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Title: Impact of Urban Design features on Happiness in Rotterdam

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Impact of urban design features on happiness in Rotterdam

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Summary

This study explains the impact of urban design features on happiness of residents in the neighbourhoods of Rotterdam, on account of subjective and objective measures, and associations with health and social ties. Looking at necessity to understand factors affecting well-being as well as to establish relationship between ‘importance of place and concept of happiness’, the study has intended to recognize remarkable urban design features that help in promoting happiness. The concept of happiness used in the research is self-reported individual ‘overall happiness’ which is combination of ‘*how well one feels generally*’ (aspect) and ‘*how favourable one compares with various standards of success*’ (appraisal).

Five urban design features- urban facilities, greenery, public space, transport nodes and mixed use were selected to analyse the relationship with self-reported happiness of the residents. Additionally, objective measures for selected urban design features were taken for all neighbourhoods of Rotterdam from municipality of Rotterdam that is a reliable source while subjective measures were collected only from two neighbourhoods- Cool and Terbregge, of Rotterdam because of constraints on time and resources. Selection of neighbourhood was done on the greater variance in urban design features of the two neighbourhoods. Cool is characterized as mixed land use and presence of physical infrastructure while Terbregge can be termed as sub-urban with abundance of natural elements.

Ordered probit model was used to examine association of urban design features with self-reported happiness. Both, objective and subjective, measures of urban design features were analysed separately to find their significance with happiness. Additionally, Big seven factors for happiness given by Richard Layard were taken as control variables in the modelling. Research statistics showed significance of objective measures of greenery and land use mix with happiness while on account of subjective measures, availability of daily need shops, public spaces and land use mix were relevantly associated with happiness. However, presence of transport nodes in the neighbourhood demonstrated non-significance with happiness on account of both the measures.

The research concluded the importance of urban design features for happiness. The way neighbourhoods are planned and built have relevant impact on well-being of the residents. However, on implications and applicability of specific features of urban design, it demands further investigations and suggests future guidelines for research because of the several limitations of the current study. The study findings also exhibited significance of both the measures of urban design for happiness. Happiness depends on perception as well as real qualities. Moreover, with the exhibition of importance of urban design for happiness, the research corroborated ongoing trend of inclusion of non-pecuniary measures, more specific physical environment, while assessing well-being.

Keywords

Happiness, Urban Design, Land Use Mix, Urban Facility, Greenery, Public Space, Transport Nodes.

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Abbreviations

IHS	Institute for Housing and Urban Development
GDP	Gross Domestic Product
NCD	Non Communicable Diseases
ONS	Office of National Statistics
QOL	Quality of Life
SCP	Smart City Planner
SWB	Subjective Well-being
SD	Standard Deviation
UK	United Kingdom
UN	United Nations

Table of Contents

Summary.....	iii
Keywords	iii
Acknowledgements	iv
Abbreviations	v
Table of Contents	vi
List of Figures.....	viii
List of Tables	viii
Chapter 1: Introduction	1
1.1 Background.....	Error! Bookmark not defined.
1.2 Problem Statement.....	2
1.3 Research Objective	5
1.4 Provisional Research Questions.....	5
1.5 Significance of the Study.....	5
1.6 Scope and Limitations	6
Chapter 2: Literature Review / Theory	8
2.1 Understanding happiness and Happiness research	8
2.1.1 The concept of happiness and its significance	8
2.1.2 Happiness economics	10
2.2 Urban design as important force for human health and conditions.....	12
2.2.1 Defining Urban design	12
2.2.2 Benefits of Urban design for health, social ties and wellbeing	12
2.3 Similar research	21
2.4 Conceptual framework	21
Chapter 3: Research Design and Methods	24
3.1 Revised research questions	24
3.2 Operationalizations: concepts, variables and indicators	24
3.3 Research strategies and approaches.....	28
3.4 Data collection & sample size	28
3.5 Data analysis methods	29
3.6 Reliability and validity	30
Chapter 4: Research Findings and Analysis	32
4.1 Part 1: Analysis of objective measures of urban design with happiness	32
4.1.1 Descriptive Statistics	32
4.1.2 Statistical Analysis	33
4.2 Part 2: Analysis of subjective measures of urban design with happiness.....	34
4.2.1 Description of neighbourhoods: Cool and Terbregge	34

4.2.2 Descriptive Statistics	34
4.2.3 Statistical Analysis	36
4.3 Part 3: Discussion	37
4.3.1 Interpretation and explanation of Statistical findings	37
4.3.2 Applicability of Research Conceptual Framework	42
Chapter 5: Conclusions and recommendations	44
5.1 Research findings reflections and answer to research questions	44
5.2 Guidelines for further research for generalization of findings.....	45
5.3 Conclusions	46
5.4 Policy Recommendations	48
Bibliography	49
Annex 1: Research Instruments (Survey Questionnaire: English version).....	56
Annex 1: Research Instruments (Survey Questionnaire: Dutch version)	58
Annex 3: Marginal Effects (1)	60
Annex 4: Marginal Effects (2).....	61
Annex 5: IHS copyright form	62

List of Figures

Fig. 1: Components of overall Happiness.....	9
Fig. 2: Link of built environemnt, walkability and social ties	13
Fig. 3: Urban design interventions as applied in compact cities model.....	14
Fig. 4: Benefits of nature for stress reduction and prevention of NCD	19
Fig. 5: Research conceptual framework.....	21
Fig. 6: Proposed conceptual framework for further research.....	46

List of Tables

Table 1: Urban design interventions and features that enhance health and well-being	13
Table 2: Criteria for selecting urban design features	24
Table 3: Objective measures of urban design features	25
Table 4: Operationalization table (I)	26
Table 5: Operationalization table (II)	27
Table 6: Research appraoch	28
Table 7: Data analysis method.....	30
Table 8: Descriptive statistics for happiness.....	32
Table 9: Descriptive statistics for control variables	32
Table 10: Descriptive statistics for objective measures of urban design features.....	33
Table 11: Model 1	33
Table 12: Descriptive statistics for happiness	35
Table 13: Descriptive statistics for control variables	35
Table 14: Descriptive statistics for subjective measures of urban design.....	36
Table 15: Model 2	37

Chapter 1: Introduction

1.1 Background

“Cities are viewed as the must-be places to provide not just quality of life but also the cultural excitement, manifold thrills and indeed “happiness” that one has come to associate with an urban way of life” (Macleod, 2014, p.583).

Urban places are known as fascinating, diverse, dynamic, thriving and heterogenous (Potapov, Shafranskaya, *et al.*, 2016, Callatary, Svanfekdt, *et al.*, 2011, Polèse and Stren, 2000) but can also be violated, ignored, polluted and crime ridden (Leyden, Goldberg, *et al.*, 2011, Dolan and Metcalfe, 2011). Increasingly, these spaces have to be recognized powerful as they are the places that make differences in people’s life. Along with the economic powerhouses of their nations (Martin and Sunley, 2015, Brereton, Clinch, *et al.*, 2008, Rogerson, 1999), cities have capabilities to become immense sources of wellbeing (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Montgomery, 2013, Burdett and Taylor, 2011, Gehl, 2006, Jackson, 2002, Jacobs, 1961). Consequently, cities found a prominent place in the United Nations sustainable development goals (United Nations, 2015). Per UN sustainable development goal 11 *“make cities and human settlements inclusive, safe, resilient and sustainable by 2030”*.

‘Beyond GDP’ is a buzz word today. There is an increasing awareness with the wellbeing of a society along with economic statistics (Dolan and Metcalfe, 2011, Burdett and Taylor, 2011, Dolan, Peasgood, *et al.*, 2007) to get wider overview for society’s performance to measure its success. Moreover, to integrate indicators of wellbeing with country’s progress, former French President Nicolas Sarkozy authorized a panel of Nobel laureates Joseph Stiglitz and Amartya Sen. Stiglitz committee recommends *“to shift emphasis from economic production to measure of people’s well-being”* (Stiglitz, Sen, *et al.*, 2008, p.12) and additionally, report defines well-being as multi-dimensional concept comprising of pecuniary and non-pecuniary factors including income, health, education, social connections and environment (Stiglitz, Sen, *et al.*, 2008). Additionally, increasing awareness of wellbeing as broader measure of progress prompted national survey of happiness in the United Kingdom (Taylor, 2015).

Consequently, understanding the nature of well-being and factors affecting it is a necessity for people’s welfare and societal performance (Taylor, 2015, Dolan and Metcalfe, 2011, Burdett and Taylor, 2011, Stiglitz, Sen, *et al.*, 2008, Dolan, Peasgood, *et al.*, 2007). What are the causes and consequences of well-being? How to assess well-being? There is a growing trend to represent well-being in subjective terms, subjective well-being or happiness (Dolan and Metcalfe, 2011). The term ‘happiness’ has now become a broader umbrella concept (Veenhoven, 2009, Frey and Stutzer, 2002, Veenhoven, 1991, Veenhoven, 1984), not limited to capturing good moods or exhibiting pleasant moments only (Frey and Stutzer, 2002), but inclusive of *‘how well we are doing’* (Veenhoven, 2000). Also, happiness is considered not as subject of outlook that exhibits mental constructs only, instead, it reflects realities of life too (Veenhoven, 1991). Happiness, recognized as ultimate motive of any human being (Frey and Stutzer, 2002), is defined as *“how much one likes the life one lives”* (Veenhoven, 2009, p.45). Moreover, there is increasing evidence for epitomising happiness as ‘new GDP’ or counter measure of GDP (Taylor, 2015). Subsequently, the study of happiness is gaining momentum and happiness economics has become a rapidly growing field that illustrate the ways wellbeing can be measured and enhanced.

With shifting focus on non-financial measures, subjective factors are also gaining importance in happiness studies. Income, health and social ties are recognized as key predictors of happiness (Leyden, Goldberg, *et al.*, 2011) in well-being economics. Apart from income, numerous studies demonstrate significant effects of health on well-being (Praag and Ferrer-i-

Carbonell, 2010, Dolan, Peasgood, *et al.*, 2007, Layard, 2005, Frey and Stutzer, 2002). Even few studies assert relevance of mental health more than income for well-being (Wilkinson and Pickett, 2009). Social scientist Robert Putnam reported “*happiness is best predicted by the breadth and depth of one’s social connections*” (Putnam, 2000, p.332). Also, various research have proven the significant role of physical and social environment for improving health, wealth and social connectedness (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Foster, Giles-Corti, *et al.*, 2010, Foster and Giles-Corti, 2008, Cao, 2006, McCulloch, 2003) and thus, they are becoming significant for measuring happiness along with economic measures. Britain’s former Prime minister David Cameron also stated relevance for living environment for happiness, “*Wellbeing can't be measured by money or traded in markets. It's about the beauty of our surroundings, the quality of our culture and, above all, the strength of our relationships*”. However, the seminal work of Jane Jacobs “The death and life of great American cities” is considered as pioneer work to focus on the aspects of city planning, urban planning and design for well-being (Jacobs, 1961) and the master piece is termed as “*a magnificent study of what gives life and spirit to the city*” by William H. Whyte.

Instead of wider emphasis on living environment and its broader applicability, what are the implications of happiness economics for urban development, urban design, urban and transport planning? What is relationship between importance of place and concept of happiness? Is there necessity for researchers of urban place and urban policy to engage with the subject of happiness? In this respect, the current study explains the impact of urban design features on happiness among residents in the neighbourhoods of city of Rotterdam. In general terms, urban design is the physical setting of life in an urban context. It is art of place making and includes buildings, group of buildings, landscapes and spaces, and establishment of framework of transport, built forms and other physical attributes to make suitable places for things and to structure activities and events.

Indeed urban design and planning are important (Montgomery, 2013, Gehl, 2006, Jackson, 2002, Jacobs, 1961). Haussmann’s plan for Paris is an epitome of the significance of physical environment to human health and living conditions (Burdett and Taylor, 2011). Even in post-industrial era, the relevance of urban design was tremendous for improving human health (Jackson, 2002). An increasing body of literature consistently recognises the significance of design of living spaces and related patterns for public health spheres and social connections (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Wood, Frank L., *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Cao, 2006, Foster, Giles-Corti, *et al.*, 2010, Foster and Giles-Corti, 2008, Wood, Shannon, *et al.*, 2007, Mullan, 2002, Onyx and Bullen, 2000).

1.2 Problem Statement

Our limited ability to explore the determinants of wellbeing in cities restrict us to figure out the performance of cities. Paul Dolan and Robert Metcalfe in their publication “Movin’ on up: happiness and urban economics” state about the lack of evidence on what makes us happy which includes the attributes of neighbourhoods and cities (Dolan and Metcalfe, 2011). They also pointed out about the dearth of strategy and suitable data to find out precisely the determinants of wellbeing in urban areas. The economic resources are limited and not possible to optimise them always but happiness can be enhanced through proper interventions in design and planning. Indeed, design and planning of spaces have potential to enhance people’s lives (Montgomery, 2013, Jackson, 2002, Putnam, 2000, Jacobs, 1961). However, it is also evident that they have power to deteriorate quality of life (Foster, Giles-Corti, *et al.*, 2010, Ross and Jang, 2000, Skogan and Maxfield, 1981). Therefore, there is necessity in the field of urban

economics for direct assessment of wellbeing and behaviour outcomes of urban places (Dolan and Metcalfe, 2011).

Emphasis on places for well-being leads to growing amount of literature on ‘geographies of happiness’ underpinned by ‘economics of happiness’ (Morrison, 2011). In this context, there has been increasing interest for assessment of urban environment for human welfare and well-being. Several studies reveal that human welfare and happiness are influenced by physical environment (Potapov, Shafranskaya, *et al.*, 2016, Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, Morrison, 2011, Leyden, Goldberg, *et al.*, 2011). The study for 12 settlements in New Zealand attempted to explore “*how city-specific effects influence peoples’ subjective appreciation of their quality of life in that city*” (Morrison, 2011) by controlling for traditional predictors of well-being along with socio-demographic factors. Findings depicted inverse association of subjective well-being with densely populated environment (Morrison, 2011).

Still, there is necessity to emphasis profoundly on the role urban design and planning interventions and discover fully the interlinking between significance of living environment and concept of happiness. How variations in spatial characteristics within cities affect happiness? Why there is significant difference in levels of happiness within similar urban context even after adjusting income and personal attributes? Additionally, there is an ongoing international debate on significance of mixed type and sub-urban development for well-being (Jackson, 2002). New urbanism consistently supports for walkable mixed land use neighbourhoods for sustainable development (Lund, 2003, Leyden, 2003, Lund, 2002) while proponents of sub-urban development refute these claims and categorise presence of multiple destinations as detrimental for social connectedness and well-being (Hart and Parkhurst, 2008, Ross and Jang, 2000). Interestingly, mixed evidence has been found for significance of land use mix for well-being in studies (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002) .

People who live on busy streets and with multiple destinations, knew very few neighbours, suggesting that presence of outsiders and heavy traffic deteriorates their sense of community as these hinders them to go out and mingle with locals (Hart and Parkhurst, 2008). On the contrary, Leyden (2003) demonstrated that presence of destinations promotes walking and hence physical activities as well as sense of community (Leyden, 2003). Moreover, academia of physical activity differentiates the types of walking in brisk and leisure walking (French, Wood, *et al.*, 2014) and contradictory findings has been reported for relevance of walking types for health and social cohesion (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010). Therefore, there is need to outline specific characteristics of urban design that are significant for well-being in traditional as well as sub urban neighbourhoods and hence, to redefine the term ‘smart growth’ which is currently limited with mixed type of development.

Furthermore, the subject of presence of transport nodes and urban amenities in the locality are also pressing issues in the contemporary world. Shift from private automobile use to active transport and convenient public transport will promote happiness among residents? Are presence of urban amenities within walkable distance enhances well-being or accessibility to leisure and recreational places not relevant? Additionally, there is also merit to investigate in the matters of one of the key features of urban design i.e. public spaces that are recognised as measure for quality of urban life. Are public gathering places relevant for health and connectedness with people apart from their scenic and aesthetic criteria? Because of symbolised as fundamental features of urban areas, the restoration and revitalisation of public spaces in city centres as well as in neighbourhoods are major policy concern in the UK (Cattell, Dines, *et al.*, 2008). Furthermore, the discussion on physical environment is incomplete without

emphasizing on nature and natural elements. Numerous studies depict wider applications of natural ecosystems on mankind (Bosch, 2017, Alcock, White, *et al.*, 2014, French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Berg, Winsum-Westra, *et al.*, 2010, Wood, Frank L., *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Wakefield, Yeudall, *et al.*, 2007, Nielsen and Hansen, 2007, Groenewegen, Berg, *et al.*, 2006, Jackson, 2002, Kuo and Sullivan, 2001, Kaplan, 1995, Ulrich, Simons, *et al.*, 1991). However, It is warranted to investigate implications and necessity of presence of greenery and natural elements in the vicinity of residential settings in distinct spatial contexts because of changing trends of mobility, communication and life-styles.

Therefore, there is need for better understanding of dynamics of urban design and planning interventions and their significance for wellbeing and happiness. In other words, designing urban areas as a sense of place where people want to be, places that make differences in people's life and reorientation of urban design vision towards people like public spaces be conceived to make life pleasant for pedestrians and not toward the flow of vehicles. Hence, there is requirement of paradigm shift towards people and their happiness and give emphasis on urban design interventions that will intend to humanize the city and improve them as settings for human use and requirement.

In this context, Leyden's study for 'importance of place and concept of happiness' in 10 global cities suggests that wellbeing of residents in major cities are influenced by the city's physical form i.e. the way city is designed and built (Leyden, Goldberg, *et al.*, 2011). The study also strengthens importance of place for social connectedness. Furthermore research finding state that cities having good public transport network along with provision of active transport (walking, cycling), presence of adequate and accessible facilities and availability of social gathering places promote happiness. Showing similarity with most of the QOL research, this study also uses perception of residents for assessing importance of place for happiness.

