of QoL.

2.6. GIS and urban planning:

2.6.1. GIS and its applicability in urban planning:

GIS is defined as a computerized system capable of capturing, storing, analyzing, and displaying geographically referenced information, that is, data identified according to location (Longley *et al.*, 2001). Longley *et al.*, (2001) illustrates the potential of GIS in urban planning. The geographical information, which GIS handle, comprises two main categories: attribute data and geometric data. Geometric data refer to location information of geographic features and are often in the form of map. Attribute data are descriptions, measurements, and classifications of the geographic features. GIS is extensively used since it can execute a lot of tasks, ranging from basic functions to sophisticated modelling. Mapping is one of the important functions of GIS. GIS can capture data from different sources and re-organize them into thematic maps. However, GIS is more than mapping. Spatial analysis distinguishes GIS from general information system. GIS can complete a lot of spatial analysis such as, overlaying, buffering, reclassifying, line-in-polygon, point-in-polygon, proximity analysis, connectivity and viewshed. Modelling is the highest level of GIS application. It involves combining maps together in a logical sequence, through a series of spatial operations to evaluate how objects are organized in space, to study how their attributes are distributed, or to explore the relationship between dependent and independent variables through quantitative operations. Besides of static modelling, GIS can also perform dynamic modelling, which involves study of spatial variation through a period of time. Table 2.6 explains the potential of GIS in almost all sorts of urban applications.

Table 2-6 Potential of Geo-informatics in urban applications

Applications	Inventory applications	Policy analysis applications	Management/policy-making applications
Economic Development	Location businesses and their primary resource	Analysis of resource demand by potential local supplier	Informing businesses of availability of local suppliers
Transportation and Services Routing	Identification routes, staffing by area, landfill and recycling sites	Analysis of potential capacity strain given development	Identification of ideal high-density development areas based on criteria

Area	Inventory applications	Policy analysis applications	Management/policy-making applications
Housing	Inventory of housing stock age, condition, status (public-private, rental, etc.), durability	Analysis of public support facilities for housing by geographic area	Analysis of funding for housing rehabilitation, location of related public facilities
Infrastructure	Inventory of roads, sidewalks, bridges, utilities	Analysis of infrastructure conditions	Analysis to schedule maintenance and expansion
Health	Locations of persons with particular health facilities	Spatial location, time-series analysis of disease	Analysis to pinpoint possible sources of disease
Tax Maps	Identification of ownership data by land plot	Analysis of tax revenues by land use	Projecting tax revenue change due to land-use changes
Human Services	Neighborhood details with multiple subjective or objective indicators	Analysis service facilities and human services needs and capacities of nearby residents	Facility sitting, public transportation routing, program planning and place-based social intervention
Law Enforcement	Inventory of location of police stations, crimes, arrests, security system locations	Analysis of police visibility, presence	Reallocation of police resources and facilities to areas where they are likely to be most efficient and effective
Land-use Planning	Parcel inventory of zoning areas	Analysis of percentage of land used in each category	Evaluation of land-use plan
Parks and Recreation	Inventory of park holdings/ play scapes, trails by type, etc	Analysis of neighborhood access to urban amenities	Modeling population growth projections
Emergency Management	Location of key emergency exit routes	Analysis of effects of emergencies	Modeling effect of placing emergency facilities and response
Citizen Information	Location of persons with specific demographic	Analysis of voting characteristics of particular areas	Modeling effect of placing information locations

Source: Longley *et al.*, 2004

2.7. GIS and visualization of urban quality of life:

Rinner (2007) describes the importance of geographic visualization of urban quality of life using GIS and multi-criteria decision analysis. Rinner (2007) describes the worthiness of visualize quality of life and its role in decision making process. In GIS the two techniques, i.e. spatial interpolation and spatial multi criteria analysis plays a vital role in criteria based spatial studies (Santos *et al.* 2007). Even GIS it self is one of the potential tool because of its data management, data analysis and visualization capacity. According to Zlatanova *et al.* (2007) visual interpretation of information of any area is always helpful to assess the existence of the problems and to select the better sustainable solutions. Zlatanova *et al.* (2007) also explains that this visual interpretation of information is different for all stakeholders and needs a common perceptive for that. GIS can be a very helpful tool to assess and analyse the different spatial situation. Rinner (2007) and Zlatanova *et al.* (2007) both describes the fact that visual effects makes spatial situations more crystal clear as compare to tables or thousands words. Zlatanova *et al.* (2007) explains the role visual information with special reference to the Netherlands neighbourhoods which requires more attention post war. According to Ghose (2001) 'Ease of visualizing and analyzing neighborhood-based spatial data makes GIS especially useful to neighborhood planner, citizen, and professional alike. With this technology, both planning agencies and community organizations can play an increasingly significant role in implementing neighborhood revitalization programs and in assessing neighborhood markets and needs'.

2.7.1. Spatial interpolation methods:

Spatial interpolation method defined as the procedure of predicting the value of attributes at unsampled sites from measurements made at point locations within the same area or region (Burrough *et al.*, 1998). To measure values of attributes at every location in a study area is usually too difficult and costly. Instead, only some limited sample points are strategically selected and measured. These known points are then used to estimate the value of all other locations with spatial interpolation techniques. According to Bonnes *et al.* (2007) inhabitants and experts perceptions on environmental quality such as perceived air pollution or noise pollution can be interpolate. The visualisation of urban environmental quality by using residents and experts perceptions is very useful in urban environmental decision making process (Bonnes *et al.,* 2007). According to Auchincloss *et al*. (2007) spatial

interpolation is an appropriate method to fill the gap about neighbourhood characteristics by interpolating residential survey data. It was also examined in this research that results of spatial interpolation on subjective data of neighbourhood survey can be provide extra information in research (Auchincloss *et al*. 2007). Bonnes *et at.* (2007) and Ellul (2009) describes that mapping of inhabitant's perceptions (subjective) on urban quality of life can be helpful to improve the urban services and amenities. The methods of interpolation can be classified into global interpolators or local interpolators (Burrough *et al.*, 1998). Global interpolators use all available data to provide predictions for the whole area of interest, while local interpolators operate within a zone around the point being interpolated to ensure that estimates are only associated with the related neighbourhood and fitting is as good as possible. Global polynomial is one of the common global interpolators. It uses a polynomial equation to model the surface cross the sampled points. Global polynomial methods assume that the spatial coordinates (x, y) are the independent variables, and that z, the attribute of interest, is the dependent variable and normally distributed. The global interpolation imposes an external, global spatial structure on the sampled points while discarding the short-range, local variation by considering them as random noise. Inversely, the local interpolation methods estimate the unknown points from the nearest data points directly. In other words when, a specific neighbourhood is considered for interpolation, the interpolation method can be said as local interpolation. In local interpolation method, there can be various interpolation functions throughout the dataset. The examples of local interpolation are Thiessen-polygons, Inverse distance weighted (IDW), Local polynomial and Kriging.

2.7.2. Spatial interpolation methods: relevance to this study

In the present study, visualization of perceived quality of life at unsampled households requires spatial interpolation methods. Spatial interpolation is very useful where research dealing with large population and survey consumes time and money as well. According to discussion with Ellul (2009) spatial interpolation can be regularly used with fixed population perceptions by changing households which is much relevant to this study. In this study best method of local interpolation was deployed based on following criteria and goodness index for each indicator.

- The standard mean error (ME) should be nearest to zero,
- Root mean square error (RMSE) should be as small as possible,
- Method of speared the information of known point to unknown point.

Chapter 3. Methods and Approach:

This chapter presents a brief overview and introduction about study area Wesselerbrink neighbourhood. This chapter contains the information generates from secondary data about study area which have direct relation with urban quality of life such as population composition, land use, housing status and urban amenities etc. This chapter presents the detailed methodology of survey. This chapter contains methods of analysis of the primary survey as well as secondary data to get research findings based on GIS based spatial interpolation methods. Results from different analysis have been discussed in next chapter i.e. visualization of quality of life.

3.1. The Wesselerbrink: selection as study area

The Wesselerbrink was selected as a study area based on the following two criteria:

- Priority neighbourhood for development by Ministry of Housing Spatial Planning, and the Environment, Government of the Netherlands,
- Kultuurstraat Project.

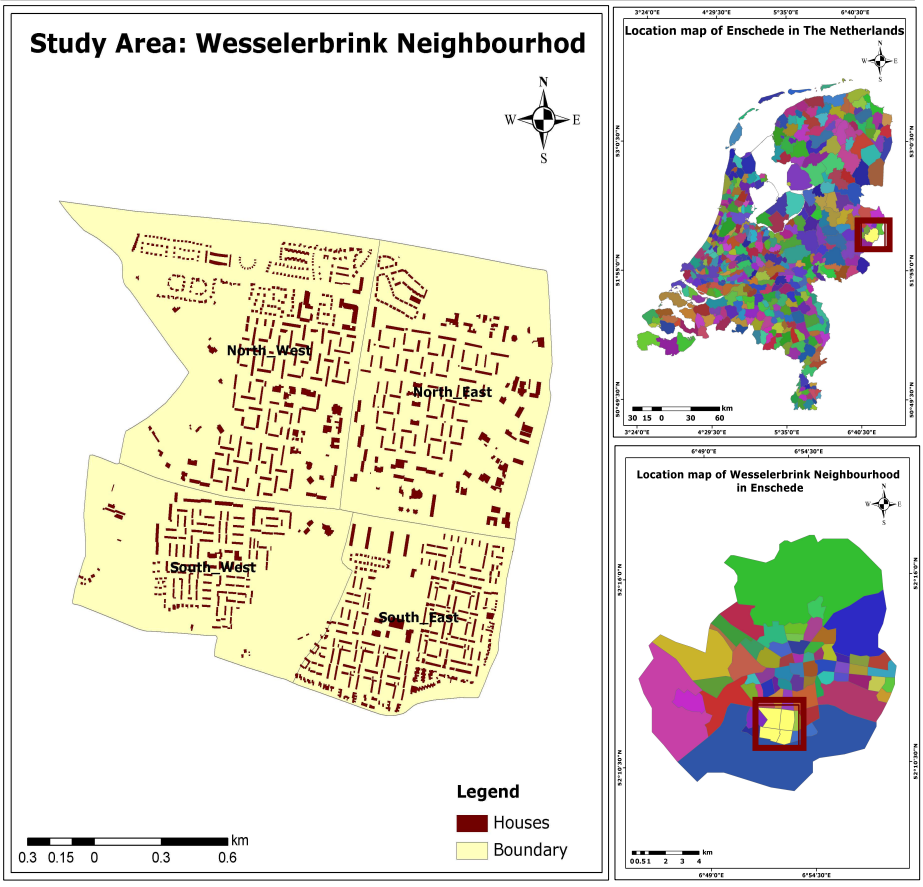
The Wesselerbrink neighbourhood is one of the priority neighbourhoods out of 56 which were priorities in 2002 for implementation of the *BIG City Policy-III,* which was meant for neighbourhood development from 2004 to 2009 (Table 2.1, 2.2 and Annex 4). The main setback of these 56 priority neighbourhoods are the low quality of life (Ministry of Housing Spatial Planning, and the Environment, 2008). These neighbourhoods were selected by the Government of The Netherlands out of the largest Dutch municipalities. The number of selected neighbourhoods is primarily related to the gravity and accumulation of the existing problems. These neighbourhoods have social problems and problems related to the physical built environment. These problems cannot be solved without specific attention and their inhabitant perceptions. An additional selection criterion is 'Kultuurstraat' which is a very unique project of neighbourhood development, which is already under implementation phase in Wesselerbrink. This project describes how the Wesselerbrink will be in next 20 years and will inhabitants of this neighbourhood fell proud on this diverse neighbourhood. 'Kultuurstraat' is derived from the notion of culture house; this means that there are different activities under one roof. This unique project 'Kultuurstraat' is not only improvement of a street but this is a development of the Wesselerbrink according to the people's perceptions and

their basic requirements. The above mentioned criteria are the basis for selection of the Wesselerbrink as study area.

3.1.1. Regional setting:

The study area is Wesselerbrink neighbourhood of Enschede city, which is situated in the eastern part of The Netherlands, in the province of Overijssel, in the Twente region (Map 3.1). It lies between latitude 52°11'0" to 52°12'0"N and longitude 6°51'30" to 6°53'30"E. The municipality also comprises the following towns, villages and townships: Boekelo, Glanerbrug, Lonneker and Usselo. The Wesselerbrink neighbourhood administratively divided in four sub-divisions i.e. North-east, North-west, South-east and South-west. Wesselerbrink neighbourhood has population of 16,710 with 7135 household in year 2006 (Table 3.1).The city is a former centre of textile production. The Enschede is cooperating with the nearby municipalities of Almelo, Borne and Hengelo as network in Twente.

Map 3.1: Location map of Wesselerbrink



3.1.2. Demographic profile:

3.1.2.1. General description:

The Wesselerbrink is a fast growing neighbourhood of Enschede city. The total population of the Wesselerbrink is 16710 with 7135 households according to census data 2006. Wesselerbrink is one of the neighbourhoods where total number of people from non-western foreign background is higher than Enschede city (Table 3.1). In Wesselerbrink people are mostly from Syria, Morocco, Turkey, Surinam and Netherlands Antilleans.

Table 3-1 Population structure

Sub-division	Total population	Density (sq. km.)	Housing dwelling	Non-western foreign background (%)
North West	5500	4980	2440	32
North East	4080	4514	1820	29
South East	4630	8300	1730	33
South West	2500	3556	1145	31
Wesselerbrink	16710	1080	7135	31
Enschede	154377	1095	-	14.2

Source: www.cbs.nl, 2006

3.1.2.2. Age composition:

The age composition of population shows the percentage population of the particular age group in the total population. The table 3.2 represents the percentage age wise composition of population in Wesselerbrink neighbourhood.