As the perception of residents is mainly a subject of examining 'life-as-it-is' to 'how life should be' and even standard of comparisons are influenced by real qualities of life but happiness is not governed by subjective comparisons only, it is matter of actual qualities of life too (Veenhoven, 1991). Objective goods have direct influence on happiness. In this regard, the current study attempts to get better understanding of influence of urban design features on happiness of residents in the neighbourhoods of city of Rotterdam, looking at perceived as well as objective measures. As 'happiness' is not related to subjective comparison only, instead, it directly depends on objective qualities too (Veenhoven, 1991), the research uses subjective and objective measures to get wider overview of remarkability of the characteristics of urban design for happiness. Looking at necessity to establish relationship between 'importance of place and concept of happiness' with emphasis on perception of residents about the living environment as well as actual qualities of physical environment, such analysis will recognize remarkable urban design features that help in promoting wellbeing and happiness.

To analyse linkage of urban design and happiness, Rotterdam city- regarded as a world leader city in sustainable urban design, is chosen as study area of this research. Being Europe's largest port, Rotterdam has reinvented itself as a playground for innovative thinkers, planners, designers and architects. The mission of Rotterdam city council is to work at a strong economy and an attractive residential city. After post war reconstruction, Rotterdam continues to enhance city design and development status. Aesthetically pleasant and functional neighbourhoods have been built on the edges of Rotterdam and with inclusion of innovative entertainment venues, food joints and cultural events have turned city into a world class city.

1.3 Research Objective

The study explains the impact of urban design features on happiness, looking at objective and subjective measures, and at associations with health and social ties. More specific, the study intends to explain the relationship between urban design features- urban facilities, greenery, public space, transport nodes and mixed use and happiness of residents in the neighbourhoods of city of Rotterdam.

1.4 Provisional Research Questions

Main research question:

1.To what extent do urban design features determine the level of happiness of residents in neighbourhoods in Rotterdam city?

Research sub-questions:

1a. What are characteristics (objective measures) of urban design features that significantly affect the happiness of residents in neighbourhoods in Rotterdam?

1b. To what extent does perception (subjective measures) of urban design features determine the level of happiness of residents in selected neighbourhoods in Rotterdam?

1.5 Significance of the Study

Academic Relevance:

The economics of happiness is a fast growing academic field to examine the ways for enhancing and measuring wellbeing (Praag and Ferrer-i-Carbonell, 2010, Dolan, Peasgood, *et al.*, 2007, Bruni and Porta, 2007, Layard, 2005, Frey and Stutzer, 2002). Apart from established usual measures, subjective indicators are also gaining importance for the urban dimension of well-being studies. Some studies show the significance of urban design, urban and transport planning for wellbeing (Potapov, Shafranskaya, *et al.*, 2016, Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, Leyden, Goldberg, *et al.*, 2011, Morrison, 2011). To this end, the research intends to add to the body of knowledge, specific urban design interventions that contribute to happiness and thus establish relationship between importance of place and concept of happiness which have a degree of relevance for wellbeing. Additionally, outlining the prominence of non-financial measures, more specific urban design features, the current study supports the trend of inclusion of non-financial in well-being studies.

Moreover, this study aims to add in happiness research by providing evidence for the significance of urban design features for well-being and also, to the strategies of urban design research by introducing perspectives of econometric and sociology to the study of urban design. In the field of happiness economics, the research attempts to add knowledge to less known determinants of wellbeing in urban context by identifying attributes of urban design interventions crucial for happiness.

Furthermore, it strengthens the fact that both objective and subjective measures of urban design are significant for happiness. In other words, apart from subjective comparison, happiness depends on real qualities of life too. However, most of QOL studies rely on subjective measures but the current study emphasizes that perception of residents for physical environment as well as real qualities of living environment are important for happiness. Therefore, inclusion of objective measures in the current study adds a new dimension to existing QOL research.

Survey is conducted in two neighbourhoods of Rotterdam and selection of neighbourhood is done on the basis of their distinct features on account of land use mix, presence of transport nodes, amenities, public space and greenery. Cool neighbourhood belongs to traditional type

of neighbourhood while Terbregge shows sub-urban characteristics. Hence, the research attempts to participate in ongoing academic, policy and planning interest debate of land use mix by selecting traditional and sub-urban type of neighbourhood and by analysing their features for significance of well-being.

Apart from aforesaid academic relevance, the study opens door for future research for better understanding of dynamics of aspects of place, human health and conditions, social and community ties and concept of happiness.

Societal Relevance:

Since the research asserts urban design matters, it advocates to reorient urban design vision towards people i.e. designing and building physical settings as per people's need and requirement and thus for their well-being and happiness. Focus of the study is on neighbourhood level for establishing relationship between "importance of place and concept of happiness", it inspires urban planners, developers, designers and architects to promote local urban design features as these small scale interventions are essential for health and social cohesion among local residents, hence for their happiness. Therefore, the study highlights the relevance of urban design interventions for well-being and urges policy makers, planners, developers and designers to focus on people-place relationship.

1.6 Scope and Limitations

As stated earlier, the study aims to explain the impact of urban design features on happiness, looking at objective and subjective measures, and at associations with health and social ties. Hence the research analyses the impact of urban design features on happiness with perceived as well as objective measures i.e. with perception of residents as well as actual qualities of urban design features. For objective measures, reliable existing data available for all the neighbourhoods of Rotterdam are used for explaining linkage between objectivity of urban design features and happiness of residents, so results can be generalised for whole Rotterdam and even for similar cities. But in case of subjective measures, primary data are collected only from two neighbourhoods of Rotterdam with limited sample of 102, so there is limitation in generalization of findings for all the neighbourhoods of Rotterdam.

Furthermore, only five urban design features - urban facilities, greenery, public space, transport nodes and mixed use are chosen for this study, thus narrowing down the research to only selected urban design interventions. Additionally, chosen characteristics from all the selected attributes belong to utilitarian category of physical environment, no characteristics from aesthetic category is included in the research. However, while explaining the impact of greenery on well-being, its aesthetic component i.e. scenic and attractiveness is mentioned.

In terms of methodology, the quantitative approach is applied and hence the study is not able to investigate the specific mechanisms through which urban design interventions affect happiness of the residents. The statistical findings can strengthen or uncover presupposed link between characteristics of urban design attributes and happiness or perception about these characteristics and happiness but is not able to tell the exact mechanism by which these characteristics affect happiness. However, significance of urban design features for happiness is explained in terms of health and social ties underpinned by academic literature but elucidation of mechanism by which urban design features affect happiness is not analysed.

The study is also restricted by the scale of the survey from which perception of residents about characteristics of urban design attributes came from. Because of constraints on time and resources, survey is conducted in only two neighbourhoods of Rotterdam with a relatively small sample size. Hence, the findings of the research related to subjective measures cannot be

generalised to the city of Rotterdam. However, due to availability of reliable existing data on objective measures of selected urban design attributes for all neighbourhoods of Rotterdam, the results for relationship between objective measures and happiness can be generalised for Rotterdam city and even for similar cities. Additionally, the theoretical implications of the study are significant for futuristic large scale and long term similar researches for explaining or exploring the characteristics of physical environment and happiness of the residents.

Moreover, since data from both the sources, secondary as well as survey, are cross sectional, causality can't be established. The current study is unable to exhibit whether the directional arrows point from urban design features to happiness or the reverse.

Chapter 2: Literature Review / Theory

2.1 Understanding happiness and Happiness research

2.1.1 The concept of Happiness and its Significance

Happiness is considered as utmost aim of any human existence (Frey and Stutzer, 2002) and present day welfare society exhibits it in highly valuable terms (Kováč, 2012, Frey and Stutzer, 2007, Rafael Di Tella and MacCulloch, 2006, Frey and Stutzer, 2002, Veenhoven, 1991, Veenhoven, 1984, Gillin, 1955). 'Life, liberty and the pursuit of happiness' corresponds to 'unalienable rights' in the United States Declaration of Independence (Frey and Stutzer, 2002). Thus, happiness and its pursuit is interlinked with the origin of American Republic (Maier, 1997) and stands with justice, equality and freedom- the core values of modern states (Veenhoven, 1991). Moreover, the notion that '*politics should aim at producing eudaimonia*' (Leyden, Goldberg, *et al.*, 2011) started with Aristotle statement, the "*best form of government is that under which body politic is happiest*" (Aristotle, 1996). Jeremy Bentham, regarded as founder of modern utilitarianism (Kahneman and Krueger, 2006), focuses on significance of happiness by defining society having happiest citizens as the best one (Bentham, 1789). Additionally, the classical philosophy of '*greatest happiness for greatest number*' given by Jeremy Bentham, is widely acceptable concept (Veenhoven, 1991) supplemented by scientific research to broaden the causes and consequence of happiness.

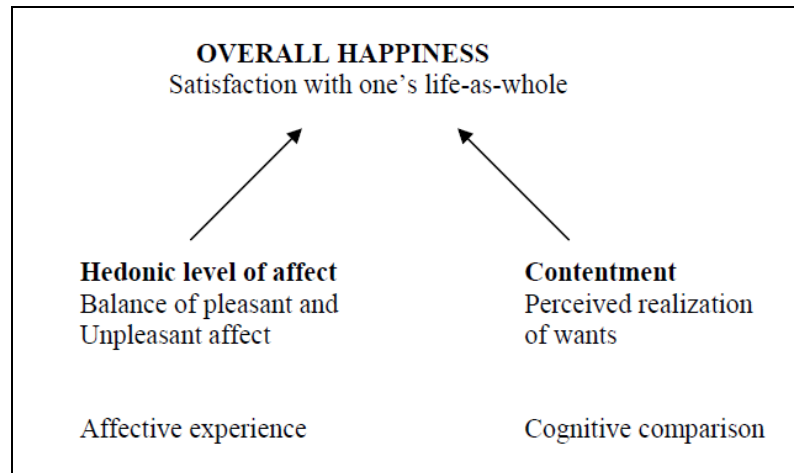
Contrary to core-beliefs of modern welfare society, the concept of happiness is also termed as ineffectual and evasive matters (Frey and Stutzer, 2002); ineffectual as a happy life is not essentially always a good life and evasive as happiness is regarded as momentarily thing, matter of outlook and standards of expectations rise with advancements, leaving one unhappy (Veenhoven, 1991). Furthermore, opponents of utilitarian moral philosophy believe that happiness is only reflection from comparisons, exclusive of objective goods and the standard of comparisons are adjustable mental arbitrary constructs (Veenhoven, 2009, Veenhoven, 1991). But the important question arises if happiness is only relative, not indication of actual conditions of life, why so much emphasis is given on study of happiness and its statistical analysis by modern welfare states?

It is evident that happiness does not depend on subjective comparisons only, it relies on real qualities of life too (Veenhoven, 2009, Frey and Stutzer, 2002, Kahneman, 2000, Veenhoven, 1991, Veenhoven, 1984). There are two sources by which happiness can be driven, aspect and appraisal. Aspect (experience or feeling) refers to affective component which is the '*degree to which the various affects a person experiences are pleasant*' while appraisal (comparison or beliefs) corresponds to cognitive component which is '*degree to which an individual perceives his aspirations to be met*' (Veenhoven, 2009, Veenhoven, 1984). In other words, affective experience is defined by '*how well one feels generally*' while cognitive comparison is '*how favourable one compares with various standards of success*' (Veenhoven, 2009, Veenhoven, 1984). Therefore, overall happiness or overall evaluation of life is combination of components of affective experience and cognitive comparison and it is defined as , "*the degree to which an individual judges the overall quality of his life as a whole favourably*" (Veenhoven, 2009). In simpler words, how well one likes the life one lives or it is an attitude that an individual has towards his/her life.

As aforesaid, people usually use feelings and beliefs as sources of information while doing overall evaluation of life. Feeling belong to affective experience and as per affective definition, happiness is an indication of how we are feeling generally i.e. "*the sum of pleasures and pains*" (Bentham, 1789). Balance of pleasant and unpleasant feeling i.e. affect balance is termed as hedonic level of affect. The affect balance is related to gratification of needs and needs are

considered as inborn universal constructs, related to objective conditions. Additionally, mood also acts like an informant to influence affective experience. The second source for overall evaluation of life beliefs depends on cognitive comparison. Cognitive theories state that happiness is reflection of gap between perception of life-as-it-is and notions of how-life-should-be and “*the degree to which an individual perceives his wants to be met*” (Veenhoven, 2009, Veenhoven, 1984) is contentment, another component of overall happiness. There is variance on type of standard of comparisons as well as kinds of comparison in academic literature (Veenhoven, 2009).

Fig. 1: Components of Overall Happiness



Source: (Veenhoven, 2009)

Similarly, Sumner supports the presence of affective and cognitive components by defining ‘being happy’ as “*having a certain kind of positive attitude toward your life, which in the fullest form has both a cognitive and an affective component. The cognitive aspect of happiness consists in a positive evaluation of your life, a judgment that at least on balance; it measures up favourably against your standard or expectations... The affective side of happiness consists in what we commonly call a sense of well-being, finding your life enriching or rewarding or feeling satisfied or fulfilled by it*” (Sumner, 1996, p.145).

As the term ‘happiness’ has always been surrounded by conceptual doubts and confusions (Leyden, Goldberg, *et al.*, 2011, Praag and Ferrer-i-Carbonell, 2010, Frey and Stutzer, 2002, Veenhoven, 2001, Veenhoven, 2000, Veenhoven, 1991), similarly, the notions on interlinking and influence of its components on each other is not an exclusion (Veenhoven, 2009, Veenhoven, 1991). Moreover, there is on-going debate on dominance of one component over another and their relative weight in determining overall happiness (Veenhoven, 2009). One strand of advocates of ‘happiness is relative’ compares ‘pleasant affect’ and ‘perception of success’. But Zajonc denied the similarity between these two components of happiness (Zajonc, 1984). However, there is possibility of influence of ‘positive comparisons’ on ‘pleasant affect’ but cognitive comparison is not only source of ‘affective experience’ (Zajonc, 1984). Furthermore, there is also trend to view ‘needs’ in terms of ‘standard of comparison’. Needs, nevertheless, are innate, largely unconscious, universal, prerequisite for biopsychological functioning while ‘standards’ are mental constructs liable to vary with individual and cultures and also subject to learning (Veenhoven, 2009, Veenhoven, 1991, Veenhoven, 1984). The concern of ‘adjustability’ deals with cognitive comparisons not with affective experience. Needs are not adjustable as they are innate necessities not mental constructs. Additionally, standards of comparison are also not only dictated by variable mental constructs but they are also related to basic human needs. Minimum standard of comparison is set by

needs. Hence, cognitive comparisons are also guided by innate needs and by cumulative wisdom. Moreover, hedonic level of affect also guide in the assessment of the discrepancy between want and reality i.e. in comparison process. If one person is feeling good, the person will tend to see small gap in need and want and vice versa. This is known as mood effect in affective experience (Veenhoven, 2009, Veenhoven, 1991, Veenhoven, 1984).

There are several terms like well-being, subjective well-being, QOL, life satisfaction that corresponds to the term 'happiness' in academic literature (Marans and Stimson, 2011, Praag and Ferrer-i-Carbonell, 2010, Veenhoven, 2009, Veenhoven, 2000, Susniene and Jurkauskas, 2009); sometimes they refers to similar meaning and sometimes they represent sub-set of other (Veenhoven, 2009, Veenhoven, 2000) . Furthermore, well-being can be categorised on the basis of material and psychological utility (Frey and Stutzer, 2002, Kahneman, 2000). Objective well-being deals with observable factors and we can term psychological utility as subjective well-being (D'Acci, 2010). Happiness is found synonymous with SWB in most of the QOL research (Susniene and Jurkauskas, 2009) but it is defined by both material and psychological utility in some of the well-being research (Frey and Stutzer, 2002).

Similarly, Previously, in academic sphere, the words 'happiness' and 'Quality of Life' were complementarity terms (Susniene and Jurkauskas, 2009, Veenhoven, 2001). Some of the researchers in the field of social science and environmental science present QOL as a multi-faceted concept (Susniene and Jurkauskas, 2009) and 'happiness' as one of the constituents of this conceptual family. Indeed notion of happiness concurs with several life qualities but not all of the qualities of life correlates with happiness (Veenhoven, 2001). State welfare or intelligence does not always refers to state of happiness and additionally, some of the cherished qualities work against the happy life (Susniene and Jurkauskas, 2009). Happiness is considered as subset of QOL and, in contrast, QOL is often measured as '*how long and happy a person lives*' (Veenhoven, 2000). However, one notion contradicts happiness as part of QOL concept and corresponds quality of life as essential criteria for happiness (McCall, 1975).

2.1.2 Happiness Economics

Similar to variance in concept of happiness, there is distinct views on measurement of happiness. One notion is that there is possibility to measure happiness empirically by answering the questionnaires but it is not a definable term (Bruni and Porta, 2007). Frey and Stutzer (2002) depict the term as "*a useful way out is to ask the individuals how happy they feel themselves to be and assume that they are the best judges of when they are happy and unhappy*" (p. 405). However, Daniel Kahneman doubts subjectivity of the phenomenon and states about people "*they do not generally know how happy they are, and they must construct an answer to that question whenever it is raised*" (Frey and Stutzer, 2002). Additionally, there are chances that reported happiness may get influenced by instant judgements, mood of the respondents, wordings of the questions and applied scale (Frey and Stutzer, 2002). Some of the existing studies, nevertheless, demonstrated that self- reported happiness is a satisfactorily assessment of actual conditions of life (Veenhoven, 1991).

Richard Easterlin is regarded as pioneer to introduce the study of happiness to mainstream economics (Praag and Ferrer-i-Carbonell, 2010). Because of the enormous emphasis on well-being by modern welfare states (Kováč, 2012, Frey and Stutzer, 2007, Rafael Di Tella and MacCulloch, 2006, Frey and Stutzer, 2002, Veenhoven, 1991, Veenhoven, 1984, Gillin, 1955), happiness economics is gaining momentum and consequently determinants of happiness are increasingly established by various research (Dolan, Peasgood, *et al.*, 2007). 'Big Seven' described by Richard Layard that exhibits the factors affecting happiness significantly is considered as one of the comprehensive research in the field of happiness economics (Leyden, Goldberg, *et al.*, 2011). Layard states seven factors as income, health, family relationships,

social ties, job opportunities, personal freedom and personal values (Layard, 2005). These factors are also proven relevant in many of the social science investigations (Leyden, Goldberg, *et al.*, 2011).

Most of the happiness research have been focusing on individual income and wealth (Leyden, Goldberg, *et al.*, 2011). Studies show the positive linkage between income and happiness, however, the relation is not linear (Praag and Ferrer-i-Carbonell, 2010, Frey and Stutzer, 2002). Effects of income on happiness within countries is affirmative but when aggregate income within society comes into account, the happiness factor becomes constant (Praag and Ferrer-i-Carbonell, 2010, Frey and Stutzer, 2002). Happiness has positive but diminishing returns to income (Dolan, Peasgood, *et al.*, 2007). Moreover, there is one theory based on comparison in happiness research which states that happiness is not only based on income but also depends on amount of income with comparison to others (Praag and Ferrer-i-Carbonell, 2010).

Family ties, second factor of Big Seven, are crucial for individual happiness (Layard, 2005). In a Finland study of young population, it is found that marital status and family life are significantly with satisfaction with life (Martikainen, 2008). Importance of Big Seven's third factor i.e. work is statistically proven and moreover, employed with a secure job and having satisfactory working conditions lead to happiness (Martikainen, 2008).

Layard's fourth factor gives emphasis on connectedness- the connectivity of people in their community and active participation in community activities (Layard, 2005). Social capital is found related to happiness and life satisfaction, directly as well as through the impact of connectedness with people on health (Helliwell and Putnam, 2005). Empirical findings suggest that ties whether it's the strength of family, religion or community are significantly associated with happiness and health. Furthermore, proponents of social networking have found relevant associations between social capital and social benefits. The main idea is that social networks possess value (Helliwell and Putnam, 2005) that results in lower incidences of crime and thus adds to safety of the community as well as better physical and psychological health (Putnam, 2000). Additionally, social ties also have significant impact on happiness through the channels of health (Helliwell and Putnam, 2005). Health is supposed to constitute pathway by which social connectedness influences happiness as studies found relevant relationship between health and social factors (Helliwell and Putnam, 2005, Ryff, C. D. and Singer, B. H., 2001, Berkman and Glass, 2000).

Good health is considered as Big Seven's fifth factor associated with happiness. Studies have consistently demonstrated that healthy people are happier (Diener, Suh, *et al.*, 1999, Kahneman, Diener, *et al.*, 1999). Previous research statistics have found significant relationship between health and happiness and with the growing emphasis on the subject of well-being in recent years, the studies of relationship between health and happiness are also gaining momentum. Health and happiness are consistently related regardless of self-assessment (subjective measure) of health or determined by a doctor (objective measure) (Marks and Shah, 2005). However, along with person's medical health conditions, self-rated health is supposed to influenced by some other factors like personality and environmental factors (Diener, Suh, *et al.*, 1999).

Big Seven also includes personal freedom and personal values as factors important for happiness. Additionally, Dolan, Peasgood, *et al.* (2007) review factors affecting subjective wellbeing and presented seven categories of determinants of happiness, namely- income, personal and socially developed characteristics, how we spend our time, attitude, social and family ties and environment (economical, societal and political). valuation of relationship between subjective well-being and age is supposed to be one of the most robust results in happiness research. Negative relation between SWB and age has been found consistently but

the relationship becomes positive as age is replaced by age squared (Dolan, Peasgood, *et al.*, 2007).

2.2 Urban Design as important force for Human Health and Conditions

2.2.1 Defining Urban Design

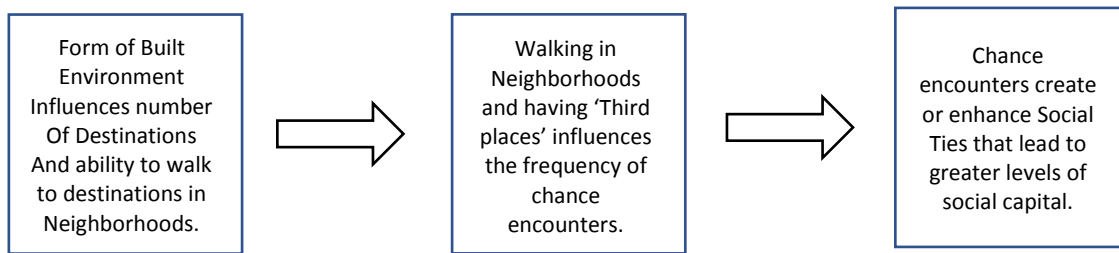
Urban design, urban planning and architecture, three intertwining spheres, are crucial for urban development. Peter Buchanan describes “urban design is concerned with analysing, organising and shaping urban form so as to elaborate as richly and as coherently as possible the lived experience of the inhabitants”. He further adds the importance of time with treatment of space and call on urban designers not only to combine urban forms but to make intertwining network of places with their natural and apt orientation to foster human activities. In the words of Jerry Spencer, urban design is creating the theatre of public life while some of the urbanists like Carmona, Heath, Oc and Tiesdell viewed this collaborative and multidisciplinary act as process of creating places suitable for people that would otherwise be created. First urban design conference organized by Graduate School of design, Harvard University which was attended by Jane Jacobs and Lewis Mumford, coined urban design as section of urban planning dealing with physical settings of the city. Additionally, Planning Policy Guidance Note 1 (department of Environment, Transport and Regions of America) describes the process as “the relationship between different buildings; the relationships between buildings and the streets, squares, parks, waterways and other spaces which make up the public realm; the relationship of one part of a village, town or city with other parts; patterns of movement and activity which are thereby established; in short, the complex relationship between all the elements of built and unbuilt space”.

2.2.2 Benefits of Urban Design for Health, Social Ties and Wellbeing

Impact of physical environment on human behaviour has been subject of interest for researchers and scholars over the last five decades (Lund, 2003). Related research are mostly concentrated in the fields of environmental and community psychology for social ties and urban & transport planning for physical activity. However, some studies tried to analyse both the behaviour- pedestrian travel and social interaction simultaneously (Lund, 2003). The current study has chosen five urban design features and as the study intends to explain conduciveness of urban design at neighbourhood level in terms of health and social ties, walkability in the neighbourhood defines the significance of all chosen urban design features for wellbeing to a greater extent. Nonetheless, some of the features also have relevant contribution apart from benefits of walkability. For instance, without physical experience, we can acquire benefits of greenery (Kearney, 2006, Groenewegen, Berg, *et al.*, 2006) and glimpse of nature from home is considered as great relief from mental fatigue and depression (Jackson, 2002, Ulrich, Simons, *et al.*, 1991).

The way neighbourhoods are designed and built have significant impact on human behaviour , more specific pedestrian travel and social interaction (Lund, 2003) , and thus their well-being (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Wood, Frank L., *et al.*, 2010, Gehl, 2006, Amin, 2006, Leyden, 2003, Cattell, 2001). Pedestrian travel or walkability in the neighbourhood depends on land use form and presence of physical infrastructure (Leyden, 2003, Lund, 2003, Lund, 2002) in the neighbourhood to a greater extent. Benefits of a walkable neighbourhood include physical exercise, accessibility advantages of being able to go to local destinations as well as social benefits of being able to meet, interact and linger with neighbours (Leyden, 2003).

Fig. 2: Link of built environment, walkability and social ties.



Source: (Rogers, Halstead, *et al.*, 2010)

Urban design is regarded as an important force for health and social cohesion (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Wood, Frank L., *et al.*, 2010, Carmona, Heath, *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Crawford, Timperio, *et al.*, 2008, Gehl, 2006, Amin, 2006, Leyden, 2003, Cattell, 2001, Talen, 2000) and its impact on economic, environmental, social and cultural outcomes of a place is remarkable (Montgomery, 2013, Jacobs, 1961). Modern society is increasingly recognize urban spaces as crucial social determinant for wellbeing and quality of life (Potapov, Shafranskaya, *et al.*, 2016, Leyden, Goldberg, *et al.*, 2011). Ricky Burdett and Myfanwy Taylor state being well is more significant than good health (Burdett and Taylor, 2011) as well-being relates to several dimensions like psychology, physical, mental, socio-economic and cultural.

Urban planning and design interventions are prerequisite for compactness of urban settings and thus for sustainability and health benefits (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016). Table 1 shows list of urban design interventions and corresponding features which have significant impact on health and well-being of residents. In compact cities model (Stevenson, Thomson, *et al.*, 2016), urban design interventions(density, distance and diversity which corresponds to residential density of population density, average distance to public transport nodes and mixed use pattern respectively) are experimented for assessment of possible health benefits achieved through compactness and low motorised mobility for selected cities. The main objective of this modelling is to assess the influence of urban design interventions that promote compactness of urban settings and low motorised mobility on resident's health. Findings signify the importance of compact settings and low motorised mobility for health benefits. High residential density, mixed use pattern, proximity to daily needs, enhanced public transport along with active transport promote potential health gains. Furthermore, the compact city model shows considerate decrease in cardiovascular diseases, respiratory diseases, and diabetes with compact settings and low motorised mobility in selected cities (Stevenson, Thomson, *et al.*, 2016).

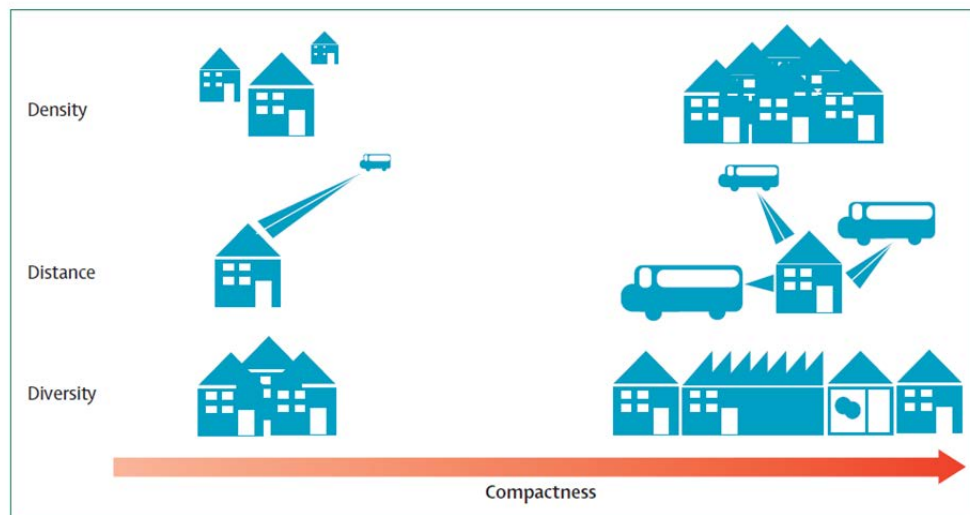
Table 1: Urban design interventions and features that enhance health and wellbeing

Local urban design	Features	Examples
Design	Urban design creates walkable catchments around activity centres and incorporates accessible public open space; street networks minimise distances between homes and daily living destinations, reduce traffic exposure, and create safe pedestrian, cycling, and public transport networks; lot layouts designed to increase residential densities and promote natural surveillance	High street connectivity including ped-sheds ≥ 0.6 within 0.8–1.2 km (i.e. 1–15 min walk) of activity centres, transport hubs, and schools; separated pedestrian and cycle paths; local public open space provided; housing overlooks streets and public open spaces

Density	Residential densities sufficient to support the viability of local business and high-frequency public transport services	Multiunit housing built around activity centres with shops, services, and transport hubs
Distance to public transport	High-frequency public transport located within short walking distances from homes	Bus stops accessible ≤ 400 m; rail stops accessible ≤ 800 m from homes
Diversity	Residential areas built with different types of housing mixed with commercial, public, and recreational opportunities	Different types of housing available near, around, and on top of shops and services required for daily living
Desirability	Neighbourhoods designed to be safe, attractive, and accessible; public transport that is convenient, affordable, frequent, safe, and comfortable	Crime prevention design principles incorporated into residential and commercial developments; urban greening strategies implemented; traffic minimised, calmed, and separated from pedestrians and cyclists, particularly near schools.

Source: (Giles-Corti, Vernez-Moudon, *et al.*, 2016)

Fig. 3: Urban design interventions as applied in the compact cities model



Source: (Stevenson, Thomson, *et al.*, 2016).

Some of the great architects and planners vision of the twentieth century are motivated towards health (Burdett and Taylor, 2011). Ebenezer Howard's garden city concept of group of slum less and smokeless cities are also based on the same principle (Hall and Ward, 1998). He proposed urban planning principles for well planned, self-contained communities surrounded by green spaces. The main vision behind garden city is to generate relatively independent units with good transport networks and protection of country side. Additionally, he conceptualized an ideal garden city planned in a concentric manner consisting of open areas, green spaces and parks and six boulevards of each 37 m width radiated from the centre. He further termed the garden city as self-sufficient unit with 3200 inhabitants on an area of 6000 acres and proposed development of another satellite towns nearby similar to his vision for garden city as population extends its limit of 3200. Howard's vision of these self-sustained independent cities consists of a group of six cities acts as satellite towns connected with efficient and effective transport networks to a central garden city (Hall and Ward, 1998, Howard, 1965).

However, urbanist Lewis Mumford presented the concept in different manner as suburbs with presence of quality of life instead of conserving the green belts of suburbs (Mumford, L., 1938). Le Corbusier presented a totally distinct vision from Howard's garden city and Mumford's suburbs. He was influenced by many of the same issues to provide liveable conditions for the residents of crowded cities. Moreover, he conceptualized his visions of an utopian ideal city for bringing back quality of environment to inhabitants and termed as 'Ville Radieuse'. His idea for prototype of social reform cities formulates a city of high rise multifunctional buildings sparsely located to one another with inclusion of plenty of open spaces and provision for free movements (Corbusier, 1933).

Apart from the motivation of these influential planning and architecture movements towards health, WHO also plays a remarkable role in connecting public health with urban environment. The major aim of healthy cities networks initiated by WHO is to focus on the significance of health by involving local bodies in health development programs and giving attention to social, economic and environment related health-determinants (Burdett and Taylor, 2011). Along with advantages of physical environment for health, social connectedness, regarded as one of the major predictors of happiness, initiates in the neighbourhoods and as Cahoon states "*the neighbourhood is thus the landscape of persons with whom one habitually deals, or with whom one may well have to deal. These are the people to whom one must, with rare exceptions, be civil. Failure to do so will not only be seen as a moral failing by others, but will threaten to make one's life unhappy*" (Cahoon, 2002, p.246). Additionally, influence of neighbourhood in building social capital is suggested by numerous authors (French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Leyden, Goldberg, *et al.*, 2011, Wood, Frank L., *et al.*, 2010, Foster, Giles-Corti, *et al.*, 2010, Foster and Giles-Corti, 2008, Lund, 2003, McCulloch, 2003, Leyden, 2003, Jackson, 2002, Mullan, 2002, Stephenson, 2002, Ross and Jang, 2000, Skogan and Maxfield, 1981). Robert Putnam in his book 'Bowling Alone: the collapse and revival of American community' displays 14 parameters of social capital and links these indicators with societal, economic and health benefits. Furthermore, he compares lack of social connectedness to severe health ailments like high blood pressure, obesity and smoking (Putnam, 2000). Moreover, poor social capital is considered as an aid for increase in suicide rates, tuberculosis, schizophrenia and alcoholism (Lindheim and Syme, 1983). Jane Jacobs terms this connectedness as social capital and emphasizes on mixed used patterns which enhances informal activities and consequently lower in crime rates and better liveable surroundings (Jacobs, 1961).

In his book "Happy City", Charles Montgomery also gives stress on social capital. He describes happiness, not only as momentarily pleasure, but about being connected to society. He advocates for mixed use, dense cities with efficient transport system including conducive sidewalks for social connectedness and criticises isolated low-density car dependent suburbs. Moreover, benefits of walkability is also pointed out in his book. He epitomises Copenhagen as user friendly city and gives credit to Danish architect Jan Gehl for the pedestrianisation of the city. Additionally, Montgomery describes Canadian city Vancouver as a liveable city with presence of high rise, multiple activities on streets and different income groups. On the other hand, 'Happy City' states Stockton, to focus on drawbacks of sprawl, a place 60 miles away from San Francisco for its long commuting hours. The book also points out poor social capital and presence of environmental degradation factors due to excess levels of greenhouse gases as characteristics of suburban sprawl (Montgomery, 2013).

Famous architect Louis Kahn shined a light on streets and depicted streets as first institution of any city. In his essay, "*The room, the street and human agreement*" (1971), he compared streets with community spaces where people can socialize and use them for common purposes.

Moreover, sky is viewed as roof for streets in his essay and he criticized modern urban planning principles for disappearance of streets and converting them into roads.