Table 3-2 Age wise composition of population

	Age group (in %)				
	0-15	15-25	25-45	45-65	> 65
North East	20	12	27	23	18
North West	21	13	26	21	18
South East	16	12	22	23	26
South West	18	14	33	25	10
Wesselerbrink	19	13	27	23	18
Enschede	17	15	30	24	14

Source: www.cbs.nl, 2006

3.1.2.3. Household composition:

The average household size in Wesselerbrink is 2.2 persons per household. In Wesselerbrink households comprises with one person are 38 percent (2711 households), households without children are 28 percent (1999 households) and households with children are 34 percent (2425 households). The comparison of these figures with total Enschede figures shows in Table 3.3 below.

Table 3-3 Household composition (in %)

	One-person households	Households without children	Households with children	Average household size
North East	38	30	32	2.2
North West	41	24	35	2.2
South East	34	33	33	2.3
South West	40	26	34	2.2
Wesselerbrink	38	28	34	2.2
Enschede	42	28	30	2.1

Source: www.cbs.nl, 2006

3.1.3. Settlement pattern:

The Wesselerbrink is on of the unique and largest neighbourhood of Enschede-south district which was built between 1960 and 1970 (Municipality of Enschede, 2008). Wesselerbrink represents the urban planning ideas of the CIAM thinking, which was the most well-known organization of the 'Modern Movement' in architecture. The Wesselerbrink neighbourhood consists of several building blocks that are repeated in a linear structure and which is a unique identity of the Wesselerbrink district too. The centre of the Wesselerbrink neighbourhood is the central shopping and the beautiful Wesselerbrink Park. Each sub-division has its own centre in the zone facilities, often with primary schools. High rise buildings are visible only along the main roads and further low rise buildings in the form of drive-in and row houses can be visible inside the brinks.

3.1.4. Landuse pattern:

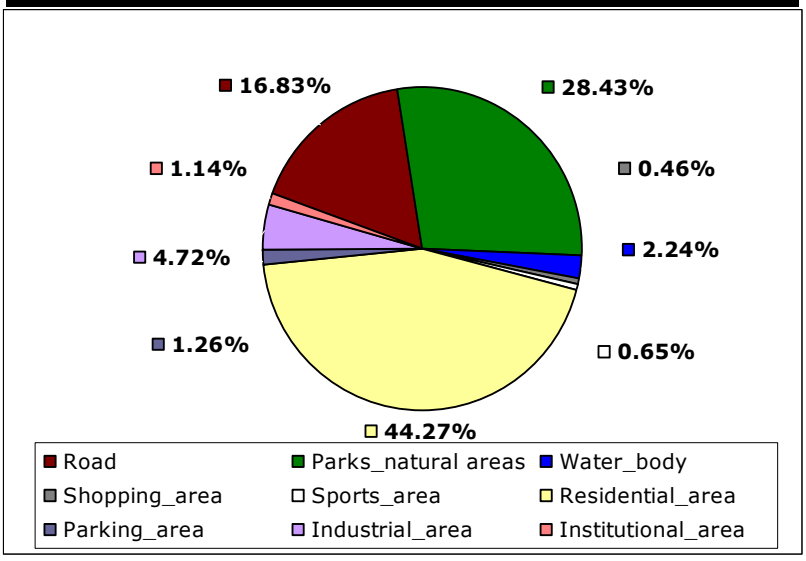
Wesselerbrink neighbourhood is characterized by a pattern of multiple urban land uses. The total area of Wesselerbrink is about 3.33 sq km (Table 3.6). Figure 3.1 shows the percentage distribution of landuse under different

categories. Landuse under residential category 44.27 percent (1.47 sq km.) i.e. very to near to half of this area, while parks and natural areas cover 28.43 percent and roads with three different (i.e. main, secondary and brink road) categories occupies 16.83 percent. Map 3.3 shows the landuse pattern in Wesselerbrink neighbourhood. Other than these three major landuse categories; industrial area, water bodies, parking areas, sports complex, institutional and shopping areas are different landuse which can be observed in Wesselerbrink neighbourhood (Table 3.4). QuickBird image of September 2006 was used in preparation of land use map shows in Map 3.2. Map 3.4 shows the available basic amenities in Wesselerbrink. Map 3.5 shows the survey households in research.

Table 3-4 Major landuse type and area

Landuse type	Area (sq. km.)	Landuse type	Area (sq. km.)
Residential area	1.474	Parking area	0.042
Parks & natural areas	0.947	Institutional area	0.038
Road	0.561	Sports area	0.022
Industrial area	0.157	Shopping area	0.015
Water body	0.075	Total	3.33

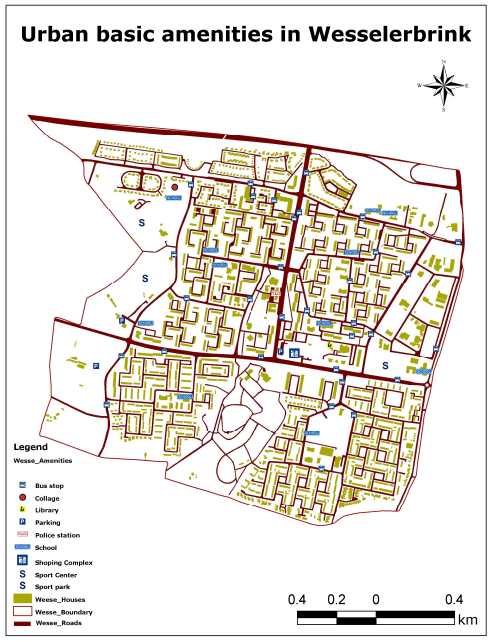
Figure 3.1: Landuse pattern in Wesselerbrink



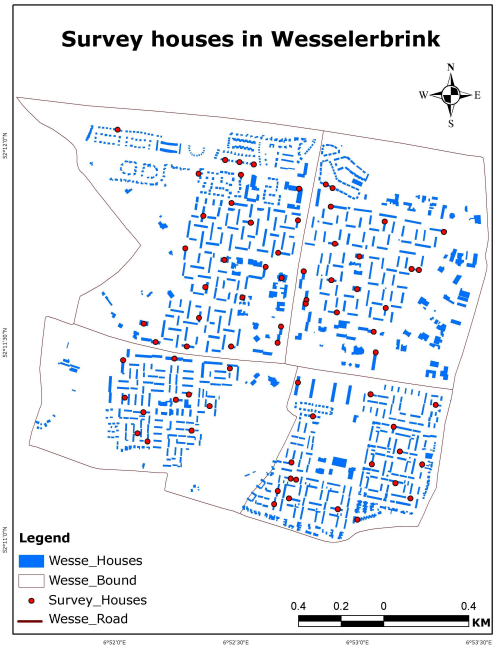
Map 3.2: False Colour Composite (FCC) of Wesselerbrink

Map 3.3: Landuse map of Wesselerbrink

Map 3.4 Survey households in Wesselerbrink



Map 3.5 Survey households in Wesselerbrink



* See annex-4 for legend of Map 3.3 and 3.4

3.2. Quality of life indicators: selection by public participation

The subjective quality of life indicators were selected by literature review in previous chapter. These indicators were discussed in rapid appraisal rounds with the inhabitants of Wesselerbrink, local public leaders, municipal officials of the Wesselerbrink-south district, knowledge consultant, subject expert, current researcher and owner of housing societies for final selection and their relevance with study area. The municipal officials of the Wesselerbrink-south district and knowledge consultant were involved in participatory process and discussed five times in rapid appraisal round and finalize the indicators. The inhabitants and local public leaders were discussed during their availability and presence in neighbourhood meetings. The table 3.5 and figure 3.2 shows the details of different discussions and consultations. The people's perceptions about QoL are based on these indicators and indicator themes. The participation which carried out in this study is a good start of public participation and also known as 'participatory model' according to Wiedemann and Femers ladder (Fig. 2.6 and 2.7). According to Arnstein (Fig 2.5) this is a basic level of public participation which heading towards a complete participation in case of inhabitants were involved in any decision making process.

Table 3-5 Different discussions and consultation

Type of discussion	Group of people	Date and Place
Rapid appraisal (5 rounds)	Municipal official Knowledge consultant Current researchers Police officials Elected members	5th September, 2008 to 31st October, 2008 Enschede
Neighbourhood meeting	Elected members Police officials Municipal official Inhabitants of Wesselerbrink	9th October, 2008 De Magneet, Hertmebrink, Enschede
Neighbourhood conference on 'Kultuurstraat Project'	Elected members Municipal official Knowledge consultant Current researchers	31st October, 2008 Bonhoeffer College, Enschede
Subject experts	Subject experts	6th November, 2008 ITC, Enschede

The discussion with different stakeholders on indicator themes and indicators during rapid appraisal round and during other meeting was very fruitful to know the applicability and usefulness of these indicators in Wesselerbrink.

Figure 3.2: Discussions and consultation with stakeholders

3.3. Target population for study:

The target population in this research involved all the residents in the study area (Table 3.1). For the purpose of carrying out interviews, sampling units were taken from this population, as time and financial constraints did not allow the whole population to be interviewed. The households in the Wesselerbrink neighbourhood have been selected and residents interviewed according to their work schedule and availability at home using simple random sampling.

3.4. Data collection method:

3.4.1. Secondary data collection:

During the data collection phase following secondary data were collected and referred for study.

- Census information: Census data were obtained and refereed from Dutch census websites. Data such as population, density, age composition, household composition. This census information was used in study area profile and also in following chapter for discussion.
- Satellite images: QuickBird high resolution multispectral satellite image (2.4 meter- September 2006) were obtained from ITC data archive and used in landuse map preparation (Map 3.3).
- Quality of life catalogue: Quality of life catalogue were obtained from knowledge consultant of municipality and used in preparation of questionnaire. This catalogue was also used in pilot study of 'Kultuurstraat project'.
- Urban development policies: The Dutch urban policies with special reference to neighbourhood development were obtained from literature review, ministry of housing, spatial planning and the environment (online source) and reviewed.

3.4.2. Primary data collection:

A household survey was carried out from 10th October 2008 to 31st October 2008 by using questionnaires for primary data collection (Annex 1). These questionnaires were prepared in consultation with municipal officials as well as knowledge consultant of municipality. QoL questions were based on Likart scale. Likart scale is method to know the peoples perceptions or satisfactions. Graphics were used with questions for better visualization and similar understanding about questions. The graphics which were used in questionnaires adopted from 'Quality Catalogue' which was successfully used in pilot study of 'Kultuurstraat Project'. Questionnaires were converted into Dutch language to make survey more easy and comfortable for interviewee. These questionnaires were given to interviewees with postal stamped envelope and researcher's self address. This procedure of survey was adopted after experience of first few interviews where inhabitant had not much time to response. The household survey was announced through news paper and all residents of Wesselerbrink requested to cooperate by taking part in survey through questionnaires.

3.4.2.1. Survey design:

The survey questionnaires were divided into four different parts according to requirements of the study. The format of survey questionnaires was kept

simple with minimum amount of requirement of writing. The questions related to different indicators themes and indicators were arranged in questionnaires under specific headings which are described below.

- **Household characteristics:** Questions related to general information such as house number, brink name, age of interviewee, number of rooms and residents, time of living in the house, ownership of house i.e. rented or owned, residence change, house construction and level of education were asked.
- **Physical aspects of quality of life:** Questions related to physical quality of life indictors such as road quality such as asphalt and marking, street cleanness, side walks, traffic quality and congestion, vehicle parking, trees and landscaping, parks and natural areas, quality of furniture in parks, graffiti issues, quality of playing areas for children, noise pollution and reason of noise pollution and housing quality were asked.
- **Social aspects of quality of life:** Questions related to social quality of life indicators were asked into three parts that are safety, service accessibility to urban basic services and community participation to collect the information.
- **Economical aspects of quality of life:** Questions related to economic quality of life indictors such as housing availability, house purchase cost, construction cost and travel cost by public transport were asked. In questionnaire each indicators and indicators measures were weighted by inhabitant's weights to know their priority for overall visualization.

3.4.2.2. Household selection:

A list of brinks (streets) in Wesselerbrink neighbourhood was obtained from current researcher (Ms. Judy Jenson, University of Twenty) (Annex 5). By using this list and systematic sampling i.e. one household was selected from each brink and interviewed. The selected households were well distributed all over the study area because of this method each brink has equal chance to represent. Spatial location of all surveyed households was measured by GPS instrument.

3.4.2.3. Sample size:

Total 94 households were selected by using systematic sampling from 94 brinks and 72 responses were collected (Table 3.6). It shows 76.59% responses as a result of survey. The interviewees for information collection were belongs to different Dutch census age group over 15 years. Sample selection based on economic level and ethnicity or nationality was removed

after rounds of discussions with local public leaders of neighbourhood and municipal officials. This survey was carried with GPS to know the spatial location of household. Map 3.5 shows spatial location of survey households.

Table 3-6 Survey and sample scheme

Sub division	No. of brinks	No. of houses surveyed	No. of responses
North east	34	34	18
North west	25	25	25
South east	23	23	18
South west	12	12	11
Wesselerbrink	94	94	72

3.5. Visualisation method:

3.5.1. Spatial interpolation:

Spatial interpolation was deployed for predicting the value of attributes at unsampled sites from measurements made at point locations within the same area or region. The inhabitant's qualitative perceptions were converted into quantities values from 1 to 3 using Likert scale. Likert scale is scaling method between qualitative perceptions or opinion and qualitative values. In this study, local interpolation methods were deployed to achieve the objectives of the research, which is visualizing the perceived quality of life at neighbourhood level. The local interpolation methods Thiessen polygons, IDW, Local polynomial and Kriging were performed by using ESRI-ArcMap 9.2. The data which was collected by primary survey on inhabitants perceptions in Wesselerbrink used here as an input for spatial interpolation.