Similarly, *Cities Alive: Towards a walking world*, a report by ARUP (an independent firm of designers, planners, engineers and related consultants) focuses on walkability and regarded this active mode of transport as daily basic efficient mode (Kleinert and Horton, 2016). On the same concept of advocacy for walkability, urbanist Jeff Speck writes in his book ‘Walkable City’, “*get walkability right and so much of the rest will follow*. In the book which is regarded as comprehensive guide to walkability, he defines health, economic and environmental benefits of walkable places. Also, he presents ten steps to walkability to prove advantages of walkable urbanism against drivable sub-urbanism (Speck, 2012). Additionally, Jane Jacobs in her influential book ‘The death and life of American cities’ defines importance of pedestrians as significance for city’s diversity and vitality. Furthermore, she links streets characteristics as city’s crucial features and explained their role in making cities safe and secured. Jacobs gives prominence to continuous presence of pedestrians on the street to maintain street liveability and vibrancy characteristics and she regarded pedestrians as effective eyes on the street for safety- security purposes (Jacobs, 1961).

Emphasizing on the role of walking, one of the urban planning paradigms, New Urbanism also advocates for creation of pedestrian friendly neighbourhoods for enhancing physical activity and sense of community (Leyden, 2003, Lund, 2003, Lund, 2002). Walkable environment enhances sense of community which is defined as “*feeling that members have of belonging and being important to each other and a shared faith that members’ needs will be met by the commitment to be together*” (McMillan and Chavis, 1986, p.9). Moreover, New urbanists assert that physical settings of urban areas are conducive for walking and they focus on street connectivity, street pattern, land use mix, residential density (moderate to high) and presence of urban facilities, public space, greenery, transport nodes for walkability of neighbourhoods (Wood, Frank L., et al., 2010). Also, they state that presence of mixed land use and multiple destinations encourage for local social encounter and interactions (Leyden, 2003, Lund, 2002, Cattell, 2001), thus enhancing health, social ties and well-being (Giles-Corti, Vernez-Moudon, et al., 2016, Stevenson, Thomson, et al., 2016, French, Wood, et al., 2014, Wood, Frank L., et al., 2010, Jackson, 2002).

However, there is mixed evidence to date for significance of land use mix for well-being (French, Wood, et al., 2014, Wood, Frank L., et al., 2010, Jackson, 2002). One rationale of land use mix is that because of presence of large number of outsiders, residents constraint themselves to walk (Skogan and Maxfield, 1981) and interact with locals. Moreover, presence of non -residential land often refers to presence of strangers, hence physical disorder and perception of residents about this disorder links to safety and crime issues (Mullan, 2002). Multiple destinations and non -residential use of land in neighbourhood also refer to traffic volume, noise pollution and congestion (Foster, Giles-Corti, et al., 2010, Hart and Parkhurst, 2008, Mullan, 2002), whereas residents seek out locals for interaction and social connectivity in lower density developments (French, Wood, et al., 2014). Also, sub-urban neighbourhoods have got abundant of nature and natural elements, encouraging residents for outdoor activities (Brueckner and Largey, 2008) and therefore conducive for their health and social ties.

Although New Urbanism state that traditional neighbourhoods present picture of highly pedestrian walkable environment but several studies assert suitability of walking in sub-urban types (Brueckner and Largey, 2008, Hart and Parkhurst, 2008). This contradiction can be solved by considering academia of physical activity division for walking types. Physical activity literature distinguishes walking as brisk walking and recreational walking (French, Wood, et al., 2014). Brisk walking refers to task focused walking for transport, to multiple

destinations while recreational walking corresponds to leisure walking. Hence brisk walking relates to mixed land use development while leisure walking goes with sub-urban neighbourhood. Research present mixed evidence for significance of walking types for well-being (Wood, Frank L., *et al.*, 2010).

While discussing pros and cons of sub-urban development, mention of public transport is an obligatory as sub-urban is usually considered as drivable type while there is presence of public transportation lines in traditional neighbourhoods. Although sale of private cars is usually considered as indicator of modernization and economic growth (Giles-Corti, Vernez-Moudon, *et al.*, 2016) but higher dependence on private vehicles results in physical inactivity, loss of sense of community and social capital as well as increase in traffic congestion (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, Jackson, 2002). A body of literature of built environment and well-being state the detrimental effects of car dominant urban sprawl (Jackson, 2002). Sub-urban neighbourhoods require these forms of sedentary travel and hence restricts residents from active form of transportation resulting in physical dormancy and obesity (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016) as well as lesser sociability (Jackson, 2002). Besides, negative externalities are also present with long commuting as lesser participation of commuters as well as non-commuters in community activities. Symptoms of absenteeism and accidents at work have been reported by long commuters (Jackson, 2002).

The role of one of the fundamental features of urban areas, public place, is also vital as they are considered as places of sociability (Francis, Giles-Corti, *et al.*, 2012, Carmona, Heath, *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Gehl, 2006, Talen, 2000, Carr, Francis, *et al.*, 1992, Jacobs, 1961) as well as '*sites of civic promise*' (Amin, 2006, p. 1020). Studies have outlined the prominence of public spaces for enhancing healthy life styles, benefitting psychological health and sense of community (Francis, Giles-Corti, *et al.*, 2012, Leyden, Goldberg, *et al.*, 2011, Cattell, Dines, *et al.*, 2008, Jackson, 2002). Moreover, community centres, market places, pizzas are components of built environment essential for fostering sense of community (Talen, 2000). They promote social interaction, chances for sustained bonding and making new connections as well as relief from daily routine (Cattell, Dines, *et al.*, 2008). Additionally, emphasizing on people-place relationship and symbolising these places prominence as home and work, Ray Oldenburg defines 'third places' as "*a generic designation for a great variety of public places that host the regular, voluntary, informal and happily anticipated gatherings of individuals beyond the realms of home and work*" (Oldenburg, 1989, p.16).

Instead of vast globalization and focus on diversity and vibrancy, there is growing incivility in today's society. Fyfe *et al.* state "*the difference and diversity of urban life [for example] are viewed as threatening rather than enriching*" (Fyfe, Bannister, *et al.*, 2006, p.854). In this respect, '*sites of sociability*' can also be viewed as places of conflict, clash and sites of division between diverse cultures as Young assert "*because by definition a public space is a place accessible to any one in entering the public one always risks encountering those who are different, those who identify with different groups and have different opinions of different forms of life*" (Young, 1995, p.268). Furthermore, one strand of proponents of 'community' state importance of network closure for public spaces for formation of 'thick trust' and reciprocity (Coleman, 1990). Amin also focuses on restricted usability of public places for interethnic sociability and integrity (Amin, 2006).

However, Jane Jacobs emphasizes on the term '*exuberant diversity*' (Jacobs, 1961). Social connectivity is not restricted to local areas, rather, it corresponds to larger geographical areas (Francis, Giles-Corti, *et al.*, 2012) with broader vision in the changing trend of mobilisation and communication. Therefore, public places should be fulfilling the diverse need of users,

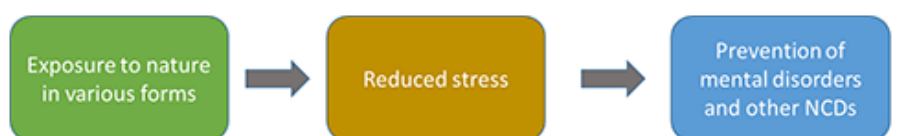
“what is important is that the wider the variety of public spaces and associated facilities within a vicinity, the greater the likelihood that diverse needs may be met” (Cattell, Dines, *et al.*, 2008, p.558). Moreover, policy matter related with public space also concern about fulfilling the diverse need of distinct social and cultural groups (Cattell, Dines, *et al.*, 2008).

In conjunction with focus on diverse use of public space, architects, planners and designers have also given emphasis on subjective qualities like presence of amenities, seating, shelter (Gehl, 2006, Carr, Francis, *et al.*, 1992, Jacobs, 1961). Accessibility and connectivity of public places to surroundings, neighbouring diverse land use, cleanliness, maintenance and attractiveness are required for its frequent use (Gehl, 2006, Carr, Francis, *et al.*, 1992). Some studies demonstrate that frequency of use of these ‘third places’ are positively related to sense of community (Francis, Giles-Corti, *et al.*, 2012). Furthermore, Jan Gehl has given emphasis on ‘why and how people use public space’ before designing and building it as they are the places crucial for social cohesion, sense of community as well physical activity (Gehl, 2006).

Along with built features of environment, natural elements are also of enormous significance for human welfare and well-being. There is an old adage, *“happiness is being surrounded by greenery”*. Studies have also report the vast relevance of natural environment for health, social cohesion and well-being (Bosch, 2017, French, Wood, *et al.*, 2014, Francis, Giles-Corti, *et al.*, 2012, Berg, Winsum-Westra, *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Wakefield, Yeudall, *et al.*, 2007, Groenewegen, Berg, *et al.*, 2006, Jackson, 2002, Kearney, 2006, Kuo and Sullivan, 2001, Kaplan, 1995, Ulrich, Simons, *et al.*, 1991). The association of human beings and natural eco-system are undeniable as humans are part of natural eco-system and depends on them for their survival (Bosch, 2017). Apart from scenic and aesthetic values of greenery, they possess therapeutic, restorative and conduciveness for residential settings properties (Nielsen and Hansen, 2007). Presence of nature and their elements in residential settings are major assets for health promotion and social cohesion in the modern world of vast urbanisation and changing life styles (Nielsen and Hansen, 2007). Contemporary health economy consistently recognises physical inactivity, mental stress along with depression and ‘burn out’ syndrome as key challenges of present day society (Nielsen and Hansen, 2007). Moreover, physical inactivity, psychological stress and lack of social ties are also main causes of non- communicable diseases (Bosch, 2017).

Natural environment exposure is significant in reducing anger, anxiety and aggression (Kearney, 2006, Kuo and Sullivan, 2001, Kaplan, 1995, Ulrich, Simons, *et al.*, 1991). Stress recovery is a term used with nature-health relationship which acts as mediator between natural environment and health (Bosch, 2017). Mere view of nature from home is great relief from mental fatigue and depression (Jackson, 2002, Ulrich, Simons, *et al.*, 1991), thus, benefits of greenery can be acquired without physically experiencing it (Kearney, 2006, Groenewegen, Berg, *et al.*, 2006). Therefore the role of nature in preventing mental disorders and NCD is remarkable (Bosch, 2017, Nielsen and Hansen, 2007). Cohort studies state that people residing with larger greenery than built forms have better psychological health (Bosch, 2017). Similarly, improved mental health has been found while moving to residential areas abundant in natural elements in a study from the UK (Alcock, White, *et al.*, 2014).

Fig. 4: Benefits of nature for stress reduction & prevention of NCD Source: (Bosch, 2017)



Residents living with high nature are more physically active, sociable, supportive as well as have greater sense of community than people living with low nature (Kuo and Sullivan, 2001). European Union research program findings also emphasize on the role of green spaces in improving life quality of residents. Longevity has been linked with presence of green spaces as walkable green areas are conducive for long life (Bosch, 2017). Moreover, both, developed and less-developed, natural areas are directly linked to sense of community (Kearney, 2006). Natural elements have restorative effects (Bosch, 2017, Alcock, White, *et al.*, 2014, Wakefield, Yeudall, *et al.*, 2007, Kearney, 2006, Ulrich, Simons, *et al.*, 1991) that improves psychological well-being and health. In this regard, Kaplan and Kaplan give attention restorative theory (ART). This theory specifically deals with cognitive processes and states that green elements are conducive for restoration from mental stress (Bosch, 2017). Cases of domestic violence have been reported lower in public housing that are near to trees and natural elements (Jackson, 2002). ‘Biophilia’ a term given by Edward Wilson to show human fascination for nature (Jackson, 2002). On the same concept, a movement in architecture has been initiated ‘Biophilic Architecture’ by Caperna and Serafini. They define the three major features of this style of architecture as the naturalistic dimension, the basic structure of the place and the geometric coherency. Major difference between green architecture and biophilic architecture is that green architecture deals with diminishing environmental effects of built-forms but does not focus on human attraction to nature (Jackson, 2002).

However, nature and greenery are also related with ‘ecosystem disservices’, the detrimental effects of nature (Bosch, 2017). Common examples of these disservices are vector borne diseases (lyme disease, malaria), allergies from pollen, falling branches and safety issues. Air-borne pollen grains come from grass, weeds, shrubs and trees and due to air pollution and climate change the allergic effects of these pollen grains are increasing (Bosch, 2017). Additionally, homogeneous lawn and alternative lawn covers are regarded as detrimental on account of water & energy consumption and wild life habitat loss. Lawn care pesticides are harmful for human health (Jackson, 2002).

Previous paragraphs focus on influence of real qualities of urban design features on health and social ties, however, along with direct benefits of physical environment on wellbeing, they also have significant impact on well-being through the channels of perception of residents. Neighbourhood physical features also contributes to health and social connectedness by influencing the perception of residents about their environment. ‘Pleasant pedestrian friendly environment’ is very subjective term which has an impact on perception as well as behaviour of the residents. People who perceived their neighbourhood pleasant are more engaged in neighbouring activities. Similarly, perception of walkable environment is connected to frequency of pedestrian trips and number of trips in the neighbourhood leads to frequent encounter with neighbours (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Wood, Shannon, *et al.*, 2007, Leyden, 2003, Lund, 2003, Lund, 2002). Therefore, physical environment also facilitates increase in pedestrian trips and social cohesion by influencing perception of the people about their environment and hence, perceived measures of urban design features are relevant for happiness and well-being.

Along with positive perception of ‘pleasant walkable environment’, perception of safe environment also conducive for walkability (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Wood, Shannon, *et al.*, 2007, Leyden, 2003, Lund, 2003, Lund, 2002) as persons who perceived their neighbourhood safe are more likely to go out for strolling or destination trips. Fearful people are less likely to go out of their homes, use internalized amenities and services or meet with neighbours hence their participation in neighbouring activities are less. Because of less pedestrian travel and low social ties, they often rate their sense of community low.

For instance, studies demonstrated that positive perception about neighbourhood leads to more visits to local destinations present in the surroundings (Leyden, 2003). Similarly, Lund's study also emphasised on residents perception for neighbouring behaviours (Lund, 2003). However, her research findings demonstrated that recreational trips are more conducive for well-being than destination trips. Furthermore, research also found that more engagement in neighbouring activities by those with positive perception of openness and spaciousness of the surroundings (Wood, Shannon, *et al.*, 2007). Also, people's opinion about safe neighbourhood is related to frequent trips to local focal points.

Suburban environment are usually linked with positive perception of safety as there is less or negligible presence of urban amenities or different activities which limit the incoming of strangers in the neighbourhood (Brueckner and Largey, 2008, Hart and Parkhurst, 2008, Wood, Shannon, *et al.*, 2007). Since the positive perception of safety is linked to perception of walkability (Wood, Frank L., *et al.*, 2010, Wood, Shannon, *et al.*, 2007, Leyden, 2003, Lund, 2003) as walkability enhances physical activities as well as social connectedness among residents. However, studies also assert suburbs as detrimental for well-being because of absence of internalized destinations, footpaths or attractive pedestrian environment. Local destinations are seen as meeting points for residents and it also encourages people for more frequent trips in the neighbourhood (Wood, Shannon, *et al.*, 2007).

In contrast with sub urban neighbourhoods, mixed use neighbourhoods are characterized by a number of destinations including centres for business, commerce, hospitality, art and culture. Residents have a lot of local destinations to travel in the neighbourhood that enhance their physical activities as well as sense of community. So, these type of neighbourhoods are often linked with positive perception of walkable environment. But as the presence of number of amenities, activities, transport nodes invite a large number of outsiders in the neighbourhood, therefore perception of safety of residents about these type of neighbourhood is usually found to be negative. As said earlier, perception of walkability is linked to perception of safety, residents who perceived that there is lack of safety issues in the neighbourhood are less likely engage in pedestrian travel. However, One aspect of 'stranger hypothesis' is also that there are chances of casual interactions with outsiders visiting destinations creating social ties and thus making neighbourhood vibrant and convivial (Wood, Frank L., *et al.*, 2010). In trends of globalization, communication and mobility, social connectivity is not restricted to local areas, however, it corresponds to larger geographical areas (Francis, Giles-Corti, *et al.*, 2012) with broader vision. Thus, perception of residents may be positive about presence of strangers in the neighbourhood. Additionally, some studies found that perception of safety is also linked with perceived adequacy of internalized amenities but type and quality of urban amenities are also found important for influencing feeling of safety.

Previous research findings indicate the importance of subjective factors in any research related to human behaviour. Crime literature even depicts perception as more crucial factor than actual experiences (Wood, Shannon, *et al.*, 2007). and there are several other factors on which perception of people depends about their surroundings apart from real qualities of physical environment . Length of residency, home ownership, self -selection criteria for neighbourhood and personality are also influential factors for building perception about neighbourhood features. Self -selection criteria of neighbourhood is also subject of concern while evaluating benefits of neighbourhood features. People who prefer walking choose walkable neighbourhoods. Stronger neighbourhood ties are be predicted by length of residency (Berg, Winsum-Westra, *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Walker, 2004, McCulloch, 2003, Onyx and Bullen, 2000) while an Australian research does not show any relevant relationship (Wood, Shannon, *et al.*, 2007).

2.3 Similar Research (Impact of Urban design on Happiness)

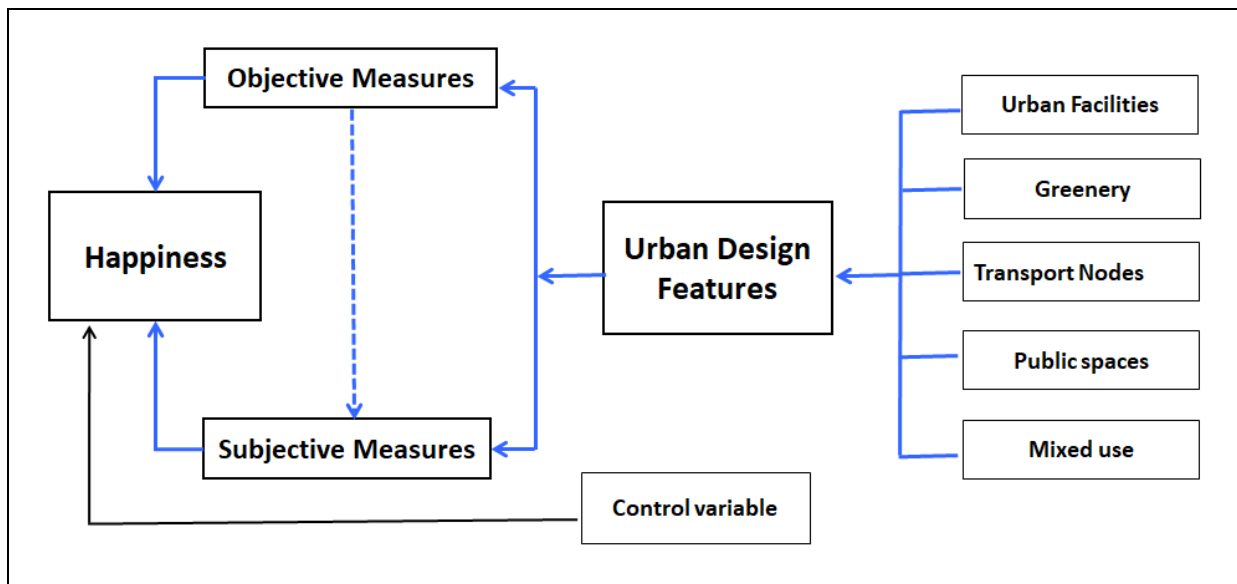
Leyden *et al.* (2011) study on concept of happiness and significance of place is based on the hypothesis that happiness of city residents are significantly influenced by the way cities and neighbourhoods are planned and built. The research uses 2008 quality of life survey data for 10 global metropolitan cities in which measures of happiness was taken by asking residents ‘how happy are you now’ and the answers were coded on Likert’s scale of 1 to 5; 1 = *not happy at all*; 2 = *not very happy*; 3 = *neither happy nor unhappy*; 4 = *somewhat happy*; 5 = *very happy*. Big seven factors of happiness given by Layard are also included in the survey. It is evident from the research that even after keeping independent effects of cities constant, happiness is significantly related to these factors. For example, higher income respondent who self-reported being healthier and perceived social ties in the neighbourhood are more likely to be in ‘very happy’ category of happiness. The finding underpins the theory of ‘health, wealth and social ties are important predictors of happiness’.

Moreover, research findings explicit relevant association between happiness and proximity, access to urban facilities and convenient public transportation. Outcomes of the study suggest that happiness of residents in 10 major cities are influenced the way cities and neighbourhoods are designed. The research supports the positive linkage between concept of happiness and importance of place. However, there is negative association between maintenance of public places and happiness in the findings of the research.

In nutshell, the study advocates that along with focus on economics of the city, there is requirement to give emphasis on other spheres like urban design and planning for happiness of the residents.

2.4 Conceptual Framework

Fig.5: Research Conceptual Framework



Source: Author, 2017

The conceptual framework rests on the existing literature which recognises:

- Health, wealth and social ties as major predictors of happiness (Leyden, Goldberg, *et al.*, 2011).

- Urban design as important force for human health and conditions (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002, Jacobs, 1961).
- Both, subjective and objective, measures are important for happiness (Frey and Stutzer, 2002).

The framework, as a whole, states that urban design features are also important for happiness. Five urban design features-urban facilities, greenery, transport nodes, public spaces and mixed land use are selected for the current study. As aforementioned, health, wealth and social ties are major predictors of happiness. Studies found that urban design features contribute to all these three forecasters of happiness significantly. But this study has taken consideration of only health and social ties for explaining significance of urban design features for happiness. Although significance of these features for income is undeniable as Richard Florida states about people-place relationship in his book *“the place we choose to live affects every aspect of our being. It can determine the income we earn, the people we meet, the friends we make, the partners we choose, and the options available to our children and families. People are not equally happy everywhere, and some do a better job of providing a high quality of life than others”* (Florida, 2008). In nutshell, the current study is based on the postulate that since urban design features contribute to health and social ties significantly, and health and social ties are key predictors of happiness, therefore urban design features are relevant for happiness.

The study considers *“people are reckoned to be the best judges of the overall quality of their lives, and it is a straight forward strategy to ask them about their well-being”* (Frey and Stutzer, 2002, p.405). Overall quality of people’s life is overall happiness which is defined as *“the degree to which an individual judges the overall quality of his life as a whole favourably”* (Veenhoven, 1984, p.22). Therefore, happiness as exhibited in framework is self-reported overall happiness of an individual which is measured in the current study by asking single item question *“taking all things together, are you happy”*?

During the evaluation of life, people usually use two sources of information, feelings and beliefs. Feeling belong to affective experience and beliefs refer to cognitive comparison (Veenhoven, 2009, Veenhoven, 1984). As per affective definition, happiness is *“the sum of pleasures or pains”* (Bentham, 1789) and from pleasant-unpleasant experience, one of the component of overall happiness, hedonic level of affect, is derived. This affect is related to gratification of needs and needs are inborn universal constructs, hence depend directly on real qualities of life. Contentment is another component of overall happiness which is *“the degree to which an individual perceives his wants to be met”* (Veenhoven, 2009). The main premise of cognitive theory is that happiness is based on standard comparisons. It reflects the difference between perception of life-as-it-is and notions of how-life-should-be (Veenhoven, 2009, Veenhoven, 1984). As there is variance on type of standard of comparisons as well as kinds of comparison in academic literature (Veenhoven, 2009), the framework assumes that

1. Standards of comparisons are mental constructs but not arbitrary nor adjustable.
2. These standards are rooted in collective beliefs which in turn is reflection of accumulated experience with the real qualities of life.
3. Since minimum standard of comparisons are dictated by needs, cognitive comparisons also influenced by affective experience.
4. Mentally constructed ‘standard’ of comparisons fit ‘real’ requirements for the good life.

In the framework, urban design features are distinguished into objective and subjective measures. Objective measures are real qualities of urban design features while subjective

measure refers to perception of residents about these qualities of urban design. Hedonic level of affect is derived from objective measures whereas contentment is guided by subjective measures. Additionally, as the framework assumes that standards of comparison are influenced by affective experience which depends on objective goods, subjective measures of urban design are supposed to be guided by its objective measures which is displayed in dotted line between objective and subjective measures in the framework.

Apart from income, health and social ties, the framework includes job opportunities, marital status, age and gender as control variables.

Chapter 3: Research Design and Methods

3.1 Revised Research Questions

Main research question:

1. To what extent do urban design features determine the level of happiness of residents in neighbourhoods in Rotterdam city?

Research sub-questions:

1a. What are characteristics (objective measures) of urban design features that significantly affect the happiness of residents in neighbourhoods in Rotterdam?

1b. To what extent does perception (subjective measures) of urban design features determine the level of happiness of residents in selected neighbourhoods in Rotterdam?

3.2 Operationalization: Variables and Indicators

On the basis of the conceptual framework, variables are categorized into three types: independent variables, dependent variable and control variables.

Independent variable: Urban Design Features

Concept: Urban Design

Urban design is art of place making in an urban context and it involves buildings, group of buildings, landscapes and spaces, and establishment of framework of transport, built fabric and other physical features to organize suitable location for things and to structure activities and events.

As aforementioned, five urban design features are selected for the study. Local Urban design interventions given by Giles-Corti, Vernez-Moudon, *et al.* (2016) to plan cities that are compact, promote health and well-being are basis for selecting urban design features for the current study and these features are listed in chapter Two, page no., Table 1 in the current research report. Since the current study attempts to investigate urban design features on neighbourhood level and the study by Giles-Corti, Vernez-Moudon, *et al.* (2016) also classifies these features as local urban design interventions that promotes health and well-being, selection of urban design features on the basis of the previous study is justified. Table 2 exhibits local urban design criteria with their features for urban design features of the current study.

Table 2: Criteria for selecting Urban design features

Local Urban Design	Features	Examples
Design	Urban design creates living destinations and minimises distance between homes and these destinations as well as creates safe pedestrian (1-15 minute walk), cycling pathways to reach these places.	Presence of urban facilities within walkable distance from home. Access to public spaces
Density	Not included in the study.	-----
Distance to Public Transport	Transport nodes located within short walking distance from home.	
Diversity	Land use mix	Multiple use buildings
Desirability	Presence of urban greening strategies	Presence of parks, natural elements

As displayed in the conceptual framework, urban design features can be assessed through objective and subjective measures. For objective measures, suitable indicators displayed in Table 3 are selected from existing database of SCP (smart city planner) from Rotterdam Municipality which display characteristics of urban design features. These indicators represent observable condition of chosen urban design features. For urban facilities, indicators are selected on the basis of its wider applicability for a larger population. Since urban facilities refer to primary school, health clinics, recreational facilities, daily need shop etc but the study selects daily need shop to represent urban facility as shops are required by a larger population in comparison to primary school, health clinics or recreational centres. Additionally, land use mix corresponds to a range of distinct land uses that are placed together and which includes residential settings, commerce, institutions, recreational centres, parks, open space. The current study has taken multipurpose buildings i.e. different type of activities like residential, institutional, commercial, recreational within a single premise as indicator of land use mix. Multipurpose buildings are type of multiple land use which is regarded as successor of mixed land use (Louw and Bruinsma, 2006).

Table 3: Objective measures of Urban design features

Local Urban Design	Indicator	Unit
Urban Facilities	Proportion of residents with a daily supply <300m. Objective measure (1)	Percentage
Public Place	1.Proportion of residents with public space <250m 2.Proportion of residents with potential playgrounds <100m incl. playable sidewalk> 3m Objective measure (2)	Percentage Percentage
Transport nodes	Proportion of residents with a public transport stop within reasonable distance. Objective measure (3)	Percentage
Land use mix	Share multi-functional buildings (min 3 different functions) of total number of buildings. Objective measure (4)	Percentage
Greenery	1.Share of total green 2.Number of individual trees in the public area per hectare. Objective measure (5)	Percentage Average number per hectare

Subjective measures refer to people's perception for objective conditions of urban design features. As the research intends to investigate the impact of urban design features looking at both the measures, objective and subjective and the conceptual framework states the influence of objective conditions on subjective measures, it is necessary to include similar indicators for both the measures. Thus, similar indicators (as selected for objective measures, Table 3) are used while preparing questionnaire asking perception of residents about the selected urban design features .Focusing on urban design features, participants are also asked to give their opinion with the following statements in the survey:

- I have easy access in my neighbourhood to plenty of **shops, supermarkets and department stores.** (urban design feature- urban facilities)
- There is presence of **public gathering places** in my neighbourhood. (urban design feature-public place)

- It is convenient to use **public transportation system** (bus, tram, metro) in my neighbourhood. (urban design feature- transport nodes)
- There is presence of **multi-functional buildings** in my neighbourhood.(urban design feature- land use mix)
- There are many **parks and natural areas** in my neighbourhood. (urban design feature- greenery)
- My neighbourhood has sufficient **trees and landscaping.** (urban design feature- greenery)

Dependent variable: Happiness

Concept: Happiness

The term used ‘happiness’ used in the study is overall happiness that is overall evaluation of one’s life. It is defined as “*the degree to which an individual judges the overall quality of his life-as-a-whole favourably*” (Veenhoven, 1984, p.22).

It is measured by asking, “taking all things together, are you happy”? And reported happiness can be listed as 1= not happy at all, 2= not so happy, 3= happy and 4= very happy.

Control variables

Big Seven factors affecting happiness given by Layard (2005) are taken as control variables in the research. However, two of the factors of Big Seven, personal freedom and personal values, are excluded from the research because of unavailability of data related to these two factors. Indicators for control variable for this research are income, marital status, job opportunities, social ties and access to health care.

Table 4: Operationalization Table (I)

For sub question 1a

“What are characteristics (objective measures) of urban design features that significantly affect the happiness of residents in neighbourhoods in Rotterdam”?

Concept	Variable	Indicator	Scale	Source
Happiness	Y1: Happiness	Happiness	Interval	Vrijetijds onderzoek (leisure research) Rotterdam, 2015
Urban Design	Urban design features		Ordinal	Secondary Database- Rotterdam Municipality, 2015.
	X1: Urban facilities	Objective measure (1)		
	X2: Public Place	Objective measure (2)		
	X3: Transport Nodes	Objective measure (3)		
	X4: Land use mix	Objective measure (4)		
	X5: Greenery	Objective measure (5)		

	Control Variable	Income Health Social Ties Age Gender	Interval	Vrijetijdsonderzoek (leisure research) Rotterdam, 2015
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Table 5: Operationalization Table (II)

For sub question 1b

“To what extent does perception (subjective measures) of urban design features determine the level of happiness of residents in selected neighbourhoods in Rotterdam”?

Concept	Variable	Indicator	Scale	Source
Happiness	Y2: Happiness	Happiness	Interval	Primary Data
Urban Design	Urban design features X1: Urban Facilities X2: Public Place X3: Transport Nodes X4: Land use mix X5: Greenery	Perception of presence of shops, supermarkets and department stores in the neighbourhood. Perception about presence of public gathering places in the neighbourhood. Perception about ease of use in public transportation system in the neighbourhood. Perception of presence of multi-functional buildings in the neighbourhood. Perception about presence of parks and natural areas in the neighbourhood. Perception about number of trees and landscaping in the neighbourhood.	Interval	Primary Data
	X6: Control Variables	Income Health Marital Status Job Opportunities Social Ties Age Gender	Interval	Primary Data

3.3 Research Strategies and Approaches

The main objective of the research is to explain the impact of urban design features on happiness of residents in neighbourhoods in the city of Rotterdam, the study comes under the category of deductive research. Furthermore, the research employs two approaches given in quality of life literature (Marans and Stimson, 2011) for explaining the impact of urban design on happiness:

1. Objective approach- constrained to analysis of secondary quantitative data -usually aggregated data at neighbourhood level that are gathered as official governmental data.

In this regard, Diener and Suh (1997) states, “*objective QOL reflects objective circumstances in a given cultural or geographic unit and are based on objective quantitative statistics*” (Diener and Suh, 1997, p.192).

2. Subjective approach- based on primary data collected at the individual level by using survey as measurement instrument and predominantly deals with individual’s behaviour and perception.

As Carley states about subjective approach, “*based on reports from individuals on the ‘meaning’ of aspects of their reality and as such represent psychological variables*” (Carley, 1981, p.31).

Table 6: Research approach

Research Sub-Questions	Research Approach
1a. What are characteristics (objective measures) of urban design features that significantly affect the happiness of residents in neighbourhoods in Rotterdam?	Objective Approach
1b. To what extent does perception (subjective measures) of urban design features determine the level of happiness of residents in selected neighbourhoods in Rotterdam?	Subjective Approach

3.4 Data Collection & Sample Size

Data for objective measures of independent variables are gathered from the Rotterdam municipality’s Smart City Planner (SCP) database (the database corresponds to quality of life) at neighbourhood level. Other secondary data for dependent variable i.e. happiness and income are obtained from Vrijetijds onderzoek (leisure research) Rotterdam at individual level.

Primary data has been collected by a cross section survey due to constraints on resources and limited time period of 4 weeks. As survey is regarded as standardized form of measurement and the written questionnaire is virtually equivalent to the survey (Thiel, 2014), questionnaire is chosen as the key instrument of data collection during the survey. Questionnaire is considered as suitable instrument for collecting data from respondents on their perception for attributes of living environment.

Several studies use the approach of comparing neighbourhoods having distinct physical features to determine the effect of neighbourhood design (Leyden, 2003, Lund, 2003, Lund, 2002). Findings of these studies show significant influence of neighbourhood design on social ties (French, Wood, et al., 2014, Wood, Frank L., et al., 2010) and behaviour of people. Since social connection is regarded as predictor of happiness along with wealth and health, this

research replicates strategies of above mentioned previous studies for selecting neighbourhoods of varied design features for survey purpose. The two selected neighbourhood, Terbregge and Cool, are varied greatly from each other on characteristics of urban design features, more specific selected urban design features of the study-urban facilities, public place, transport nodes, land use mix and greenery. These features range from traditional mixed use, active transport favoured neighbourhood to modern, suburban and automobile oriented neighbourhood.

Residents from the two selected neighbourhoods, Terbregge and Cool, are approached in public areas to answer the questionnaire. Sample of 50 units from Terbregge and 52 units from Cool are collected by convenient sampling, thus total sample size is 102.

3.5 Data Analysis Methods

3.5.1 Statistical model for data analysis: Ordered Probit Model

As self-reported happiness is adequate and valid measure for human well-being and also it can empirically assessed, it is possible to model happiness as micro econometric function that can be estimated by Ordered Logit or Ordered Probit (Frey and Stutzer, 2002).

Happiness is a dependent variable in this research which has an ordered outcome on the scale of 1 to 4 (1 – not happy at all, 2 – not so happy, 3- happy, 4 – very happy). Since the dependent variable is categorical and ordered, an ordered probit statistical model is used to analyse the relationship between a dependent variable and independent variables (urban design features).

Model for Ordered Probit Model

For a single latent variable y^* , an index model is given by:

$$y^*_i = x'_i \beta + u_i$$

$$y_i = j \text{ if } \alpha_{j-1} < y^*_i \leq \alpha_j$$

y^* is unobservable and known only if it passes thresholds.

x = covariate vector

β = vector of regression coefficients

u = error term.

There is probability that observation i will select alternative j which is given by:

$$p_{ij} = p(y_i = j) = p(\alpha_{j-1} < y^*_i \leq \alpha_j) = F(\alpha_j - x'_i \beta) - F(\alpha_{j-1} - x'_i \beta)$$

F is the standard normal cdf (cumulative distribution function). The ordered probit model with j alternatives will have j sets of marginal effects and also will have one set of coefficient with $(j-1)$ intercepts.