3.5.1.1. Inverse distance weighted method:

IDW was used in data analysis based on the assumption that the value of an attribute z unvisited points is a distance–weighted average of data points occurring within a neighbourhood or window surrounding the unvisited point. IDW method can be described as follows according to Burrough *et al.*, 1998:

$$Zx = \sum_{i=1}^{n} Wi * Zi / \sum_{i=1}^{n} Wi$$

Where:

$$Wi = 1/D^{k}$$

Zx: the predation value of unvisited point *x*
i: the used known data point from 1 to n
n: the number of used know points

Zi: the value of point I
D: the distance to know point I
k: a constant that influences the distance weighting

IDW interpolation method is a commonly used method in GIS to create raster overlays from point data. IDW interpolation determines cell values using a weighted average formula where weight is decided in terms of inverse distance from the unknown point to the known points in the search window. The weights are controlled or managed by the {power} option provided in IDW method. It lets one signify the distance of known points on the interpolated values, based on their distance from the output point. The interpolation surface generated by IDW is less smooth. If the power is higher the unknown point resembles the value of closest known point in the search window and if the power is small (2), the unknown point resembles the value of true mean of all the known points in the search window.

3.5.1.2. Kriging method:

Kriging is an interpolation based on geo-statistical methods which was also used to visualize the perception about accessibility of urban basic amenities. Kriging works on the regionalized variable theory, which assumes that the spatial variation of any variable such as elevation of the land surface is neither totally random nor deterministic. Instead, the spatial variation can be expressed as the sum of three major components: a structural component, having a constant mean or trend; a random, and locally varying but spatially correlated component, known as the variation of the regionalized variable; and a spatially uncorrelated random noise or residual error term. The Kriging method can be described as follows (Burrough *et al.,* 1998):

$$\boldsymbol{Z(x) = m(x)+\varepsilon'(x)+\varepsilon''(x)}$$

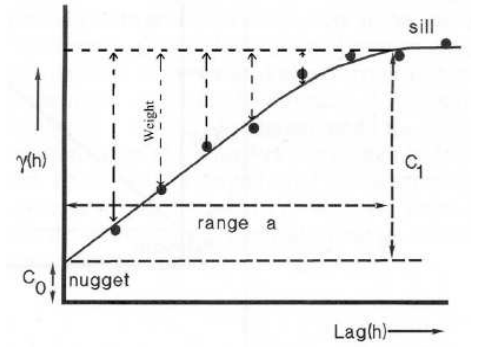
Where:

x: a position in 1,2, or 3 dimension
Z(x): the value of a random variable
m(x) : a deterministic function describing the structural component
$\varepsilon'(x)$: the regionalized variables
$\varepsilon''(x)$: a residual, spatially independent Gaussian noise term having zero mean and variance $\sigma 2$.

Kriging uses the variogram to measure the degree of spatial correlation, which describes the variation of semi variance versus distance. The distance (lag) between pairs of known points represents by the x-axis where as the semi variance represents the y-axis. The horizontal part of the curve is

known as the sill, which means that at these values of the lag there is no spatial dependence between the data points. The distance at which variance stops changing is referred to as range, which is an important part of the variogram because it specifies the maximum distance where points are no longer spatially correlated. Nugget is the variance of measurement errors combined with that from spatial variation at distances much shorter than the sample spacing, which can not be solved (Figure 3.3).

Figure 3.3 Variogram of Kriging



Source: Burrough *et al.,* 1998

3.5.1.3. Local polynomial method:

According to Longley *et al.* (2001) polynomial equations uses in the local polynomial interpolations to model the surface across the sampled points. Local polynomial interpolations create a surface from many different formulas, each of which is optimized for a neighbourhood. The value of a prediction point is only associated with the sampled points within the designated nearest point. Users can specify the neighbourhood's shape, maximum and minimum number of points.

In the present study all methods of local interpolation were deployed and the best method was used based on following criteria and afterwards goodness index.

- The standard mean error (ME) nearest to zero,
- Root mean square error (RMSE) as small as possible,
- Method of speared the information of known point to unknown point.

On the basis of above mentioned criteria IDW is a most suitable method which was selected for different indicators. The other local interpolation methods which are not considered in this study are described below:

- **Thiessen polygon:**

Thiessen polygons interpolation is not a real interpolation. It just assigns the value of the known point falling in the polygon created from three closest known points. At any place inside the polygon contains the same value of the sample point, meanings all the points in a polygon have same values as the closest point. Therefore, it is very difficult to get accurate or close to accurate results from the Thiessen polygons in randomly distributed points.

- **Spline:**

Spline is another local interpolation method also known as Radial Basic Function where a two dimensional 3rd polynomial order trend surface is used for the best fit. But it works locally on a search window at a time. It generates a very smooth surface which is some time unrealistic. It is a good for datasets with more distance and very sensitive where values changes within short distance. In ArcMap 9.2, the cross-validation is available only for IDW, Local Polynomial, and Kriging. However, no approaches like cross-validation are available to access the goodness of Thiessen polygons and Spline method.

3.5.2. Weighting indicators and overlay method:

The purpose of weighing is to express the priority or importance of indicator and themes relative to each other. It can be defined, as a value assigned to an evaluation criterion that indicates its importance relative to each other criteria under consideration. The higher or lower the weight the more or less important is the indicator in the overall utility. The average ranking method has been deployed to assign the weights. The inhabitant's priorities were asked on each indicators themes and indicator by using same questionnaire and weights were assigned (Annex-1). This method of weighting the indicators themes and indicator was also discussed with subject experts a number of times. The annex 5 shows the assigned weights to respective indicators themes and indicator. Different maps for indicator and indicator themes were prepared to visualize the physical, social, economical and overall quality of life by weighted index overlay analysis (weighted sum) and reclassify methods. The results are in maps format which shows the inhabitants perceptions about their quality of life based on subjective indicators. These maps used in following chapter to discuss the results.

Chapter 4. Visualization of Urban Qulity of Life:

This chapter deals with discussion on the findings of this research based on methodology discussed in previous chapter. In this chapter results and findings of the research are presented and discussed with the major steps in order to make the results and discussion more comprehensible and to achieve the objective and sub objective of the research.

4.1. Household characteristics:

Interviewee of this study belongs to different age group over age of 14 and sex i.e. because of perception varies by age and sex. Household characteristics such as house construction time, status of house i.e. own or rent and time period of living in the house play a significant role in perception of quality of life. Out of total responses, 56 percent respondents were male and 44 percent were female. As per age, all the respondents belong to the census age group over 14. Figure 4.1 below shows the age wise classification of interviewee in different census age group.

Figure 4.1: Age wise classification of interviewee

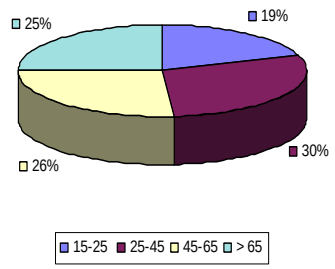


Figure 4.2: Household by ownership

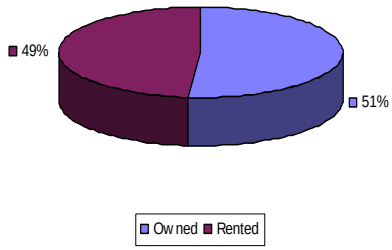


Figure 4.3: Household by construction period

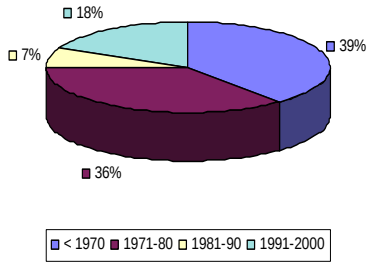
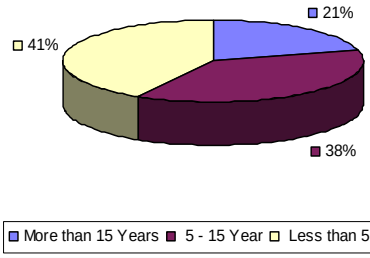


Figure 4.4: Household by living period



House ownership has a significant impact on the human life. According to the sample survey (Figure 4.2) near by 50 percent surveyed houses are on rental basis. This represents that remaining houses are owned or manage by

housing societies or other real estate agents. According to discussion with inhabitants these societies or agents are not able to provide better services or match their services with municipalities which make deprived living conditions. As per the construction time of houses, nearby 75 percent houses built before 1980 and out of that 40 percent houses built before 1970 (Figure 4.3). According to the primary survey in North-east and South-east and South-west part of the Wesselerbrink have more old constructed houses. Whereas North-west part has more newly constructed houses which represent better living conditions. This represents that construction quality and minimum house requirement in above three parts are not matching with today's requirements. These houses were built much before than BIG Cities policies were launched in 1994 which were discussed in chapter 2 (table 2.1 and 2.2) and this was one of main reason that Wesselerbrink selected as priority neighbourhood for future development. In these houses primary requirements such as vehicle parking or recreational areas within brinks are not matching with present requirements (Figure 4.7.a). The vehicle ownership in 2006 in comparison with houses as per Dutch census 2006 shows in table 4.1. According to table 4.1 some part of the Wesselerbrink such as South-east or South-west has more than 1 car per household. These parts of Wesselerbrink were built before 1980 have less parking facilities. Sometimes people are also using this space for other domestic purpose and where this ratio is very high creates problem of parking and traffic congestions (Figure 4.5 and map 4.5, 4.6). As per the figure 4.4 only 21 percent inhabitant's lives in Wesselerbrink from last 15 years or more, this shows the less willingness to live in neighbourhood for long a period. 41 percent inhabitants are new to this place and lives in Wesselerbrink from last 5 years or even less than that, this shows the inflow of immigrants from different part of Netherlands and world. Wesselerbrink have maximum immigrants from Syria, Turkey, Morocco and Netherlands Antilleans.

Table 4-1 Vehicle parking in Wesselerbrink (2006)

	No. of cars	No. of houses
North_East	1593	1820
South_East	2848	1730
South_West	1307	1145
North_West	1576	2440
Wesselerbrink	7324	7135
Source: www.cbs.nl		

Figure 4.5: Vehicle parking problem

4.2. Visualization of physical quality of life:

The map 4.1 shows the road asphalt quality in Wesselerbrink. The North-east and South-west part of neighbourhood perceived the poor quality of roads and asphalt whereas Northwest and southeast part of Wesselerbrink shows the good or satisfactory quality of roads according to inhabitant's preference. This map also shows the differences between peoples perceptions on quality of life within brink of Wesselerbrink. On 17th November, 2008 a road carpet dressing work on roads were observed after study the survey and discussion with inhabitants in North-east part of Wesselerbrink which support the inhabitant's perception. Map 4.2 shows the inhabitant's perceptions on quality of road marking and traffic signs such as diversion, speed limit and speed breaker signs in Wesselerbrink. The northeast and southwest part of neighbourhood shows the poor quality of roads signs or marking. North-west and South-east part of Wesselerbrink shows the good or satisfactory quality of roads according to inhabitants. Inhabitant's perception about road marking quality also shows almost similar areas where road asphalt quality is unsatisfactory or not in good conditions.

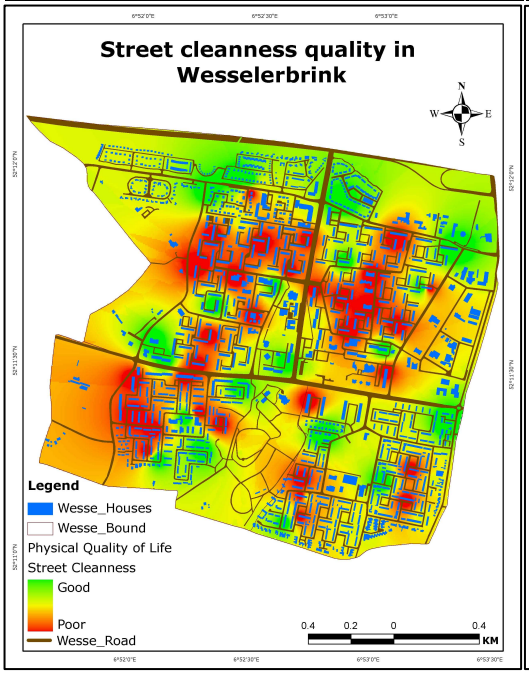
Other significant indicators to measures the physical quality of life are street cleanness and side walks which have a direct impact on daily human life represents here through map 4.3 and 4.4. These maps show the some parts i.e. North-east, North-west and South-west are not perceived well and in discussion it was came out that is because of low frequency of municipal cleaning services. Figure 4.6.a & 4.6.b shows a clear picture of South-west part of Wesselerbrink and supports the inhabitant's perception. In map 4.4 South-east part is perceived as cleaned and well built side walks.