Marginal effects:

Marginal effects for an ordered probit model for an increment in a regressor on the probability of selecting j is given by the formula:

$$\frac{\partial p_{ij}}{\partial x_{ij}} = \{F'(\alpha_{j-1} - x'_i \beta) - F'(\alpha_j - x'_i \beta)\} \beta_r$$

These effects are interpreted as each unit of increase in independent variable changes the probability of selecting alternative j by the marginal effect expressed as a percent.

3.5.2 Overview of data analysis method:

Table 7: Data analysis method

Research Questions	Data Type	Analysis Technique	Computer Program	Expected Outcome
1a. What are characteristics (objective measures) of urban design features that significantly affect the happiness of residents in neighbourhoods in Rotterdam?	Secondary Data	Ordered Probit Regression	STATA	Association between characteristics of urban design features and happiness of residents.
1b. To what extent does perception (subjective measures) of urban design features determine the level of happiness of residents in selected neighbourhoods in Rotterdam?	Primary Data	Ordered Probit Regression	STATA	Association between perceptions of residents for characteristic of urban design features and happiness of residents.

3.6 Reliability and Validity

While measuring variables, high level of accuracy and consistency is crucial for presenting methodical depiction of results in the case of explanatory research. As Van Thiel (2007) states, *“the variable to be measured should be captured as correctly and precisely as possible”*. The current study is an explanatory research and its independent variable i.e. five urban design features are derived from the previous study by Giles-Corti, Vernez-Moudon, *et al.* (2016). Additionally, all the selected indicators (objective measures) for these urban design features are extracted from Rotterdam Municipality SCP database that is a reliable source. Similar indicators are used while formulating questionnaire for capturing subjective measures of urban design features. The questionnaire, however, is not replica of the one used for QOL survey for research of “concept of happiness and importance of place” but it took reference from Leyden, Goldberg, *et al.* research. Moreover, data for dependent variable happiness (to analyse with objective measures of urban design features) are also collected from reliable source, leisure research survey, Rotterdam. Since the research gathers data from reliable sources and also questionnaire prepared for gathering subjective measures are taken reference from previous research of similar subject investigating relationship between concept of happiness and physical environment, there is increased chances of accuracy and consistency by which variables are measured and consequently it adds to reliability of the research.

Additionally, to ensure reliability of a study, one of the best ways is repeatability i.e. to create or work with larger sample to replicate the research in the same exact way with different situations (Thiel, 2014). For explaining the relationship between objective characteristics of urban design and happiness of residents, data sets from all 71 neighbourhoods of Rotterdam is analysed so that the research can be replicated in the same way in some other city with similar situation. However, because of constraints on time and resources, local perception about urban design features are collected only from two neighbourhoods of Rotterdam and with limited sample of 100.

The current research is a deductive research i.e. theory driven research. It is based on the postulate that health and social ties are major predictors of happiness as evident in happiness research findings; urban design are important force for human health and conditions, therefore urban design features are also important for happiness. Moreover, the relationship between

importance of place and concept of happiness is directly established in some of the QOL studies (Potapov, Shafranskaya, *et al.*, 2016, Leyden, Goldberg, *et al.*, 2011). Places having good transportation system, presence of sound urban amenities, adequacy of social gathering places facilitate excellent quality of life for residents (Leyden, Goldberg, *et al.*, 2011). Hence, it is evident that there is presence of presupposed linkage between independent (urban design features) and dependent (happiness) variables of the research. The relationship between independent and dependent variable of the study presents picture of cogency of the study itself (Thiel, 2014) and consequently enhances internal validity of the research. Apart from dealing with cogency of the research, validity also focuses on credibility of data collection instruments to analyse with satisfactorily outcomes and minimum errors (Thiel, 2014). The data for observable conditions of urban design features are extracted from various archives of municipality and happiness data for analysis with objective measures of urban design features are gathered from leisure research, Rotterdam that predominantly followed survey as its measurement instrument. Data collected from survey can easily be generalized and hence supportive of generalization of the findings.

However, One of the major limitations of survey is lack of control over respondent's responses. It is found that cognitive aspects of data collected through questionnaire are sometimes dubious (Kahneman, 2011, Ajzen and Krebs, 1994) as Daniel Kahneman states *they do not generally know how happy they are, and they must construct an answer to that question whenever it is raised*" (Frey and Stutzer, 2002) about responses related to "taking all things together, are you happy"? Furthermore, respondents often give incorrect information about the questions they have negligible knowledge (Lub and Leeuw, 2016). But as aforesaid, the current study relies on "*a useful way out is to ask the individuals how happy they feel themselves to be and assume that they are the best judges of when they are happy and unhappy*" (Frey and Stutzer, 2002, p.405).

Moreover, application of triangulation in data sources of the research accelerates reliability and validity of the study (Thiel, 2014). Since the research intends to explain the impact of urban design features, looking at perceived as well as objective features, the presence of two sources of data enhances reliability as well as validity of the research. However, subjective measures of urban design features are collected only from two neighbourhoods of Rotterdam restricting generalization of research findings for Rotterdam or similar cities.

Chapter 4: Research Findings and Analysis

Chapter four: Research findings and analysis consists of three parts. First part comprises of descriptive and statistical analysis of objective measures of urban design features and happiness (data for happiness is collected from leisure research survey, Rotterdam 2015). Second part consists of descriptive and statistical analysis of subjective measures of urban design features and happiness. All these data are collected from survey conducted for this study in two neighbourhoods of Rotterdam. Description of neighbourhoods, Cool and Terbregge, is also included in this part. Third part is on discussion about statistical findings, their interpretation and applicability of research framework in the study.

4.1 Part 1: Analysis of objective measures of urban design with happiness

4.1.1 Descriptive Statistics

Dependent variable: Happiness

Happiness, for this research, is individual happiness, which is derived from the survey questionnaire. Respondents were asked to report their happiness by answering, “Taking all things together, are you happy”?

where 1= not happy at all, 2= not so happy, 3= happy and 4= very happy. {Vrijetidsonderzoek (leisure research), Rotterdam, 2015}

Table 8: Descriptive statistics for Happiness

Variable	Obs	Mean	Std. Dev.	Min	Max
Happiness	4,919	3.058752	.6682269	1	4

Control variables: Socio-demographics factors

Measures of control variables for this research is gathered from two sources. Data for income, age and gender are collected from Vrijetidsonderzoek (leisure research), Rotterdam, 2015 database. Survey questionnaire was used as measurement tool for collecting data. For income, respondents were given five choices to report their monthly income (1= less than 1100 euros, 2= 1100to 1500 euros, 3= 1500 to 2000 euros, 4= 2000 to 3350 euros and 5= 3350 and above euros). Data for health and social ties are collected from Rotterdam municipality’s smart city planner (SCP) database which gives objective measures of each 71 neighbourhoods. Since these are analysed with 4,919 observations of dependent variable happiness, number of observations are also listed 4,919 below.

Table 9: Descriptive statistics for Control variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	4,919	3.098394	1.417113	1	5
Health	4,919	.003037	.0258908	-.072	.065
SocialTies	4,919	.0519571	.2814955	-1	.5769231
Age	4,919	46.69262	18.30009	18	85
Gender	4,919	1.568002	.4954046	1	2

Independent variables: Urban design features

Data for urban design features are also collected from Rotterdam municipality's smart city planner (SCP) database.

Table 10 : Descriptive statistics for objective measures of Urban design

Variable	Obs	Mean	Std. Dev.	Min	Max
Playground	4,919	-.0230227	.181917	-.7476234	.1670524
Green	4,919	.0236858	.1378566	-.1840165	.5819478
Multifunct~n	4,919	.0120788	.04358	-.006682	.2906153
PublicSpace	4,919	-.0008537	.0075003	-.1824329	.0006657
CulturalFa~y	4,919	-.013071	.2891889	-.7316262	.2683738
DailyneedS~p	4,919	-.0014092	.2474566	-.7125374	.2874626
Trees	4,919	1.775502	.9856512	-.9508416	4.028079
TransportN~s	4,919	-.0264914	.1776143	-.8424192	.1575808

4.1.2 Statistical Analysis

Table 11: Model 1

Ordered probit regression	Number of obs	=	4,919
	LR chi2(13)	=	393.91
	Prob > chi2	=	0.0000
Log likelihood = -4654.9101	Pseudo R2	=	0.0406

Happiness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Income	.2179458	.0123445	17.66	0.000	.193751	.2421405
Health	.8207749	.8246322	1.00	0.320	-.7954746	2.437024
SocialTies	.0603083	.0774296	0.78	0.436	-.091451	.2120676
Gender	.0425079	.0329313	1.29	0.197	-.0220362	.107052
Age	-.0032837	.0009043	-3.63	0.000	-.0050561	-.0015113
Playground	-.1391867	.1216934	-1.14	0.253	-.3777014	.0993281
Green	.3685984	.1804543	2.04	0.041	.0149144	.7222823
Multifunction	.7598156	.4601851	1.65	0.099	-.1421306	1.661762
PublicSpace	-1.802516	2.649789	-0.68	0.496	-6.996007	3.390974
CulturalFacility	.0907799	.0869378	1.04	0.296	-.0796152	.2611749
DailyneedShop	.0937915	.1019413	0.92	0.358	-.1060098	.2935928
Trees	-.0026581	.0218738	-0.12	0.903	-.04553	.0402138
TransportNodes	.0988006	.1620792	0.61	0.542	-.2188688	.4164699
/cut1	-1.537418	.0977575			-1.72902	-1.345817
/cut2	-.4765518	.0925611			-.6579682	-.2951355
/cut3	1.378266	.0939731			1.194082	1.56245

P<0.01 (high significance), P<0.05 (moderate significance), P<0.1(low significance).

Model 1 examines the association between happiness and objective measures of urban design features in neighbourhoods of Rotterdam. Showing similarity with most of the happiness

research, income has significant effect ($P=.000$) on happiness. But, two other major predictors of happiness, health and social ties, are found insignificant in research statistics.. On account of urban design features, happiness, presence of greenery and multifunctional buildings in the neighbourhood show relevance with happiness. Presence of greenery and natural bodies have mild significance ($P=.041$) on happiness while having multifunctional buildings correspond to low relevance ($P=.099$) with happiness. Also, age is found relevant for happiness but in inverse order. Additionally, objective measure of transport nodes in neighbourhood does not show significance with happiness in empirical findings.

The term 'Coef.' as displayed in column 2 of Table 9: Model 1 are coefficients from the output of probit regression. But in case of probit regression, coefficients can't be interpreted. But running marginal effects, coefficients can be interpreted. Marginal effects for objective measures of urban design features are attached in Annex. 3.

4.2 Part 2: Analysis of subjective measures of urban design with happiness

4.2.1 Description of neighbourhoods: Cool and Terbregge

The perceived measure of urban design features is gathered from two neighbourhoods of Rotterdam, Cool and Terbregge. Cool belongs to city centre district with an area 63 of hectare. Total population is 5086 and number of households is 3342 as per 2016. This part of the city is considered as vibrant and diverse centre of Rotterdam. Geographically, the neighbourhood can be split into two parts, north and south, with the main road of Westblaak. The main characteristic of Cool-North is large and variety of commerce, hospitality, culture, housing and employment. De Lijnbaan shopping street, De Doelen concert hall are some of the focal points of this part while Cool South is famous for its artistic and cultural activities along with one of the most popular streets of Rotterdam, Witte De With street. The whole neighbourhood is well connected to other parts of the city with public transport.

On the contrary with Cool traditional inner city characteristics, Terbregge corresponds to sub urban type of neighbourhood with residential zones surrounded by water and greenery. This neighbourhood is a part of district with an area of 170 hectares. It has got population of 3554 and total number of households is 1353 as 2016. The whole neighbourhood can be segregated into two parts and as old and newly developed areas. Old part of Terbregge got rural features consisting of residences in ribbon type of development with playgrounds, water and greenery. New part of Terbregge started developing around 1999 and special consideration is given to children while planning. The whole neighbourhood is mostly a residential zone surrounded by water and greenery, having wind mills, playgrounds and a sport complex but devoid of commercial areas even local need shops. Showing dissimilarity with Cool in availability of public transport network, this neighbourhood has got limited connectivity with other parts of the city by public transport.

4.2.2 Descriptive Statistics

Survey was carried out in two neighbourhoods of Rotterdam, Cool and Terbregge, through individually administered survey. 102 respondents completed the survey aged from 19 to 76 years; Cool neighbourhood slightly overrepresented with 54% samples. Moreover, males were slightly overrepresented (54%). The mean age of the respondents was 49 years ($SD=14.99$ years). More than 50% of participants reported to be in very sound status of health (in the category of excellent and very good health). Health refers to self-reported health or objectivity of health. In terms of marital status, more than 40% of participants were married. On account of income, 50% of the respondents belong to higher slab of income of 3500 or more euros per month while only 6% correspond to income range of less than 1100 euros per month.

Dependent variable: Happiness

Happiness is derived from the survey questionnaire. Respondents were asked to report their happiness by answering, “Taking all things together, are you happy”? where 1= not happy at all, 2= not so happy, 3= happy and 4= very happy. (survey conducted in neighbourhoods of Cool and Terbregge).

Table 12: Descriptive statistics for Happiness

Variable	Obs	Mean	Std. Dev.	Min	Max
Happiness	102	3.098039	.724532	1	4

Control variables: Socio-demographics factors

Income, health, social ties, marital status, age, gender, job opportunities are taken as control variables.

Table 13: Descriptive statistics for Control variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	102	3.480392	1.123382	1	5
Health	102	3.647059	.7916277	2	5
Socialties	102	3.205882	1.221412	1	5
Marital	102	2.931373	1.136782	1	4
Gender	102	1.460784	.5009213	1	2
Age	102	49.37255	14.995	19	76
Job	102	3.666667	.6187393	2	5

Independent variables: Urban design features

Focusing on urban design features, participants were also asked to give their opinion in the form of agreement or disagreement with the following statements in the survey conducted in Cool and Terbregge:

- I have easy access in my neighbourhood to plenty of **shops, supermarkets and department stores.**
- There are many **parks and natural areas** in my neighbourhood.
- My neighbourhood has sufficient **trees and landscaping.**
- There is presence of **public gathering places** in my neighbourhood.
- There is presence of **multi-functional buildings** in my neighbourhood.
- It is convenient to use **public transportation system** (bus, tram, metro) in my neighbourhood.

Respondents had to list their choices in one of the five categories, strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. Likert's scale is used to quantify these choices. The choices are listed as 1=strongly disagree, 2=disagree, 3=neither agree

nor disagree, 4=agree and 5= strongly agree. Questionnaire used in survey is attached in annex. 1 and 2.

Table 14 Descriptive statistics for Subjective measures of urban design

Variable	Obs	Mean	Std. Dev.	Min	Max
Supermarket	102	3.068627	1.443729	1	5
Trees	102	3.647059	1.317416	1	5
Publicspace	102	3.519608	.6997934	2	5
Transport	102	3.117647	1.457613	1	5
Park	102	3.696078	1.264827	1	5
Multipur	102	2.911765	1.647698	1	5

4.2.3 Statistical Analysis

Model 2 examines the association between happiness and subjective measures of urban design features along with control variables (Income, health, social ties, marital status, job opportunities, age and gender). As aforementioned, all the data for this analysis is collected by survey from two neighbourhoods, Cool and Terbregge, of Rotterdam. Income, health and social ties are found significant in statistical analysis. On account for subjective measure of urban design features, local perception for presence of shops (including supermarkets and department stores), public space and multifunctional buildings in the neighbourhood shows relevant significant with self-reported happiness. Perception of residents for availability of daily need shops and public spaces in the neighbourhood is affirmative while there is inverse relationship between perceived measure of presence of multifunctional buildings in Cool and Terbregge and self-reported happiness of residents in empirical findings. Also, on level of significance with happiness, stores, supermarkets show moderate ($P=.003$) while public space exhibits low ($P=.099$) relevance. Subjective measure of presence of multifunctional buildings demonstrates moderate level ($P=.020$) of significance with happiness but the order is inverse. Additionally, subjective measure of presence of greenery, natural elements, transport nodes are not found relevant with happiness of residents in Cool and Terbregge.

Marginal effects of Happiness (all groups of happiness=1 to 4) for subjective measures of urban design features are attached in annex. 4.

Table 15: Model 2

Ordered probit regression	Number of obs	=	102
	LR chi2(13)	=	142.19
	Prob > chi2	=	0.0000
Log likelihood = -37.731172	Pseudo R2	=	0.6533

Happiness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Income	1.361462	.372336	3.66	0.000	.6316967	2.091227
Health	1.812957	.4479919	4.05	0.000	.9349088	2.691005
Socialties	.6380923	.2938238	2.17	0.030	.0622082	1.213976
Gender	.307228	.3994231	0.77	0.442	-.4756268	1.090083
Age	.0053852	.0165487	0.33	0.745	-.0270497	.0378201
Job	.1321276	.337731	0.39	0.696	-.529813	.7940682
Marital	.1723432	.1923028	0.90	0.370	-.2045634	.5492498
Supermarket	.9180142	.31154	2.95	0.003	.307407	1.528621
Trees	.5852738	.4594103	1.27	0.203	-.3151537	1.485701
Publicspace	.516073	.3131595	1.65	0.099	-.0977084	1.129854
Transport	.5355277	.3325288	1.61	0.107	-.1162168	1.187272
Park	-.3820763	.4234955	-0.90	0.367	-1.212112	.4479597
Multipur	-.6095003	.2615554	-2.33	0.020	-1.12214	-.0968611
/cut1	13.27786	3.562547			6.295394	20.26032
/cut2	17.06333	3.960856			9.300198	24.82647
/cut3	22.40851	4.696726			13.20309	31.61392

P<0.01 (high significance), P<0.05 (moderate significance), P<0.1(low significance).