Figure: 4.6.a & 4.6.b Street cleanness and side walks quality

Map 4.1 Road asphalt quality in Wesselerbrink

Map 4.2 Road marking quality in Wesselerbrink

Map 4.3 Street cleanness quality in Wesselerbrink

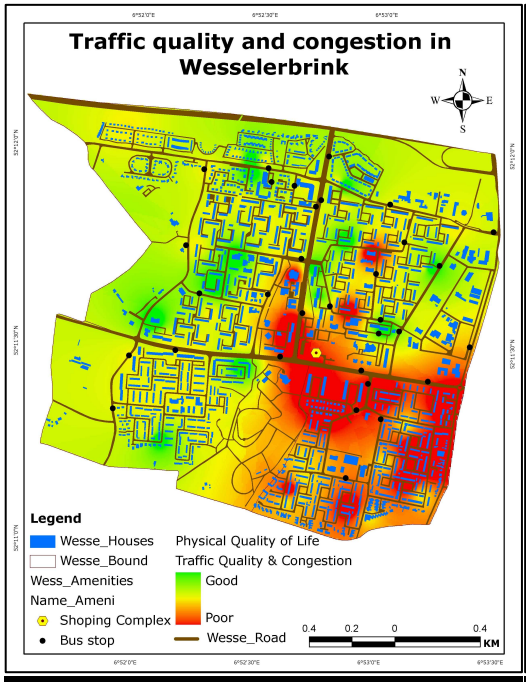


Map 4.4 Side walks quality in Wesselerbrink

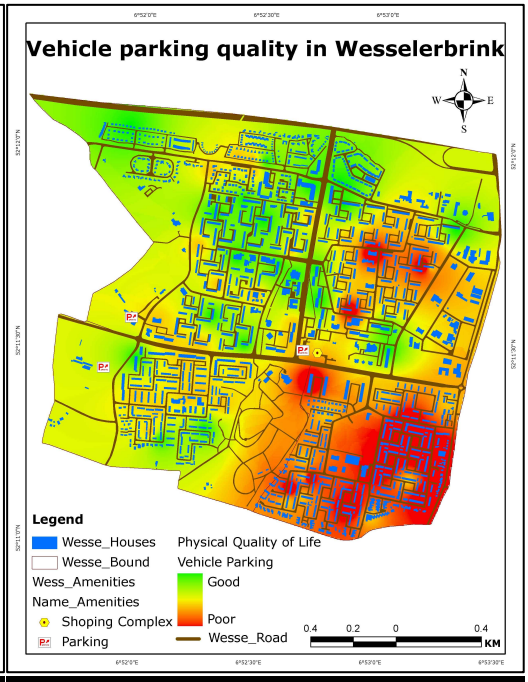
The map 4.5 and 4.6 shows the traffic quality-congestion and vehicle parking quality in Wesselerbrink. These maps represent the area near shopping complex and South-east part have a poor traffic quality and congestion too. As discussed in previous section that South-east and South-west part of Wesselerbrink has maximum number of vehicle per household and houses also not have proper parking facilities (Table 4.1). According to the interview with inhabitants people are using more private vehicle for their daily commute because of less access to public transport stops and even low frequency also in these part which leads to low traffic quality and more congestion (Figure 4.5). Map 4.5 also shows the location of bus stops. At the time of inhabitant's interviewee it was also informed that very few places has public parking facilities i.e. near to shopping complex and sport complex. The map 4.6 shows the public parking places in Wesselerbrink. Another indicator measure of physical quality of life is noise pollution and map 4.7 shows areas where noise perceived as pollution. In Wesselerbrink houses near to main roads, bus stops and public parking places perceived more noise especially in peak hours i.e. between 9 to 11 in morning and 4 to 6 in evening. Other than this, in few discussions it was came out that most of houses built before 1970 have poor sound barrier in walls and they can easily disturbed by neighbors activities such as loud speakers. Map 4.8 shows housing quality according to construction period. Most of the houses in North-east and South-west part built before 1970 and in North-west part before 1980. Houses in upper part of North-west Wesselerbrink are very newly constructed and have good perception about quality of life. In Wesselerbrink some area which is showing good quality of housing because of Kultuurstraat project work in which esthetic quality of houses are going to improve. Figure 4.7.a and 4.7.b shows the quality of houses before and after Kultuurstraat project work in Wesselerbrink.

Figure 4.7.a and 4..7.b Housing quality before and after Kultuurstraat project work

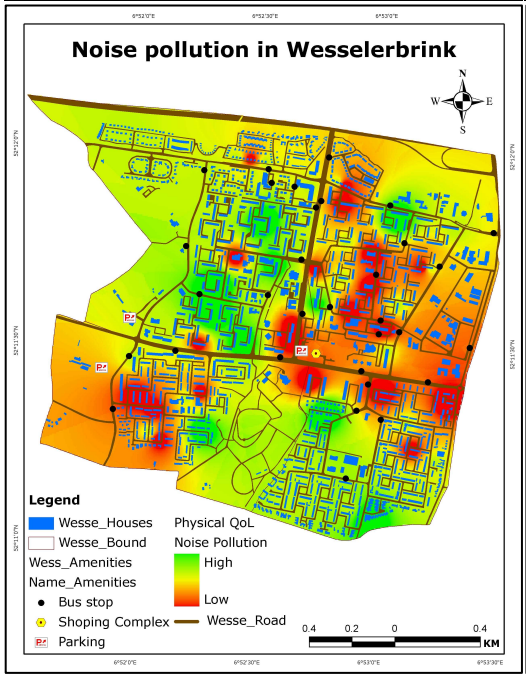
Map 4.5 Traffic quality and congestion in Wesselerbrink



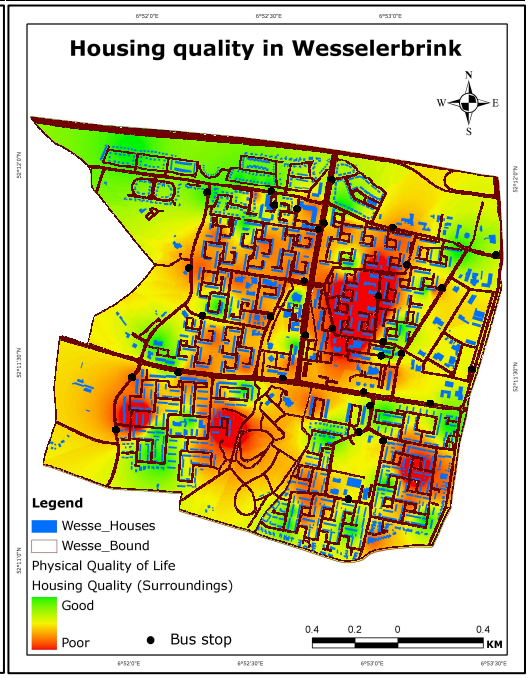
Map 4.6 Vehicle parking in Wesselerbrink



Map 4.7 Noise pollution in Wesselerbrink



Map 4.8 Housing quality in Wesselerbrink

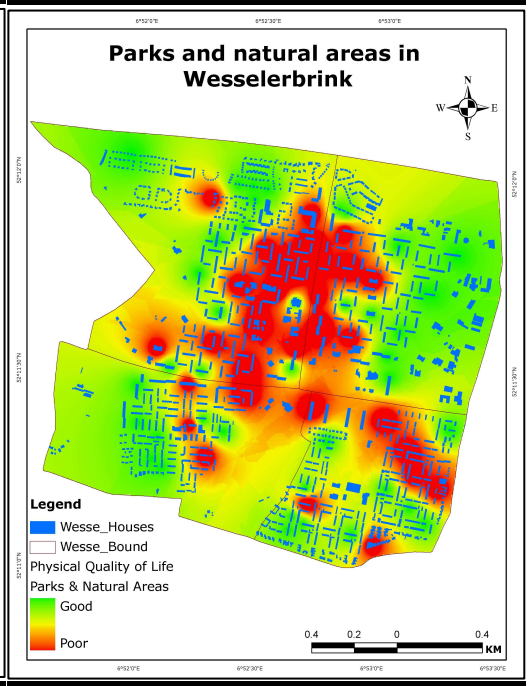


In this section, indicators measures such as quality of parks and natural areas, trees and landscaping, playing areas for children are visualized and discussed. Map 4.9 shows that almost all over the Wesselerbrink people are pleased with trees and landscaping and perceived as good. Some places perception shows poor quality near to shopping complex, community center, institutional areas and along the main roads because of different built environment such as high rise building structures. Map 4.10 shows quality of parks and natural areas in Wesselerbrink. Most of the areas which perceived low quality of parks and natural areas are vey similar which have old housing structure, near to main roads and shopping areas. As per the discussion with inhabitants, these areas are also frequent visited by most of the inhabitants because of daily activities such as shopping and various institutional work and because of this required more attention with respect to maintenance of parks and natural areas. Areas away from Wesselerbrink neighbourhood center and improved under Kultuurstraat project represent good perception about parks and natural areas. Map 4.11 shows the all sorts of furniture quality and availability in parks. This map represents perception about different furniture such as sitting chairs and crossing bridge with its timber quality, numbers of electricity light poles at proper places and rain shades. From discussion it was came out that in most of the areas not have number of required furniture or not put at proper places. In parks electricity light poles have direct connection with night safety issues which discussed later in this chapter. Map 4.12 shows the quality of playing area for children within and out side the brinks. Quality of playing areas perceived not satisfactory in most of part. Some of areas show a good quality of playing areas are either newly built or improved under Kultuurstraat project such as North-west and South-east part. Figure 4.8.a and 4.8.b shows different quality of playing areas in North-east and South-east part of Wesselerbrink.

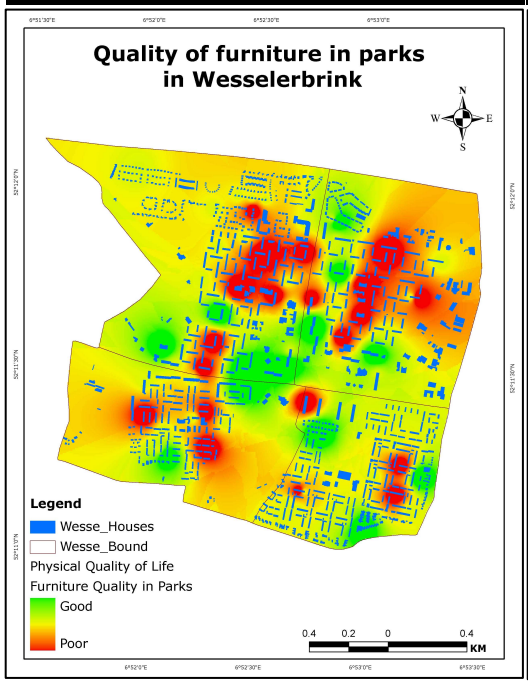
Figure 4.8.a and 4.8.b: Different quality of playing areas for children

Map 4.9 Trees and Landscaping in Wesselerbrink

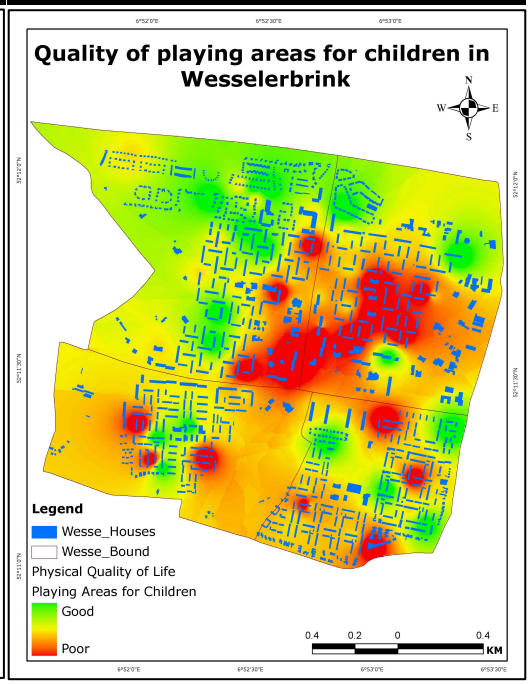
Map 4.10 Parks and natural areas in Wesselerbrink



Map 4.11 Quality and availability of furniture in parks in Wesselerbrink



Map 4.12 Quality of playing areas for children in Wesselerbrink



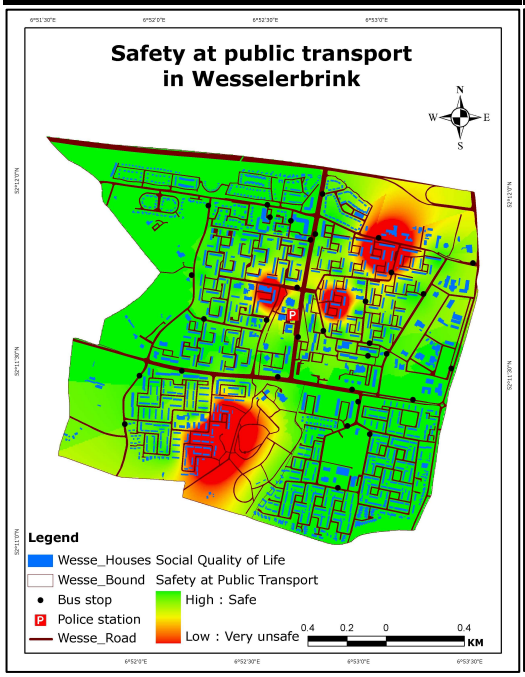
4.3. Visualization of social quality of life:

Inhabitant's perceptions about social quality of life such as safety, service accessibility and community participation are visualized and discussed here.