4.3 Part 3: Discussion

4.3.1 Interpretation and explanation of Statistical Findings

Researchers often hypothesize that characteristics and design of neighbourhoods are one of the contributors of human health and sense of community. Some neighbourhood encourage residents for physical activities and enhances health and social ties while others are designed to discourage the health conducive factors. Similarly, some fosters connectedness with people whereas others can be categorised as crime-ridden and anti-social. Thus, neighbourhood characteristics are considered related to health and social ties of the residents, thus human welfare and well-being. Studies of relationship between physical environment and well-being are gaining momentum in recent years. In this respect, the current study attempts to find out characteristics of urban design features that are important for happiness and well-being, looking at objective and subjective measures of the physical environment, and at associations with health and social ties.

Research statistics show relevance of happiness with urban design features. Objective measures of greenery and multifunctional buildings are found significant with happiness whereas perception of presence of daily need stores, public space and multifunctional buildings in the neighbourhood demonstrates relevance with happiness. The distinct empirical findings of both the measures with happiness can be explained by the variance of scale in analysis. While analysing happiness with objective measures of urban design features, all neighbourhoods are considered while for perceived measures are collected from only two neighbourhoods of Rotterdam. However, there may some other factors that explains the differences in findings of similar measure.

The current study analyses both the measures of urban facility (daily need stores) for their significance with happiness- whereby only subjective neighbourhood characteristic of urban facility is predictor of happiness while counter objective part shows no relevance with happiness. Residents with perception of adequacy of daily need shops, supermarkets etc in neighbourhood are happier. There is difference in findings of both the measure for urban facility that are not in line with previous research findings. Since previous research assert that real qualities of physical environment have significant effect on perception of residents, there is possibility that distinct empirical finding of the current study can be outcome of dissimilarity between objective and subjective measures that intend to measure the same attribute. For example, objective measure of attribute urban facility restricts the presence of daily need shops up to 300m while subjective measure does not put distance clause and also it consists more variance in the form of shops, supermarkets and department stores while measuring resident's perception.

Although the current research statistics do not show relevance of objective measures of daily need shops in neighbourhood but a number of studies found that placing internalized facilities and services including daily need stores within walking distance from home enhances physical activity and social cohesion among residents (French, Wood, *et al.*, 2014, Lund, 2003, Leyden, 2003, Lund, 2002). Pedestrian trips are greater in neighbourhoods having access to local facilities (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010). Research has consistently proven that placing facilities within walkable distance from home is conducive for three specific relationships- local access and number of trips (pedestrian travel), pedestrian travel and encounter, interaction among neighbours and local access and interaction among neighbours (Lund, 2003). All these three relations lead to health and social ties among neighbourhood residents. More likely, distance of 300m attached with objective measure of urban facility restricts its detection of significance with happiness, however, distance is considered as one of the strongest factor while taking decision to walk and limit of ¼ mile (approximately 400m) is considered as comfortable walking distance in planning literature (Lund, 2003). Extension of limit of 300m to 500m while measuring distance of daily need stores from home can be conducive in detection of significance of objective measures of urban facility for happiness.

As explained earlier, with description of the neighbourhood, both parts of Cool neighbourhood, northern and southern, are characterized by mixed land use of residences, business, commerce, entertainment including sufficient number of internalized amenities like daily need shops, supermarkets, department stores whereas the neighbourhood Terbregge is characterized as residential type surrounded by greenery and water and devoid of urban facilities like daily need stores and even grocery shops. As depicted by previous research findings that real qualities of physical environment have significant effect on perception of residents (Lund, 2003), local access to stores in neighbourhood influences perception as well as behaviour of Cool residents whereas in the case of Terbregge neighbourhood, inadequacy of daily need stores in neighbourhood have significant effect on their perception and thus behaviour. Hence, presence of sufficient number of stores, supermarkets, department stores in the neighbourhood enhances happiness of Cool residents while devoid of these facilities causes inconvenience among Terbregge residents and limits their pedestrian travel as well as chances of social cohesion and, therefore detrimental for their well-being. However, objective measure of presence of daily need stores shows no relevance with happiness but extension of local access to 500m while measuring distance between facility and home can be supportive for relevance of daily need store with happiness in futuristic research.

The current research found that the objective and perceived measures of land use mix are significantly associated with happiness. The objective measure of mixed land use is positively

associated with happiness whereas negative association is found with perceived measure and happiness in statistical findings. One reason for contradiction between findings of both the measures can be variance in scale- for objective measures, all neighbourhoods of Rotterdam are considered while subjective measures are collected only from two neighbourhoods. Types of neighbourhood selected for subjective measures can also be another reason for greater variance in findings between both the measures of land use mix.

On the basis of land use form and present of physical infrastructure, neighbourhood Cool can be termed as mixed land use type while Terbregge can be categorized as sub-urban neighbourhood. As explained earlier, Cool is characterized by large and variety of presence of commerce, business, art and cultural centres along with dwelling units. One of the streets of Cool, 'Witte de With Straat' is considered as the most busiest street of Rotterdam famous for its night life with the presence of world class museums, art galleries, food joints, bars, cafes, restaurants, hotels. Even, few years back Lonely Planet symbolised one of bars of this street, 'The white monkey' as best bar in the world. Additionally, De Lijnbaan street is considered as main shopping street of Rotterdam. The main road Westblaak that passes through the neighbourhood is a busy traffic route and consists of a number destinations including Rotterdam municipality, , De Doelen concert hall as well this road is route of several tram lines.

As higher street activities are often characterised by traffic volume, noise pollution and congestion (Hart and Parkhurst, 2008, Mullan, 2002, Appleyard, 1981) as well as presence of excessive number of outsiders, the mixed and multiple land use of Cool neighbourhood deter residents to walk, interact and linger in the neighbourhood. Frequent encounter with large number of outsiders hinders social cohesion and bonding (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002, Ross and Jang, 2000) as well as negates the feeling of sense of community among residents (French, Wood, *et al.*, 2014, Hart and Parkhurst, 2008, Wood, Frank L., *et al.*, 2010). Even though people on the street are often symbolised as 'effective eyes' (Jacobs, 1961) and this natural surveillance is linked with safety issues (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002, Jacobs, 1961) but advantage depends upon the fact that whether these people are accepted user (local residents) of space or outsiders (Wood, Frank L., *et al.*, 2010). On the contrary with Cool, Terbregge can be termed as suburb with presence of nature in the form of greenery and water bodies as well as convivial side- walks. However, there is negligible presence of internalized facilities, destinations and transport nodes but the neighbourhood is characterized by number of public gathering places in the form of parks, green spaces, and playgrounds. Absence of amenities and street commercial activities but access and accessibility to parks and greener spaces make the neighbourhood environment as pedestrian friendly.

The inverse association of happiness with perception of mixed land use in Cool and Terbregge can be explained by support of two theories. Firstly, as perception depends on real qualities of life; and land use form and presence of internalized facilities term Cool as not pedestrian friendly for residents while Terbregge can be seen as having pleasant walkable environment. Therefore Cool's residents have negative perception for their neighbourhood as walking type while residents of Terbregge's perception for their neighbourhood is as pedestrian friendly. The second theory is that perception of walking is highly influenced by perception of safety. Higher presence of outsiders in the neighbourhood influences the perception of Cool residents about safety of the neighbourhood while Terbregge's residents have positive perception for safety in the neighbourhood because of lack of high street activities and lesser presence of strangers. Studies found that people who live on busy roads know few neighbours because of traffic volume and strangers in the neighbourhood and thus lack social ties in the neighbourhood while Mullan (2002) linked traffic volume with inverse perception of safety and place attachment.

However, there has been mixed evidence to date while investigating association of land use mix and well-being (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002). New urbanism consistently advocates for mixed land use (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002) for supporting physical activity and local social interactions (Lund, 2002, Cattell, 2001) and thus well-being. Land use mix at a neighbourhood level is related with well-being as well as greater sense of neighbourhood satisfaction (Jackson, 2002). Mixed land use is usually characterised by higher quality pedestrian environment which encourages frequent encounter with neighbours and enhances social interaction (Wood, Frank L., *et al.*, 2010, Leyden, 2003, Lund, 2002, Cattell, 2001, Jacobs, 1961). Additionally, presence of local destinations corroborate walking (French, Wood, *et al.*, 2014, Jackson, 2002) and thus supportive of physical activity (Giles-Corti, Vernez-Moudon, *et al.*, 2016, Stevenson, Thomson, *et al.*, 2016). Contrast with Appleyard (1981) findings, Pendola and Gen (2008) revealed the significance of housing on a main street for higher sense of community. One rationale for 'stranger hypothesis' is also that there are chances of casual interactions with outsiders visiting commercial destinations creating social ties and thus making neighbourhood vibrant and convivial (Wood, Frank L., *et al.*, 2010).

As the current study findings state positive association of happiness with objective measure of mixed land use but inverse relationship with subjective measure, the contradiction can be interpreted as presence of multiple destinations are crucial for well-being but availability of excessive destinations are detrimental for health and social ties. Moreover, there may be possibility of descend in sense of community after a set point of walkability (Wood, Frank L., *et al.*, 2010, Wood, Shannon, *et al.*, 2007). In the case of Cool neighbourhood residents' perception about safety of environment is influenced by excessive presence of street activities and strangers in the neighbourhood while lack of high street activities but presence of public gathering places in the form of parks, greenery and playgrounds along with convivial side - walks are conducive for positive perception of Terbregge resident's about their neighbourhood's safety. As described in the previous paragraphs the benefits of mixed land use, the aforesaid advantages of presence of multiple destinations in the surroundings are responsible for significant of objective measure of land use mix in all neighbourhoods of Rotterdam. Presence of destinations encourages residents to walk, linger and interact (Francis, Giles-Corti, *et al.*, 2012, Cattell, Dines, *et al.*, 2008), thus conducive for health and social bonding while excessive destination settings correspond to intrusion by strangers (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Jackson, 2002, Ross and Jang, 2000), traffic volume (Hart and Parkhurst, 2008, Mullan, 2002, Appleyard, 1981) and safety issues (Mullan, 2002) in the neighbourhood and hence limits residents to linger and mingle in the neighbourhood and ultimately, detrimental for health and social ties. Apart from quantity, type and quality of facilities are also important for promoting walking in the neighbourhood. For instance, internalized facilities like daily need shops, kindergarten, playgrounds, parks that are placed in the neighbourhood for residents use are promoting local interaction and social cohesion but high end commercial activities like museums, art galleries, famous restaurants, multiplexes, shopping streets attract people from outside and detrimental for safety of the neighbourhood.

On account of its objective measure, there is no significant association is found between presence of public spaces in the neighbourhood and happiness of residents in the current study but perception of residents of neighbourhoods of Cool and Terbregge about presence of public spaces are found positive with happiness. Residents who perceived that there is presence of public spaces in the neighbourhood are happier. Previous research have outlined the significance of public spaces for promoting healthy life styles, benefitting psychological health and sense of community (Francis, Giles-Corti, *et al.*, 2012, Leyden, Goldberg, *et al.*, 2011,

Cattell, Dines, *et al.*, 2008, Jackson, 2002). They are symbolised as ‘*sites of civic promise*’ (Amin, 2006) as place gathering places promote face to face interactions (Cattell, Dines, *et al.*, 2008), sociability and sense of community among residents. The difference in finding of perceived and objective measures can be explained in the same manner as in case of presence of daily need shops in the neighbourhood i.e. dissimilarity in measures of objective and subjective measures while measuring similar attribute. Presence of public spaces within 250 m from home was considered while taking objective measurements whereas distance from home was not included in survey questionnaire, only adequacy about presence of public spaces in the neighbourhood were asked from the respondents in the current study. As said earlier ¼ mile is regarded as comfortable walkable distance in planning literature; shifting the distance of 250m to comfortable walking distance or even slighter higher will facilitate the detection of presence of public spaces in neighbourhood for happiness as public spaces are one of the constructs of built environment that are helpful in fostering sense of community and social interaction among residents.

However, some studies found no significance association of quantitative value of public gathering places with social interaction; it was qualitative aspect of ‘third places’ that formed relevant relationship with social bonding and sense of community. Only quantitative availability is not enough for making public spaces conducive for well-being (Gehl, 2006). Architects, urban planners and sociologists has given emphasis on quality of these spaces for social interaction (Gehl, 2006, Carr, Francis, *et al.*, 1992, Jacobs, 1961) . Jan Gehl focused on ‘*why and how people use public space*’ while Carr, Francis, *et al.* (1992) stated that quality public space must possess characteristics of attraction, cleanliness and comfort. Some researchers also concluded proximity, accessibility and suitable surrounding environment (Wood, Frank L., *et al.*, 2010, Lund, 2002) as pre requisite criteria to be termed as quality public space.

Presence of greenery in the neighbourhood demonstrates positive significance with objective measure but local perception shows no relevance with happiness in the current study. As aforesaid, characteristics of physical environment are mainly responsible for perception of residents about that specific characteristic, so perception of adequacy of greenery in the neighbourhood should be significantly positive with happiness for Terbrege residents as the neighbourhood has got abundant of parks, green spaces and natural elements. and significantly negative for Cool residents because of limited presence of greenery and parks in the neighbourhood. Hence, significant relationship with happiness and subjective measure of presence of greenery in two neighbourhoods of Rotterdam should be displayed in the current research findings. But research statistics show no significant association for presence of greenery on account of subjective measures in the neighbourhoods of Cool and Terbregge. Reasoning for non- relevance with happiness can be limited sample size of 102 that restricts the detection of perception of present of greenery as studies consistently assert significance of natural environment for well-being. Moreover, residents living with high nature are more physically active, sociable, supportive as well as have greater sense of community than people living with low nature (Kuo and Sullivan, 2001). Both, developed and less-developed, natural areas are directly linked to sense of community (Kearney, 2006). Moreover, benefits of greenery can be acquired without physically experiencing it (Kearney, 2006, Groenewegen, Berg, *et al.*, 2006). View of nature from home is great relief from mental fatigue and depression (Jackson, 2002, Ulrich, Simons, *et al.*, 1991).

Notably, most of academia related to build environment categorise green spaces as public place (Francis, Giles-Corti, *et al.*, 2012, Cattell, Dines, *et al.*, 2008, Jacobs, 1961) as they exhibit qualities of ‘third places’ of promoting social interaction and cohesion (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Berg, Winsum-Westra, *et al.*, 2010, Cattell, Dines, *et al.*,

2008, Nielsen and Hansen, 2007, Wakefield, Yeudall, *et al.*, 2007, Groenewegen, Berg, *et al.*, 2006) apart from their salutary and restorative effects. Therefore, “*the wider the varietythat diverse needs may be met*” corollary is applicable in explaining the relevance of green spaces with happiness.

Studies, however, also report significance with high quality green spaces for sense of community and social cohesion as a quality place always fascinates a large number of people and diverse activities. But as a high quality park usually corresponds to advantaged socio-economic neighbourhood (Crawford, Timperio, *et al.*, 2008) and refers to higher property value and thus high rent in that locality. Advantage depends on whether the resident is property owner or tenant. Moreover, availability of natural elements in the surroundings is also linked with eco-system disservices.

Variations in findings of objective and perceived measures of the similar construct can also be explained by the influence of potential confounding factors like length of residency, home ownership, self -selection criteria for neighbourhood and ethnicity. Home ownership is considered as key predictor of sense of community (Wood, Frank L., *et al.*, 2010) and thus well-being. Stronger neighbourhood ties are predicted by length of residency (Berg, Winsum-Westra, *et al.*, 2010, Cattell, Dines, *et al.*, 2008, Walker, 2004, McCulloch, 2003, Onyx and Bullen, 2000) while an Australian research does not show any relevant relationship (Wood, Shannon, *et al.*, 2007). Additionally, research suggest that some residents select the neighbourhood as per their preferences (Cao, 2006). For instance, people who prefer walking, will go for neighbourhood with that preference and it is also evident that higher quality parks correspond to advantaged socio-economic neighbourhoods (Crawford, Timperio, *et al.*, 2008). Not considering these factors while assessing ‘importance of place and concept of happiness’ can be listed as one of the limitations of the current study.

4.3.2 Applicability of research conceptual framework

As indicated in chapter 2, the conceptual framework of the research builds upon the three findings of the literature. First one is ‘health, wealth and social ties are key predictors of happiness’. Findings of the research (objective as well as subjective) show high positive relevance of income with happiness as predicted by almost all happiness literature. Other major predictor from previous research, subjective health also reported significant association with happiness in the research. Similarly, connectedness with people in the surroundings also found important for happiness as reported by previous research on social ties and well-being. Nonetheless, health and social ties do not show any relevance with happiness when happiness is analysed with objective measures of urban design features. Reason behind the insignificance can be given as measurement unit for both is index which is specific for each neighbourhood. Additionally, several research report higher significance of subjective health with happiness than its objective counterpart. Also, some factors like length of residency, self -selection of the neighbourhood and home ownership which are also relevant for social ties are not included in the research.

The second postulate on which the conceptual framework rests is that urban design is considered as important force for human health and conditions; and since health and social ties are key predictors of happiness, so happiness also depends on urban design features. The second postulate also proves relevant in the research. Five urban design features are analysed for their significance with happiness on objective and subjective measures. The objective measure of presence of greenery and land use mix are found significant in empirical finding of the research whereas neighbourhood perception of land use mix and presence of public space, supermarkets, shops shows relevant relationship with happiness. However, one of the selected urban feature, presence of transport nodes in the neighbourhood, is found insignificant for

happiness. In nutshell, overall research findings report importance of urban design features on happiness which is derived from contribution of urban design for improving human health and social ties.