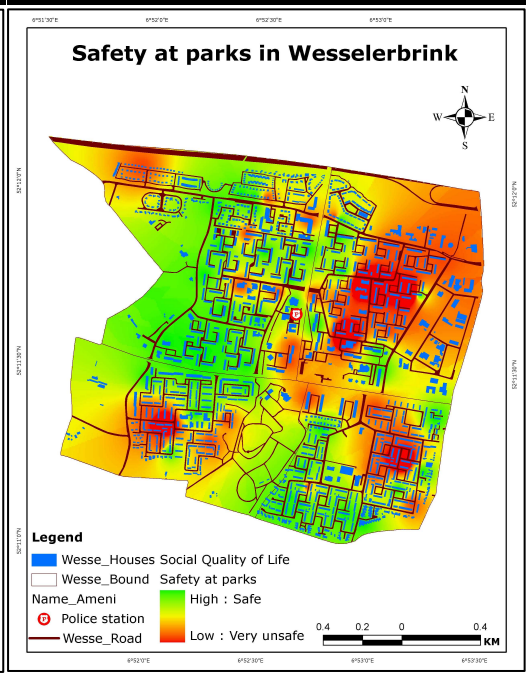
4.3.1. Safety:

Map 4.13 shows the safety at public transport. In most of the area safety at public transport while travelling and waiting at bus stops perceived as good or satisfactory except few places such as in South-west part and North-east part. In South-west part of Wesselerbrink very few places has access to public transport and to get that inhabitants have to walk through public places such as parks which makes inhabitants more unsafe especially after dark. In North-east part of Wesselerbrink, public transport stops which perceived as unsafe are discussed as locally created nuisance and these stops are also very near to some of educational institutions. Map 4.14 shows the safety at parks. Most of the areas which perceived as unsafe are in North-east, South-east and South-west part of Wesselerbrink. According to discussion with Wesselerbrink police most of safety issues are related with youth. Youth creates major nuisance at public places such as destroy things, makes noise. In same discussion it was came out that mostly both parents works and can't put much attention on their children activities. In map 4.14, areas in South-west part also shows similar places unsafe where inhabitants perceived unsafe while they go or wait for public transport. Map 4.15 shows the safety at home in Wesselerbrink. In most of the places inhabitants perceived a very safe home except few places in North-east part. Safety at home has direct link with safety at brink. Map 4.16 shows the perception about safety at brink. In map 4.15 & 4.16, inhabitants perceived similar areas unsafe i.e. North-east part of Wesselerbrink. According to discussion with Wesselerbrink police many of the houses are one member household and some time elderly woman too which makes them more unsafe especially during night time. According census, average 38 % households in Wesselerbrink are one member and these places are also discussed as youth nuisance which makes neighbourhood unsafe. Wesselerbrink police have regular meetings with neighbourhood members and municipal official about all the safety issues at monthly neighbourhood meetings. It was also came out from survey that inhabitants are not much interested to inform about safety issues and even not come to participate in neighbourhood meetings. As per primary survey more than 75 percent inhabitants have not attend any neighbourhood meeting or contact municipality about any such issues. Inhabitants who have any social interaction with their neighbors or participate in any community meeting are very less in number.

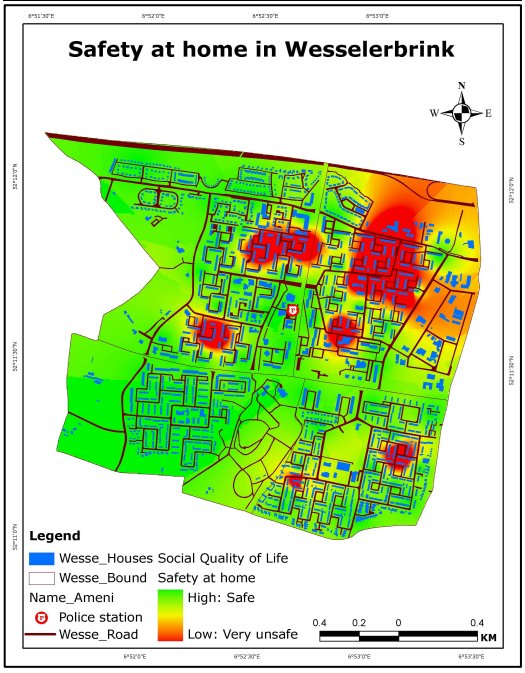
Map 4.13 Safety at public transport in Wesselerbrink



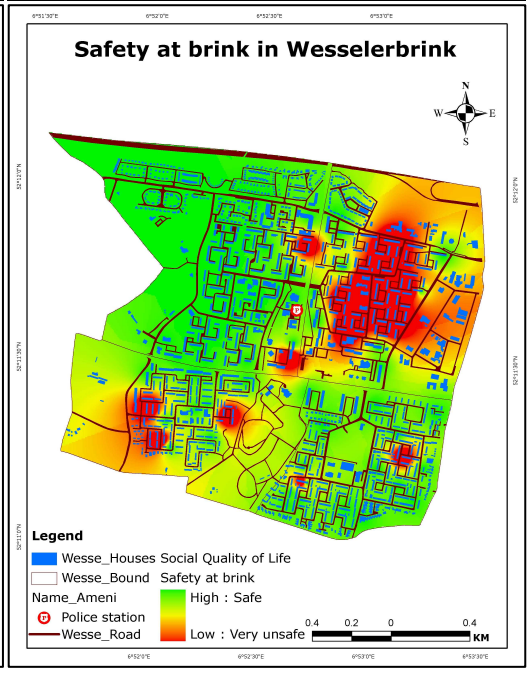
Map 4.14 Safety at parks in Wesselerbrink



Map 4.15 Safety at home in Wesselerbrink



Map 4.16 Safety at brink in Wesselerbrink

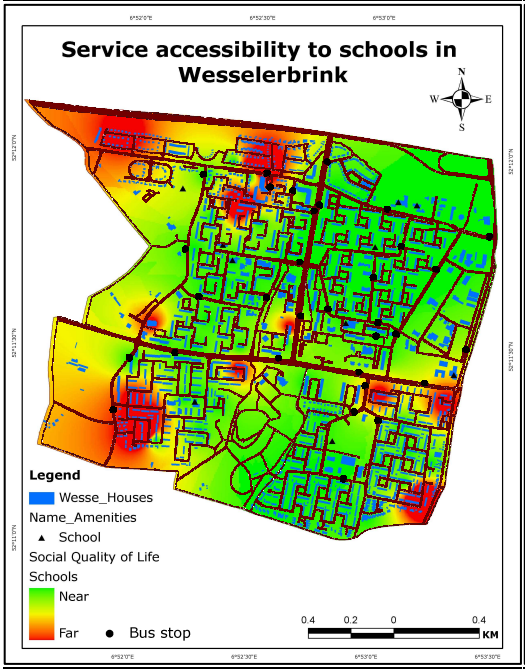


4.3.2. Urban amenities and services:

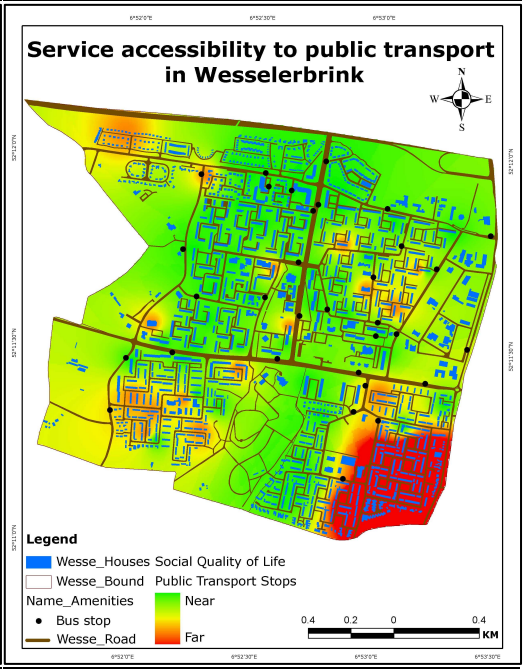
Research findings related to accessibility to essential urban amenities are visualized and discussed here in this section. Accessibility to urban amenities such as schools, library, public transport stops, recreation and cultural center, market facilities and health center is very essential for day to day life of human. Map 4.17 shows the schools location in Wesselerbrink and inhabitants perceptions about the accessibility to schools. In most of the areas inhabitants are pleased with the present educational services but in some areas inhabitants have their own opinion about the quality of education in nearest school and due to that they perceived it inaccessible. According to discussion with few families, it was concludes that in many school education method is different and which is unsatisfactory for them. As per the discussion sometimes teaching staff are from non-western foreign background which makes families uncomfortable to send their children to particular school even though that is very near for them. Map 4.18 shows the perceived accessibility to public transport stops and in most of the part it perceived well. This map also shows the location of bus stops. The South-east and South-west part of Wesselerbrink have very few public transport stops and because of that inhabitant perceived less accessible to public transport which urges them to use their own vehicle to commute which also increase the daily travel cost.

Map 4.19 shows perceived accessibility to recreation or cultural center, which is not present in Wesselerbrink. In most of the discussion with inhabitants described that recreation or cultural center such as theater or multi entertainment complex are a prime requisite of Wesselerbrink. Area nearer to sport complexes and North-east part of Wesselerbrink towards Enschede city perceived a good presence of recreational activities and benefited from other part of the city. This indicator measure was highly priorities by inhabitants after safety issues. Map 4.20 shows accessibility from public reading facilities such as library. Wesselerbrink have not enough number of public readings places and one place is not accessible from all part of the neighbourhood. According to different discussion with inhabitants their must be a provision of readings places in educational institutes where readers can go before and after teaching hours. Higher educational institutes can provide these sorts of facilities in collaboration with municipality.

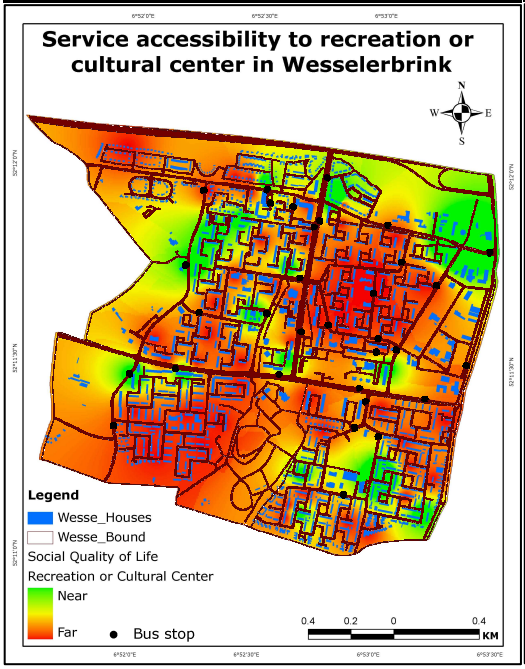
Map 4.17 Service accessibility to schools in Wesselerbrink



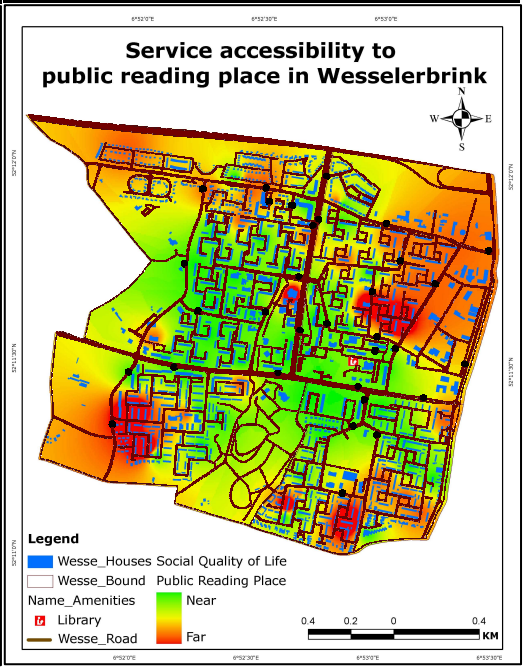
Map 4.18 Service accessibility to public transport in Wesselerbrink



Map 4.19 Service accessibility to recreation or cultural center in Wesselerbrink



Map 4.20 Service accessibility to public readings places in Wesselerbrink

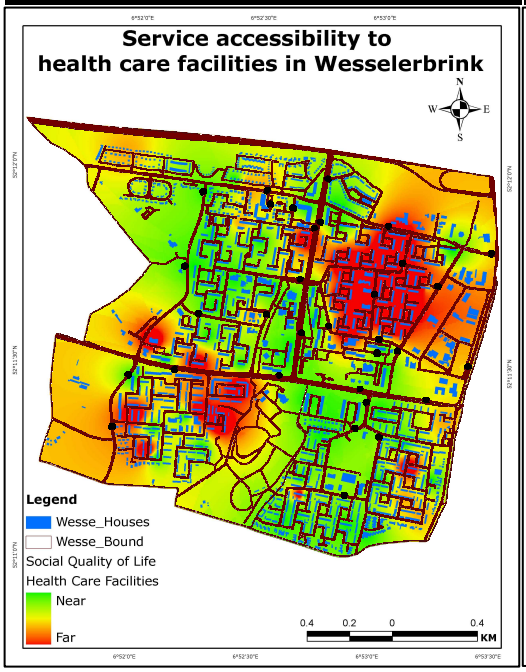


In this section of results, service accessibility of inhabitants to other basic services and amenities such as health care facilities, market place facilities, community center and post-bank are visualized and discussed.

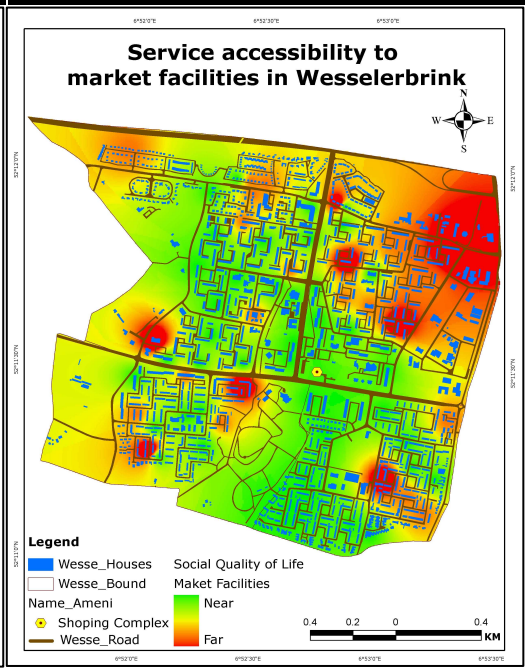
Map 4.21 shows the perceived service accessibility to health care facilities in Wesselerbrink. This map shows that central part of neighbourhood is well accessed to health care facilities and served by some good private health care centers. Major health related requirements of Wesselerbrink fulfilled by Enschede city hospital which is more than 3 kilometers. Inhabitants in some part such as North-east and South-west of Wesselerbrink perceived the requirement of health center for this neighbourhood. Map 4.22 shows the perceived service accessibility to market place from Wesselerbrink. This neighborhood has good market facilities which are in the center from all parts. In some places inhabitants have different opinion and perceived as negative. At the time of survey all inhabitants were well explained about the meaning of accessibility to market place, which means the place where they are well accessed to get the things of daily requirements. However in some part of neighbourhood, inhabitants answered it from their own experience on the things which are not available in Wesselerbrink market.

Map 4.23 shows the perceived service accessibility to community center from their houses. Community center of municipality is known as De-Magnet and situated in North-west part. Community center is perceived well accessible from most of part of Wesselerbrink. However, inhabitants are less interested to participate in neighbourhood meetings and shows low presence. According to discussion with some group of inhabitants shows that timings of neighbourhood meetings are not match with their daily schedule or some time it organize too late also. So here it can be conclude that accessibility is not the prime issue related to participation but time and willingness is more important. Figure 4.1 shows the snapshots of the De Magneet (community center) and neighbourhood meetings. Map 4.24 shows the perceived service accessibility to post and bank services. These sorts of services are also part of their scheduled life style. Wesselerbrink have few banking and a post office in central part which has good accessibility from surrounding areas, however once distance increases perceptions also changes. This is also not true in some cases. According to discussion with few of the families, it was concluded that they have work place in Enschede or other city and always using these services from their work place.

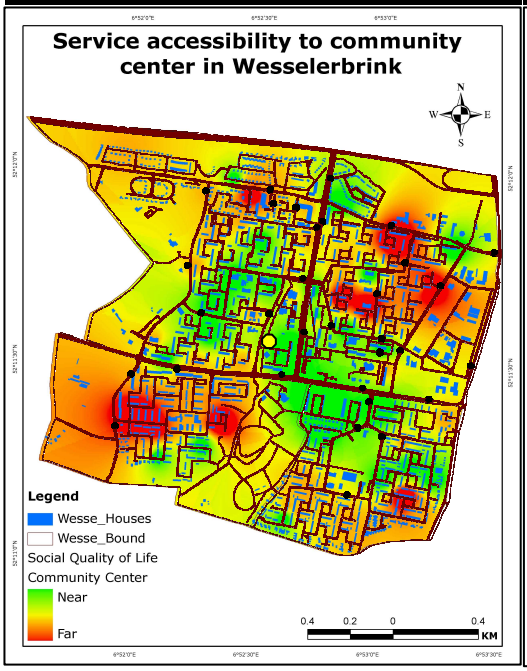
Map 4.21 Service accessibility to health care facilities in Wesselerbrink



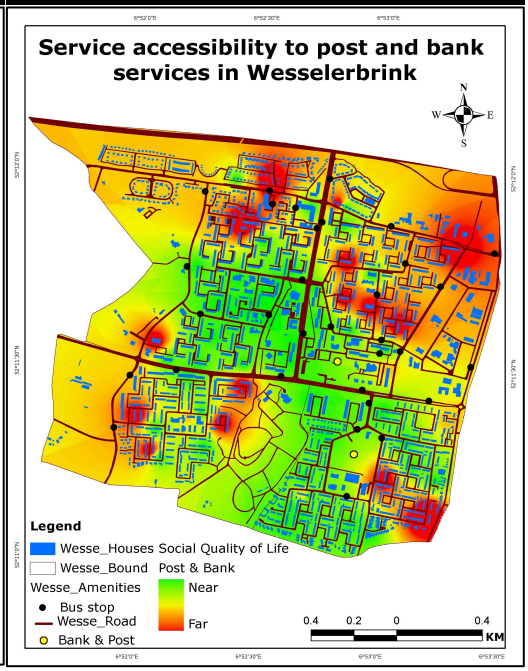
Map 4.22 Service accessibility to market place facilities in Wesselerbrink



Map 4.23 Service accessibility to community center in Wesselerbrink



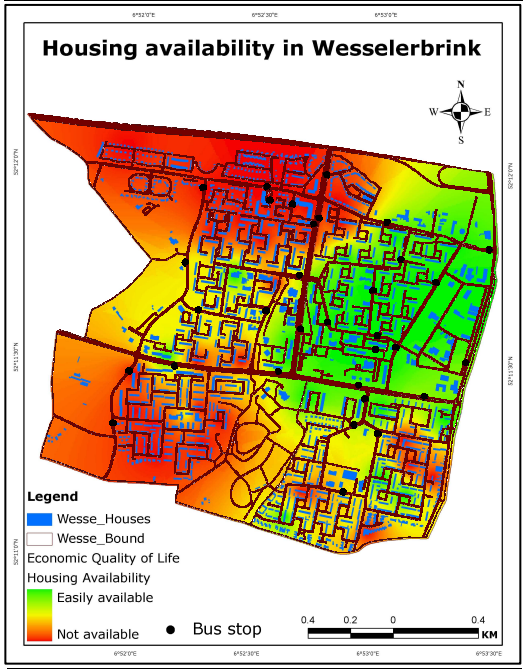
Map 4.24 Service accessibility to post & bank facilities in Wesselerbrink



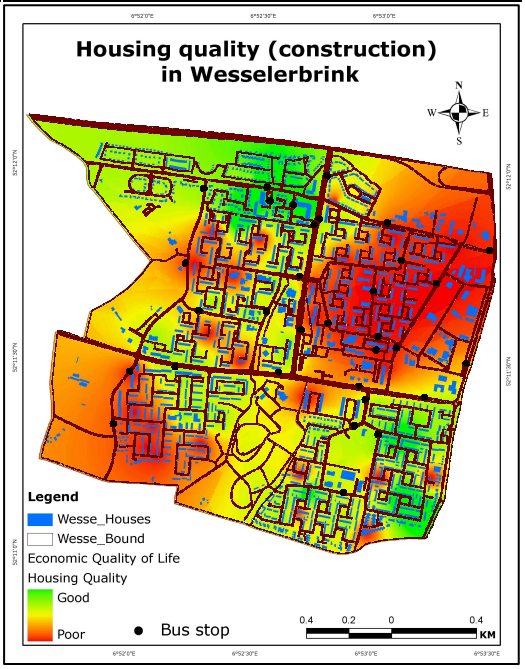
4.4. Visualization of economic quality of life:

In this section of chapter, results related to economic quality of life are discussed. Map 4.25 shows the inhabitants perception about housing availability in different part of Wesselerbrink. North-east and some other part of Wesselerbrink perceived an easy availability of residential housing by inhabitants. Other than these areas, most of the part of neighbourhood perceived less availability of houses on rent or to purchase. As per the discussion with neighbourhood inhabitants, North-east part which have many old constructed buildings and have all sorts of safety issues is a less preferred place to live and because of that housing cost are also low in these areas. According to pervious discussion these areas also performed as low physical as well as social quality of life. North-west, South-west and South-east part of Wesselerbrink are preferred places by immigrants from different countries such as Syria and Turkey. These parts of neighbourhood have average 32 percent population from non-western foreign background (refer Table 3.1) and have tendency to live in same areas which also make housing unavailable. Map 4.26 shows the houses with their different construction period and quality according to inhabitants. North-west part of Wesselerbrink have newly constructed houses and which makes it most preferred place to live with high housing cost for rent as well as to purchase (refer Map 4.23). This map also supports the previous statement about North-east and other areas which have old construction houses and have more housing available. Map 4.27 shows the map of housing cost in different part of Wesselerbrink. Most of the part shows high housing cost are north-west, south-west and some areas of south-east. South-west and south-east perceived old construction of houses in map 4.22 even though these are the very preferred place by immigrants and which increases housing cost. Population density is also very high in these areas (refer Table 3.1). Map 4.28 shows the overall travel cost in Wesselerbrink. This cost includes inhabitants travel to work place as well as for purchase their daily consumer things. Most of the areas which represents and perceived inaccessible by public transport shows higher travel cost in Wesselerbrink. In south-east and south-west part inhabitants are mostly using their own vehicle to travel and because of that these areas shows high travel cost. According to discussion with inhabitants, some times public transport frequencies and routes are not match with their daily travel schedule and this is also one the reason to use own vehicle to travel.

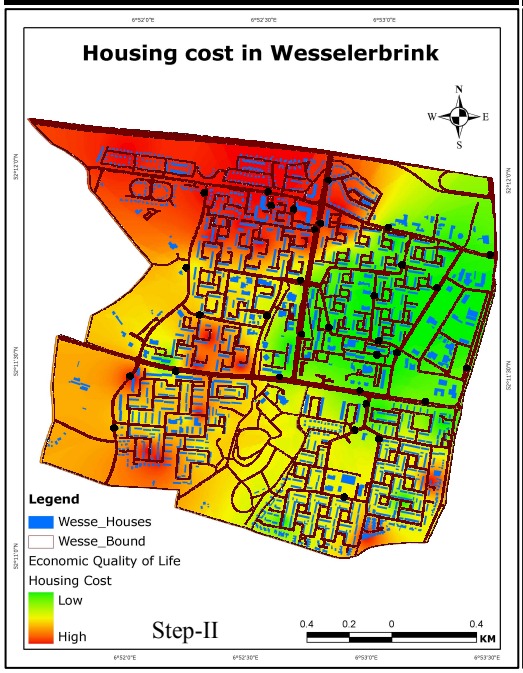
Map 4.25 Housing availability in Wesselerbrink



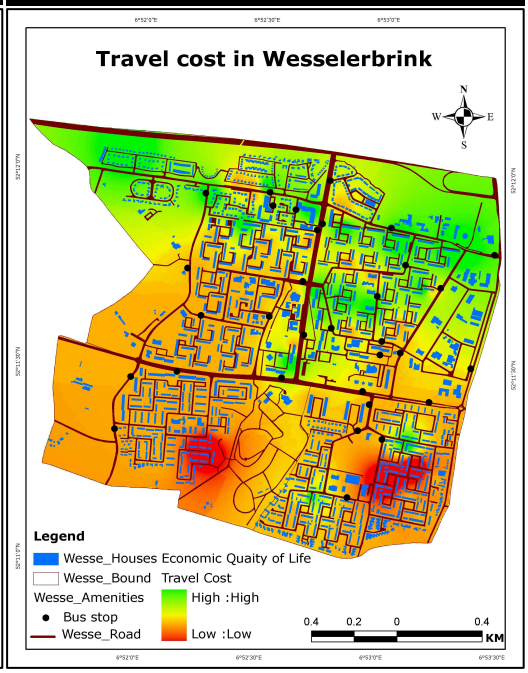
Map 4.26 Housing quality (construction) in Wesselerbrink



Map 4.27 Housing cost in Wesselerbrink



Map 4.28 Travel cost in Wesselerbrink

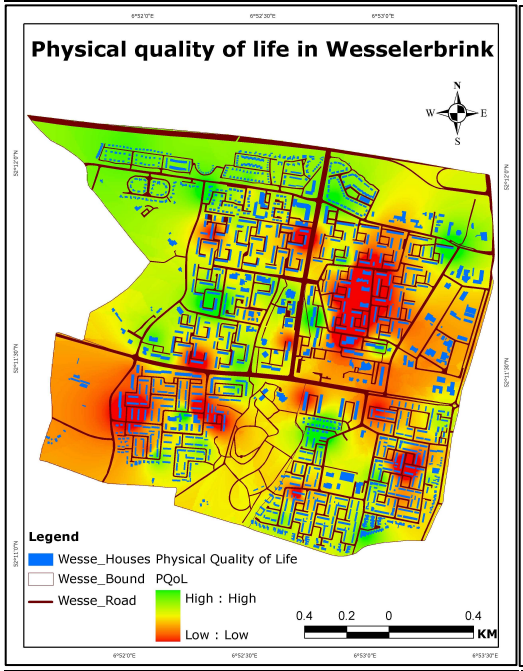


4.5. Visualisation of composit quality of life:

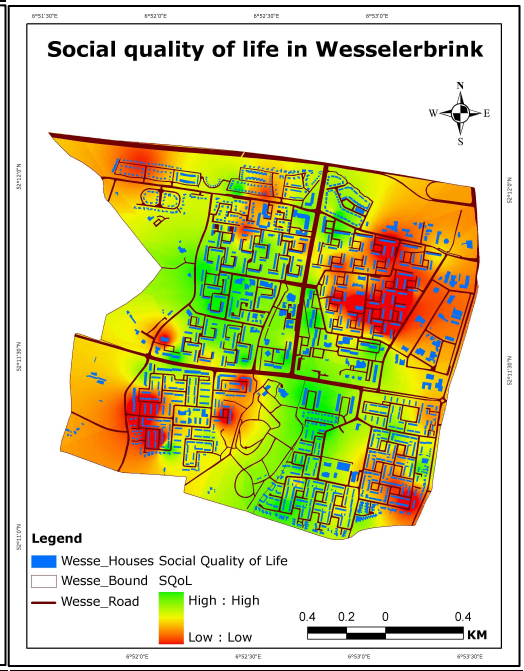
Results of composite quality of life are discussed in this section of chapter. After achieving the results on each indicator, inhabitants were asked to prioritize these indicators to visualize the perceived quality of life for each indicator themes such as physical, social and economic. In continuation with this each indicator were prioritized to know the overall perceived quality of life. Map 4.29 shows the perception about overall physical quality of life. This map shows that North-west part perceived a good quality of life and South-east perceived as satisfactory physical quality of life. North-east and South-west part of Wesselerbrink perceived a low physical quality of life and also have negative perception about it. Indicator measures such as road asphalt quality, road marking quality, traffic quality and congestion, vehicle parking, street cleanness and side walk quality are highly prioritize to improve and require more focus by municipal authorities (refer annexure 5). Aesthetic improvements of brinks and houses under Kultuurstraat project are much appreciated by inhabitants. Map 4.30 shows the overall social quality of life in Wesselerbrink. In this map North-east and South-west part perceived low social quality of life. In previous discussion also these parts were highlighted because of safety issues and youth problems. Indicators measures such as safety at public transport, home, brink, parks and accessibility to recreational and cultural center are highly prioritize and require more municipal attention (refer annexure 5).

Map 4.31 shows the inhabitants perception about economical quality of life. Areas such as North-west part which has high housing cost and travelling cost are perceived as low economic quality of life but at the same time living standard in these areas also high. South-east and west part has high cost because most of the immigrants prefer to live in these areas as well as housing units are also less in number in comparison with other part of Wesselerbrink (see table 3.1). Map 4.32 shows the overall quality of life based on above discussed three indicators i.e. physical, social and economical. Inhabitants were asked to prioritize these indicators (see annexure 5). Physical indicator is highly prioritized followed by social and economical indicators. According to overall quality of life map, North-east and South-east parts requires constructive improvement. In theses areas certain problems such as safety, youth problem, and issues related to daily life can be resolve by involving inhabitants in neighbourhood meetings or arrange meeting according to their time and place availability.

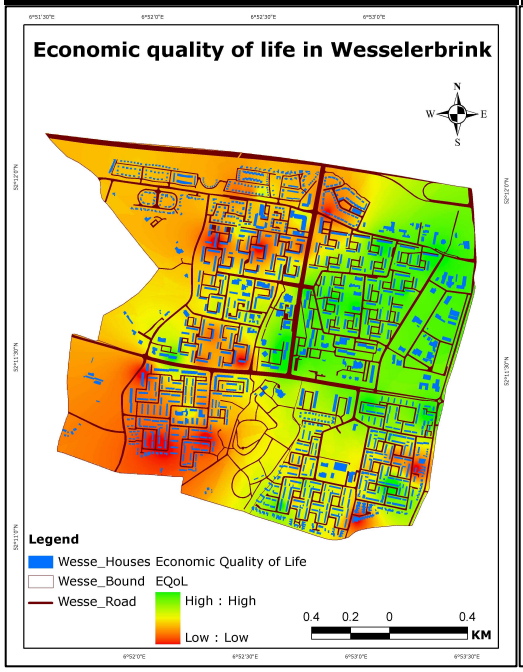
Map 4.29 Physical quality of life in Wesselerbrink



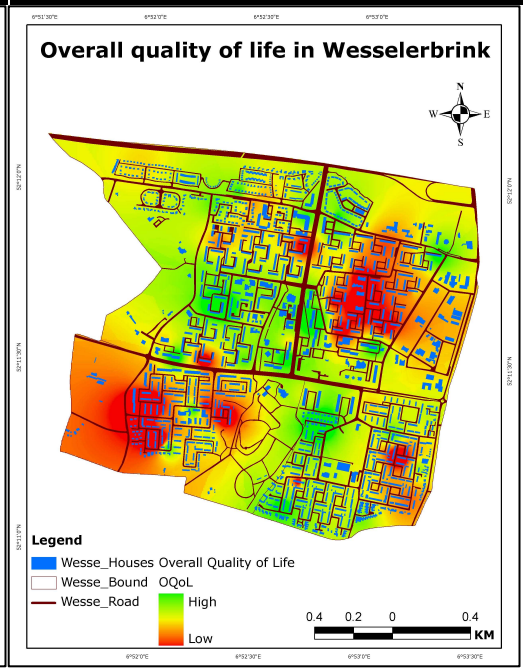
Map 4.30 Social quality of life in Wesselerbrink



Map 4.31 Economic quality of life in Wesselerbrink



Map 4.32 Overall quality of life in Wesselerbrink



4.6. Pro and Cons of quality of life in Wesselerbrink:

Issues related to quality of life in reference to Wesselerbrink neighbourhood are summarized in this section of chapter as pros and cons. The issues discussed here are mainly based on the inhabitant's opinion in different discussion and retrieved from primary survey as well (see Annex 1 and 6).

4.6.1. Pros:

- Trees and landscaping
- Road connectivity
- Less physical constraint
- Planned development and landuse
- Low Floor Space Index (FSI) and high urban porosity

Trees and landscaping is perceived as one of the pro of Wesselerbrink quality of life which visualized in Map 4.9 and also shows in Figure 3.1. Wesselerbrink has good road connectivity as well as less physical constraint for future development (Map 3.4). Another pro which differentiates this neighbourhood from other is Wesselerbrink has planned development as well as landuse (Map 3.3). The Wesselerbrink has low FSI as well as high urban porosity which makes good living environment.

4.6.2. Cons:

- Side walks and street cleanness
- Road asphalt and marking quality
- Safety issues at public transport and brink
- Vehicle parking, traffic congestion and noise pollution
- Parks maintenance and furniture quality

The issues mentioned above in this section are negatively perceived by inhabitants and highly prioritized for improvement. Street cleanness and side walks are highly prioritized and visualized by Map 4.3 and 4.4. Road asphalt and marking quality are prioritized and perceived also as negative aspect of quality of life. These issues are visualized by Map 4.1 and 4.2 in previous chapter. Safety at public transport stops, parks and brink are other major issues to be concern in Wesselerbrink (Map.4.13, 4.14 and 4.16). Vehicle parking, traffic congestion and noise pollution are visualized Map 4.5, 4.6 and 4.7. These areas also require specific attention of municipality to overcome negative perception. From the above discussion it concludes that areas which perceived low quality of life are not improved and need specific attention of urban local government where as areas which perceived high or satisfactory quality of life are esthetically improved under 'Kultuurstraat' project or newly developed.

Chapter 5. Conclusion:

This chapter presents conclusions of the research. Results on visualization of perceived quality of life in Wesselerbrink neighbourhood are summarized in this chapter.

5.1. General conclusions:

In the present research main importance has been given to inhabitant's perception and its variations based on different subjective indicators, available urban basic services and amenities. For this research indicator themes and their indictors have been selected by literature review and discussed its applicability in study area with different stakeholders. The discussions on indicators selection and prioritization were based on participatory approach, where communications and dialogues from both side were maximum utilized. Further more, relevance of these selected indicators with BIG City policies has been compared. Most of the indicators are also used in Dutch 'Quality of Life Barometer'. Non-relevant indicators to the study area were removed. Selected indicator and selection procedure of these indicators under this study were presented and discussed with subject expert Wong (2008) and Ghose (2008).

Stakeholders were identified in pre field stage. These stakeholders were discussed and interviewed afterwards during the research in Wesselerbrink. These stakeholders are experiencing day to day life of the Wesselerbrink and their perceptions about quality of life are more significant in their surroundings and in neighbourhood. Stakeholders were divided in two parts for ease of discussion. First group of stakeholders were inhabitants and local public leaders, where as second group of stakeholders were municipal officials, knowledge consultant, current researchers, housing societies owner and police officials.

Primary data on inhabitant's perceptions were collected by a questionnaire survey. Inhabitant's perceptions were based on their daily experience. A presentation on research work was given during neighbourhood meeting of Wesselerbrink. This provides a good platform in research for knowing the views of inhabitants and convinces them about survey. Inhabitants were informed in advanced before conducting survey through local news paper with the help of municipality, which facilitate the primary survey more comfortable. The questions which were asked in questionnaire linked with visual effect and converted in Dutch language. This is a well established tool

named ‘Quality of Life Catalogue’ under ‘Kultuurstraat’ project. It facilitates them to think at same level while answering the questions. Questions in the questionnaire were based on the Likert scale, which is known as psychometric scale in inhabitant’s perceptional studies. Inhabitants also asked to weight the indicators themes and indicators. The questionnaire were explained properly and given with researcher’s self addressed-postal stamped envelope. This gave inhabitants to more time to think and answer. A similar sort of questionnaire was prepared for online survey with using online survey software, Survey Monkey. Online questionnaire was prepared to cover those inhabitant’s views and perceptions that have different work schedule and don’t want to directly participate in survey. Research was carried forward only with the household survey because inhabitant’s not responded in online method of survey. Household survey was carried out with GPS to get spatial location of surveyed houses.

The inhabitant’s perceptions on quality of life were spatially interpolated with different methods such as Thiessen polygon, IDW, Local polynomial and Kriging. Finally well established IDW method was used. This method was also discussed with Ellul (2009) and Bonnes *et al.* (2009). In this method analyst achieved low ME and RMSE in results and produced more realistic results. The results of spatial interpolation method were multiplied with weights given by inhabitants and get weighted maps for each indicator themes and indicators. Summation of these weighted maps was executed through weighted sum method to get final map of overall quality of life. According to discussion with Ellul (2009) and Bonnes *et al.* (2009) inhabitant’s perceptions about quality of life give us very fruitful information about the area, which can not be gathered from objective indicators. This method has been successfully implemented in ongoing research in U.K. i.e. ‘Perceptions of street safety to increase access to public transport.

5.2. Specific conclusions:

5.2.1. Main objective:

The main objective of this research was to visualize the perceived quality of life according to subjective indicators and inhabitant’s preference in Wesselerbrink neighbourhood using participatory approach. Research objective and sub objectives were prepared in such a manner that it can give maximum understating on urban hierarchy, urban and neighbourhood development policies, public participation, subjective indicators development and visualization tools such as GIS and supports to achieve the

main objective. Urban development policies were reviewed to know the relevance of the present study at smallest unit of urban hierarchy which is neighbourhood. The research has shown that neighbourhood is a well recognized unit of urban hierarchy in the Netherlands and also demonstrates that public participation and inhabitant's observations and views are very significant to qualitatively and quantitatively analyze any urban area. The research has shown that visualization of perceived quality of life facilitate analysis and decision making. However the research has also illustrates quite difference in perception about quality of life within brink as well as in neighbourhood.

5.2.2. Sub-objective 1:

To review the urban development policies with special reference to neighbourhood development in the Netherlands

Urban as well as regional and socio-economic development is well supported by policies in The Netherlands. After 1994, The Netherlands have very effective policies which are fully focused on urban neighbourhood issues and these policies are known as 'Big City Policies'. These BCP's are playing a very significant role to upgrade the low income urban neighbourhood. The BCP are also very much focused to build mixed neighbourhood with restructuring the relatively low income neighbourhood. This was put into practice through demolish the low income housings and replaced by mixed good looking expensive houses to make neighbourhood more attractive and aesthetically improved. These BCP's are also focused towards build stronger and integrated neighbourhoods. Neighbourhoods are well recognizes as one if the main elements of urban fabric after these policies. The Netherlands also have a very good urban hierarchy to implement urban development plans. It analyzed from sample survey figures, that 95 percent people have awareness about these policies and development work in Wesselerbrink. In conclusion, The Netherlands have enough and effective neighbourhood development policies and some of them are under implementation stage using peoples perceptions such as 'Kultuurstraat project'.

5.2.3. Sub-objective 2:

To develop subjective indicators of quality of life using a participatory approach

Subjective indicators of quality of life were selected by literature review and prioritized by public participatory approach. Spatial applicability of these developed indicators to the study area was also observed by different level of

public participation. Most of the indicators and indicator themes which are selected and used in this study have good support by urban development policies. These indicators were divided into three different indicator themes, i.e. physical, social and economical for better understanding, visualization and ease of analysis. Other indicators such as air and water pollution, solid waste management under environmental theme were removed as there is no applicability to the study area after many round of discussion.

5.2.4. Sub-objectives 3:

To use GIS as a supporting tool to visualize the perceived quality of life in Wesselerbrink

GIS was extensively used by ArcMap and ILWIS software in this study. It executed lot of tasks by using different analytical tools. Visualization is core of the present research which was effectively achieved by using above mentioned GIS software. Spatial analysis distinguishes GIS from general information system and which was fully utilized. Spatial analysis tools such as spatial interpolation, overlaying, reclassifying, feature to raster and vice versa were effectively and logically used. In conclusion, GIS is one the effective and supporting tool to visualize the perceived quality of life and it also provide a good platform to communicate the spatial information.

5.2.5. Sub-objective 4:

To visualize the present situation of perceived quality of life in Wesselerbrink

The perceived quality of life based on subjective indicator is effectively visualized in this study. Each indicator is visualized first and after that different theme. Areas which have different level of perceived quality of life (i.e. low, satisfactory and high) visualized and discussed simultaneously. The inhabitants of Wesselerbrink show different perception on different indictors and indicator themes as well. The inhabitant's perception is varies within different parts of neighbourhood and brink as well. North-east and South-west parts of Wesselerbrink perceived as a low physical and social quality of life, where as North-east part economically perceived good. North-west and South-east parts perceived physically and socially well, however economic quality of life is not satisfactory in these parts. In conclusion, there is a quit difference on perception about quality of life within brink as well as in different parts of neighbourhood. This visualization will facilitate municipal official to understand diversified perception about quality of life and improve overall quality of life.

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Annexure 1

Participatory Neighborhood Development in Enschede

(This document is confidential and will use only for research purpose by student)

Interview Time: **Date:**

House No. _ _ _ _ _ _ _ _ _ _ (Optional)

Street Name _ _ _ _ _ _ _ _ _ _ _ _ _, Wesselerbrink, Enschede

What is?

Age of Interviewee:

How many?

No of rooms:

No of persons residing:

How long have you been living in this Neighbourhood?

☐ Less than 5 years ☐ 5 - 10 years ☐ 10 - 15 years

☐ More than 15 years

Have you changed your residence, if yes, than why?

☐ Yes ☐ No

Where was your previous residence?

Do you have rented/own house?

When was your house built (in years)?

What is the highest level of education within your household?

1. Physical Indicators of Quality of Life:

1. How do you assess the **Road Asphalt Quality** in your neighborhood?



☐ Good ☐ Satisfactory ☐ Poor

2. How do you assess the **Road Marking** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

3. How do you assess the **Streets Cleanness** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

4. How do you assess the **Side Walks** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

5. How do you assess the **Traffic Quality and Congestion** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

6. How do you assess the **Vehicle Parking** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

7. How do you assess the **Trees and Landscaping** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

8. How do you assess the **Parks and Natural Areas** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

9. How do you assess the **Quality of Furniture in Parks** in your neighborhood?

☐ Good ☐ Satisfactory ☐ Poor

10. How concerned are you about **Graffiti Issue** in your neighbourhood?



☐ Acceptable ☐ High ☐ Very high

11. How do you assess the **Quality of Playing Areas for Children** in your neighborhood?



☐ Good ☐ Satisfactory ☐ Poor

12. How do you assess the **Noise Pollution** in your neighbourhood?

☐ High ☐ Low ☐ No noise pollution

13. What is the **Reason behind Noise Pollution** in your neighbourhood?



☐ Public Transport ☐ Loud Speakers ☐ Other

14. How satisfied are you with **Housing Quality** in your area?

☐ Good ☐ Satisfactory ☐ Poor

Please give your priority areas from above questions (1 to 14)													
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**

2. Social Indicators of Quality of Life:

2.1 Safety:

1. How safe do you feel in your neighborhood at **Home**?

☐ Safe ☐ Unsafe ☐ Very unsafe

2. How safe do you feel in your neighborhood on your **Brink**?

☐ Safe ☐ Unsafe ☐ Very unsafe

3. How safe do you feel in your neighborhood waiting for **Public Transportation**?

☐ Safe ☐ Unsafe ☐ Very unsafe

4. How safe do you feel in your neighborhood at a **Park**?

☐ Safe ☐ Unsafe ☐ Very unsafe

Please give your priority areas from above questions (1 to 14)			
1	**2**	**3**	**4**

2.2 Service Accessibility:

5. How accessible are **Health Care Facilities** from your home?

☐ Near ☐ Suitable distance ☐ Far

6. How accessible are **Food store or supermarket** in your area?

☐ Near ☐ Suitable distance ☐ Far

7. How accessible are **Parks** from your home?

☐ Near ☐ Suitable distance ☐ Far

8. How accessible are **Post Office** from you home?

☐ Near ☐ Suitable distance ☐ Far

9. How accessible are **Schools** from your home?

☐ Near ☐ Suitable distance ☐ Far

10. How accessible is **Public Transportation Facilities** from your home?

☐ Near ☐ Suitable distance ☐ Far

11. How accessible are **Libraries/Public Reading Facilities** from your home?

☐ Near ☐ Suitable distance ☐ Far

12. How accessible are **Cinema, Theatre or Cultural Centre** from your home?

☐ Near ☐ Suitable distance ☐ Far

13. How accessible are **Community Center** from your home?

☐ Near ☐ Suitable distance ☐ Far

14. How accessible are **Recycling Facilities** from your home?

☐ Near ☐ Suitable distance ☐ Far

Please give your priority areas from above questions (1 to 14)									
5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**

Note: Distance from your home

Near (500m – 1 km), suitable distance (1 km – 1.5 km), Far (> 1.5 km)

2.3 Community Participation and Involvement:

1. How many of your neighbors do you know? Bicycle

2. In the last 12 months, how many times have you socially interacted with your neighbors?

3. In the last 12 months, how many times have you participated in community meetings or activities?

4. In the last 12 months, how many times have you contacted a city employee about a neighborhood issue or concern?

5. In the last 12 months, how many times have you attended a city council meeting?

3. Economic Indicators of Quality of Life:

1. How do you assess the **Housing Availability** (to buy /to rent) in your area?

☐ Not available ☐ Satisfactory ☐ Easily available

2. How do you assess the **Housing Cost** (to buy /to rent) in your area?

☑ High ☐ Manageable ☐ Not expensive

3. How do you assess the **Travel Cost** of Public Transport?

☐ High ☐ Manageable ☐ Not expensive

4. How do you assess the **Purchase Cost** of daily consumer goods from local market?

☐ High ☐ Manageable ☑ Not expensive

Please give your priority areas from above questions (1 to 4)			
1	**2**	**3**	**4**

What is your priority aspect?

☐ Physical ☐ Social ☐ Economic

Please give your priority on above aspects (1-3)		
1	**2**	**3**

Open questions:

What would you say about three best things in Wesselerbrink?

1.

2.

3.

What would you say about three worst things in Wesselerbrink?

1.

2.

3.

For researcher use only:

Form No.

GPS Location/Coordinates:

X:

Y:

Annexure 2

Article published in news paper on primary research findings.

'Huis aan Huis', Enschede
Wednesday, 19th November, 2008

Plaatjes maken in Wesselerbrink

Lalit Kumar Dashora is student aan het ITC. Hij is bezig met een onderzoek naar leefbaarheid in de Wesselerbrink. FOTO: ROBERT HOETINK

ENSCHEDE - Wie kunnen beter in de Wesselerbrink aangeven wat er verbeterd moet worden in hun wijk dan de bewoners zelf? Precies, niemand! Daarom betrekt Lalit Kumar Deshora uit India juist hen bij zijn onderzoek naar leefklimaat en buurtontwikkeling in de Wesselerbrink.

Deshora studeert aan het International Institute for Geo-Information Science and Earth Observation (ITC). Zijn onderzoek maakt onderdeel uit van een international programma. Voordat hij in augustus in Enschede neerstreek, heeft hij in Southampton (Engeland), Lund (Zweden) en Warschau (Polen) gestudeerd. Hij richt zich op de ontwikkeling van leefklimaat van stedelijke gebieden. Zijn doel is om een beeld te schetsen van de kwaliteit van het leven op basis van de fysieke, sociale en economische aspecten.

"Een plaatje zegt meer dan duizend woorden", vertelt Deshora. "Met moderne technologie kunnen we ontwikkelingsgebieden visualiseren. Het is belangrijk om hierbij de bewoners zelf hun mening te laten geven over hun buurt. Zij weten wat er speelt. Er zijn 100 mensen uit de Wesselerbrink, van jong tot oud, geselecteerd om mee te werken aan dit onderzoek. Het valt me op hoe enthousiast ze zijn om mee te helpen om het leefklimaat in hun buurt te ontwikkelen. Zij hebben ook oog voor de goede dingen in hun wijk." Deshora is momenteel nog bezig met de verwerking van de verzamelde gegevens. Hij wil de resultaten presenteren in maart volgend jaar. "Wel kan ik alvast zeggen dat mensen vinden dat er meer voorzieningen op het gebied van cultuur in de wijk mogen komen. Ook wonen veel mensen in vrij oude woningen. Die zijn vaak wat gehorig, de bewoners ervaren geluidsoverlast. Er zijn ook verschillen: in sommige gedeelten van Wesselerbrink is er wel een speelveldje, in een ander stuk weer niet. Wat verder opvalt is dat qua groen en veiligheid de wijk goed scoort."

Also available at:
http://www.enschede.nl/webs/stadsdeelzuid/00007/

Annexure 3

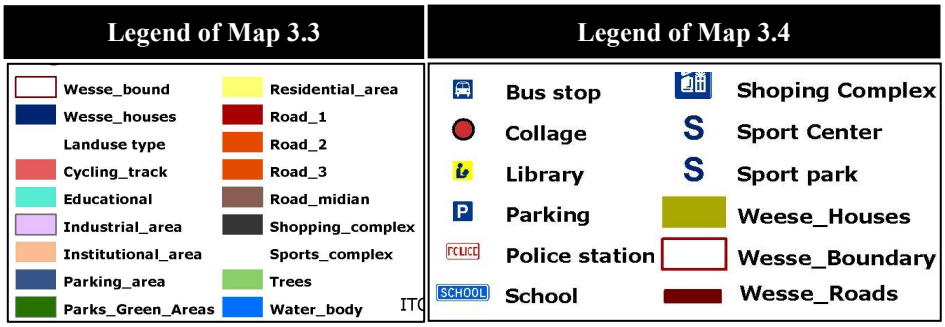
Poster presented in neighbourhood conference in Wesselerbrink

Het Bonhoeffer College, Vlierstraat 75, Enschede

Friday, 31th October, 2008

Also available at:
http://www.enschede.nl/webs/stadsdeelzuid/00005/00013/00001/kult_41.jpg/view.large.html.

Annexure 4



Annexure 5

List of 56 neighbourhoods and 32 municipalities which were priorities under Big City Policy-III (2004-2009).

Municipality	Names of the 56 deprived neighbourhoods
Alkmaar	Overdie/Schmereiland
Almelo	Almelo Zuidwest (Ossenkoppelerhoek/Kerkelanden)
Amersfoort	De Kruiskamp/de Koppel, Randenbroek/Schuilenburg
Amsterdam	Westelijke Tuinsteden, ZuidOost, Noord (De Banne/Nieuwendam Noord)
Arnhem	Presikhaaf, Malburgen
Breda	Breda Noord-Oost (Hoge Vlucht/Doornbos-Linie), De Heuvel
Den Bosch	Boschveld, Barten/Eikendonk/Hostad
The Hague	Zuidwest, Transvaal, Duindorp, Laakkwartier/Spoorwijk, Rustenburg/Oostbroek
Deventer	Rivierenwijk, Keizersland
Dordrecht	Dordrecht West (Oud Krispijn/Nieuw Krispijn/Wielwijk/Crabbehof)
Eindhoven	Woensel Zuid (Barrier/Woensel-West/Oud-Woensel), Tongelre (Doornakkers (and partly) Lakerlopen)
Emmen	Emmen Revisited (Angelslo, Bargenes, Emmerhout)
Enschede	Wesselerbrink, De Velve Lindenhof
Groningen	Vinkhuizen, Lewenborg
Haarlem	Delftwijk, Europawijk Zuid
Heerlen	Heerlen Stad Oost, Grasbroek/Musscemig/Schandelen
Helmond	Binnenstad-Oost
Hengelo (Ov)	Berflo Es
Leeuwarden	Achter de Hove – Vegelin, Vrijheidswijk
Leiden	Leiden Noord (Groenoord/Noorderkwartier/De Kool), Leiden Zuid-West
Lelystad	Zuiderzee/Atol
Maastricht	Maastricht Noordwest (Malberg/Boschpoort)
Nijmegen	Willemskwartier
Rotterdam	Zuidelijke Tuinsteden (Pendrecht, Zuidwijk, Lombardijen), Oud Zuid (Katendrecht, Afrikaanderbuurt, Tarwewijk, Bloemhof). Crooswijk Noord, Rotterdam West, Hoogvliet
Schiedam	Nieuwland/Groenoord
Sittard-Geleen	Lindenheuvel
Tilburg	Oud Zuid, Nieuw Noord
Utrecht	Overvecht Zuid, Kanaleneiland Noord, Hoograven, Zuilen/Ondiep
Venlo	Q4
Zaanstad	Zaandam Zuidoost
Zwolle	Holtenbroek

Annexure 6

Annexure 5 shows weights assigned to indicators and indicators measures.

Weights assigned to indicators themes and indicators			
Indicator themes	**weights**	**Indicators**	**weights**
Physical	0.500	Road asphalt quality (paving)	0.105
		Road marking and traffic sign	0.095
		Street cleanness	0.133
		Side walks	0.124
		Traffic quality and congestion	0.114
		Vehicle parking	0.048
		Trees and landscaping	0.019
		Parks and natural areas	0.010
		Facilities in the parks	0.029
		Graffiti issues	0.057
		Playing areas for children	0.086
		Noise pollution	0.067
		Reason of noise pollution	0.038
		Housing quality (surroundings)	0.076
Social	0.333	Safety at home	0.133
		Safety at street (brink)	0.124
		Safety at public transportation	0.095
		Safety at parks	0.114
		Health care facilities	0.068
		Food store or supermarket	0.076
		Parks	0.048
		Post office	0.029
		School	0.010
		Public transportation	0.019
		Libraries/public readings facilities	0.083
		Cinema or cultural centre	0.105
		Community centre	0.067
		Recycling facilities	0.057
Economical	0.167	Housing availability	0.400
		Housing cost	0.300
		Travel cost	0.200
		Housing quality (construction)	0.100

Annexure 7

Criteria tree of ILWIS spatial multi criteria analysis.