The third literature finding ,which is one of pillars of the conceptual framework, states the importance of both- objective as well as subjective measures of living environment for happiness. The previous research finding also proves significant with the empirical results of the current study. Aforementioned paragraph states about the relevance of particular urban design feature with happiness. There is, nevertheless, inconsistency between findings of the same urban design feature on account of its objective and subjective measures. For instance, land use mix is found positively associated with happiness while its relationship with happiness is found inverse in the current study. Similarly, presence of greenery is important for happiness but local perception for presence of greenery is reported insignificant with happiness. As previously mentioned about variance in indicators for both the measures as well as scale of measurement may be responsible for the inconsistent findings of both the measures for same urban feature.

Chapter 5: Conclusions & Recommendations

This study highlights the impact of urban design features on happiness, looking at objective and subjective measures, and at associations with health and social ties. It specifically, focuses on urban facilities, greenery, transport nodes, public spaces and land use mixed as urban design variables influencing happiness in neighbourhoods of Rotterdam city. The concept of happiness used in the research is self-reported individual ‘overall happiness’ which is combination of ‘*how well one feels generally*’ (aspect) and ‘*how favourable one compares with various standards of success*’ (appraisal).

5.1 Research Findings Reflections and Answer to Research Questions

5.1.1 (1a): Objective measures of urban design features significant for happiness

Statistically significant relationship are found between objective measures of greenery, land use mix and self-reported happiness. Relevance of happiness with objective measures implies that happiness depends upon real qualities of life (Veenhoven, 1991). Presence of greenery exhibits moderate significance with happiness while availability of multifunctional buildings in the neighbourhood shows low level of significance with happiness in empirical analysis. Neighbourhoods that have natural elements, parks, greenery also have happier residents (Leyden, Goldberg, *et al.*, 2011). Nature and natural elements have therapeutic, salutary and restorative effects that are conducive for physical and mental health (Francis, Giles-Corti, *et al.*, 2012, Wood, Frank L., *et al.*, 2010, Nielsen and Hansen, 2007, Groenewegen, Berg, *et al.*, 2006, Jackson, 2002). Also, presence of park in the vicinity promotes social cohesion (Bosch, 2017, Berg, Winsum-Westra, *et al.*, 2010, Wakefield, Yeudall, *et al.*, 2007, Jacobs, 1961) among residents and thus well-being. Also, availability of destinations and multifunctional buildings in the neighbourhood promotes health and social cohesion and thus enhances well-being of the residents (French, Wood, *et al.*, 2014, Wood, Frank L., *et al.*, 2010, Louw and Bruinsma, 2006, Jackson, 2002, Jacobs, 1961). As the new urbanism consistently urges about prominence of mixed type of neighbourhood development (Leyden, 2003, Lund, 2003, Lund, 2002) for well-being, the empirical findings also assert presence of multifunctional buildings in the neighbourhood important for happiness of the residents. Residents are happier if they have multiple destinations (Leyden, Goldberg, *et al.*, 2011) in the neighbourhood. However, presence of daily need shops and public spaces are not significant with happiness but interpretation given for the non-significance of these destinations is attachment of certain distance (300 m for daily need shops and 250 m for public spaces from home) with its measure that hinders their relevance with happiness. Additionally, presence of transport nodes in the neighbourhood are not found relevant with happiness in current research statistics.

5.1.2 (1b): Significant subjective measures of urban design and their extent of relevance for happiness

Empirical findings state that local perception of presence of land use mix, public space and local shops (including supermarkets and department stores) are significant for self-reported happiness of residents in the neighbourhoods of Cool and Terbregge. Significance of happiness with subjective measures asserts that happiness does depend on subjective comparison (Veenhoven, 1991). Perceived measure of land use mix exhibits moderate level of significance with happiness in statistical findings but the association is inverse. The study explains negative association on the basis of relationship between perception of walkability and perception of safety. Frequent encounter with outsiders negates the feeling of sense of community (Hart and Parkhurst, 2008, Wood, Frank L., *et al.*, 2010) and even instigates safety issues (Mullan, 2002), thus preventing social ties among locals (Ross and Jang, 2000) in Cool neighbourhood while absence of high street activities and availability of public gathering places in the form of parks,

green spaces promotes walkability and enhances perception of safety for the neighbourhood. Additionally, neighbourhood perception of local shopping destinations for daily need and public spaces are positively associated with happiness of the residents. Subjective measure of presence of shops demonstrates moderate relevance with happiness while public space exhibits low importance with happiness in statistical findings. Presence of destinations like daily need shops and public spaces corroborates walking and social ties and thus residents have positive perception for walkability in the neighbourhood. Perceived measure of presence of transport nodes and greenery in neighbourhoods of Cool and Terbregge, nevertheless, are not found significant for happiness in empirical results.

5.1.3 (1): Significance of urban design features for happiness

From the statistical analysis of objective and subjective measures with happiness, it is evident that urban design is important for happiness. Urban design features do matter (Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Leyden, Goldberg, *et al.*, 2011, Wood, Frank L., *et al.*, 2010, Jackson, 2002). The way neighbourhoods are designed and built have an impact on well-being and happiness of the residents (Leyden, Goldberg, *et al.*, 2011, Jackson, 2002). Furthermore, empirical findings exhibit role of both, objective and subjective, measures for happiness. Significance of 'real quality' and 'subjective comparison' for happiness states that happiness does depend on subjective appreciation but also on objective goods (Veenhoven, 1991). Hence, research outlines the importance of perceived quality of urban design features along with its objective measures. Happiness is not only a subject of outlook but also related to objective goods (Veenhoven, 1991). The research statistics, however, report significant specific characteristics with their strength of relevance with happiness but on implications and applicability of specific features of urban design, it demands further investigations and suggests future guidelines for research because of the several limitations of the current study.

One of the major shortcomings of the current study is choice of indicators for objective measures and distance from home (300m for daily need shops and 250m for public spaces) as attached with some of the indicators. Limited variance in objective features is present in the research. Also, the study is limited in terms of data on perceived quality of urban design features. Survey is conducted in two neighbourhoods of Rotterdam only with limited sample of 102. Moreover, variance in use of scale for both measures for urban design features is also one of the reasons to constrain on these outcomes for future applicability. Therefore, the research merits further investigation with newly proposed guidelines as listed in 5.2 section for categorising urban features significant for happiness to increase the applicability and wider implications of findings. But the current study findings assert the importance of urban design for happiness as well as inclusion of both the measures in the statistical analysis.

5.2 Guidelines for further research for generalization of findings

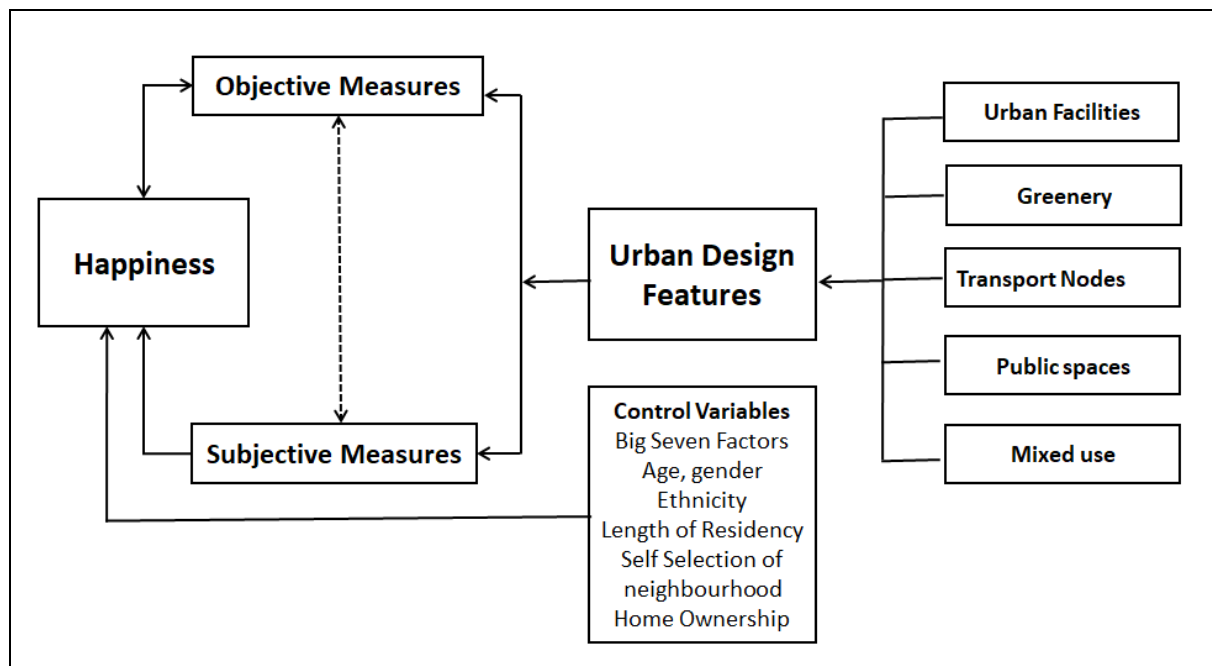
One of the major limitations of the current study is scale of survey; perceived measure related to urban design features is collected only from two neighbourhoods of Rotterdam city which restricts the generalization of the findings for whole Rotterdam city or similar cities. For higher validity, subjective measures for urban design features should be collected from rest all neighbourhoods of Rotterdam with larger sample size in each of the neighbourhoods. Another key limitation of the research is limited variance in objective measures which may have restricted detection of relevant linkage between urban design features and happiness, therefore there is need for more variance of objective environment to be included and with comprehensive measures or index, objective features should be analyse for significant for happiness in further research. Additionally, there is also necessity to include similar attribute of objective and subjective measures to investigate the complex interplay between the two (French, Wood, *et al.*, 2014) in the further research.

Besides, more variance require to be included in the further study like length of residency, home ownership, ethnicity and self-selection criteria for neighbourhood. Mixed type of findings in the study corroborate the inclusion of objective and subjective measures (Wood, Frank L., *et al.*, 2010) of urban design; however, the differences in findings between objective environment and perception of residents in the research warrant further investigations.

. Most of the research in the field of well-being with built-form advocates for perception of residents for its suitability but the role of objective environment cannot be deniable as happiness is not only relative, it also depends on need gratification too (Veenhoven, 1991).

Causality between dependent and independent variables cannot be inferred as data used for analysis are cross sectional (Giles-Corti, Vernez-Moudon, *et al.*, 2016, French, Wood, *et al.*, 2014). Previous researchers also showed concern about endogeneity while dealing with cross sectional data and stated, “*ultimately, longitudinal data and quasi-experimental methods will be necessary to resolve those uncertainties*” (Helliwell and Putnam, 2005, p.440). Hence, causality can be established by performing longitudinal studies. However, it is not possible to gather previous years data for subjective measure but objective data of previous years can easily be obtained. As happiness research is quite old, happiness data for Rotterdam can also be collected for previous years. By conducting longitudinal studies between happiness and objective measures of urban design features, causality can be inferred to exhibit whether the directional arrows point from urban design features (objective measures) to happiness or the reverse.

Fig.6: Proposed Conceptual Framework for further research



Source: Author, 2017

On the basis of given guidelines for further research for generalization of research findings for Rotterdam or similar cities, the current study proposes a new framework (Fig.6) for future investigation in matters of urban design and happiness in neighbourhoods of Rotterdam.

5.3 Conclusion

The study suggests that urban design features are also relevant for happiness. Urban design features do matters for happiness and well-being (Stevenson, Thomson, *et al.*, 2016, French, Wood, *et al.*, 2014, Leyden, Goldberg, *et al.*, 2011, Wood, Frank L., *et al.*, 2010, Jackson,

2002). Additionally, perceived as well as objective neighbourhood features are important for happiness. Because of several limitations of the current study, the research constraints itself to point out specific characteristics of urban design features relevant for well-being but proposes future guidelines for research to explain and explore the relationship between happiness and physical environment, more specifically to list the specific urban design feature conducive for well-being.

Research analysis strengthens the postulate “*health, wealth and social ties are key predictors of happiness*” of the happiness literature. Moreover, it corroborates the ‘beyond GDP’ debate of the well-being research and advocates for inclusion of non-financial measures in happiness economics apart from traditional financial predictors. Furthermore, the research presented here is explanatory but it includes objective and subjective measures to explain the impact of physical environment on happiness and most of the quality of life research are based on subjective measures. Research findings assert the importance of objective and perceived quality for happiness. It advocates for addition of non-pecuniary measures for assessment of well-being, more specifically physical environment features and inclusion of objective measures along with perceived quality while establishing relationship with well-being and physical environment. By exhibiting relevance of objective measures on QOL studies, it makes addition to the available literature and thus significantly contributes to QOL studies. However, the study maintains its shortcomings to point out specific significant characteristics for happiness but on account of highlighting the importance of affect theory in QOL research, it makes valuable contribution.

Apart from aforementioned guidelines for further investigation in matters of urban design and well-being in 5.2 section, there are several other avenues of future research that will guide better and clear understanding of interlinking of urban forms and happiness. First, as aesthetics is regarded as pivotal aspect related to urban design, the perspective of quality design and attractiveness should be included in research framework while assessing role of physical environment for well-being. What does attractiveness of a neighbourhood have to do with the study of happiness? Apart from its economic relevance, are they conducive for well-being in terms of health and social ties? Aesthetics and quality prospect of the urban areas are often linked with ‘competitiveness’ but there is also need to analyse this component of urban space with physical and psychological health and sense of community for residents. Secondly, there is also merit to investigate additional measures emphasizing on the condition of public sphere for welfare of residents. What is the relationship between maintenance of public realm and well-being? Do organization and maintenance of urban places where we live significant for happiness? Additionally, there is necessity for transdisciplinary research involving disciplines of urban planning and design, transport planning, public health departments on the matters related to physical environment and public welfare.

The research findings, nevertheless, are not quite strong for specifying particular urban design features conducive for well-being but integrates some considerable avenues for further studies that could be explained and explored. Because of this and absence of evidence on causality, there are limitations for making clear policy recommendation at this stage for specific features of urban design. Since sufficient evidence has been found in various previous research including the current findings for role of urban planning and design interventions for public welfare and well-being and the interlinking between physical and social environment is undeniable; urban designers, planners, health professionals, transport engineers and policy makers should give enough emphasis on the way urban spaces are built and designed as “*urban landscape is not simply the result of individual choices about where to live or to create a business. It is the product of a multitude of governmental policies*”(Frug, 1996, p.1038).

5.4 Policy Recommendations

One firm conclusion that can be taken from the research findings is that urban design features are also important for happiness. The current study confirms the previous research findings that urban design is important for well-being. However, the current research is unable to concisely point out specific characteristics of urban design features significant for happiness but merits further investigation and suggests apt recommendations regarding this in aforesaid section. Still, finding of current study for overall relevance of urban design for happiness underpinned by previous research results for significant of physical environment for well-being are adept to recommend inclusion of non-pecuniary measures while assessing *'how well our society is performing'*. Therefore, consideration should be given for subjective measures also apart from traditional economic measures for measuring well-being and formulating social policies. In this respect, the research findings present enough evidence for support of overall significance of urban design for happiness. Moreover, the current study advocates for inclusion of subjective measures apart from pre-determined factors for measuring well-being and in policy relevant matters. This recommendation shows similarity with the report of Office of National Statistics, UK and as ONS states *"developing better measures of well-being and progress is a common international goal ... Within the UK there is a commitment to developing wider measures of well-being so that government policies can be more tailored to the things that matter ... Wider and systematic consideration of well-being has the potential to lead to better decisions by government, markets and the public and as such better outcomes"* (ONS, 2011).

Besides emphasising on non-financial measures for well-being and policy relevant matters, another policy related relationship that can be inferred from the research findings is between land use mix and happiness. Overall research findings state significance of presence of destinations (amenities) in the neighbourhood for happiness, however, excessive destinations are also explained as detrimental for well-being in the current study. This implies for necessity of availability of internalized facilities in the neighbourhood but in controlled number and kind of these facilities also matters. However, urban regeneration policy deals with land use mix in the Netherlands but there is need for amendments and revitalisation in policy terms at municipality level and also requires validating in a number of different settings in the neighbourhoods of Rotterdam.

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Annex 1: Data Collection Instrument (Questionnaire: English version)

Quality of Life Survey

Note: All information you provided in the survey will be used for academic purposes only and will be confidential.

Respondent age:

Respondent gender:

1. I have easy access in my neighbourhood to plenty of **shops, supermarkets** and **department stores**.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

2. My neighbourhood allows easy access to **cultural and leisure facilities** like movie, theatres, community hall, playgrounds.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

3. There are many **parks and natural areas** in my neighbourhood.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

4. My neighbourhood has sufficient **trees and landscaping**.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

5. There is presence of **public gathering places** in my neighbourhood.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

6. There is presence of **multi-functional buildings** in my neighbourhood.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

7. It is convenient to use **public transportation system** (bus, tram, metro) in my neighbourhood.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

8. There are plenty **job opportunities** in my **city**.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

9. I feel **connected** to the people who live in my neighbourhood.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

10. It is easy to get good quality **healthcare** in my **city**.

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree

11. My current marital status is

☐ Married ☐ Separated /Divorced ☐ Widowed ☐ Never married

12. I can rate my health as

☐ Excellent ☐ Very good ☐ Good ☐ Bad ☐ Very bad

13. My income per month falls under the category

☐ Less than 1100 euro ☐ 1100 to 1500 euro
☐ 1500 to 2000 euro ☐ 2000 to 3350 euro
☐ 3350 and above euro

14. Taking all things together, how happy I say I am?

☐ Very happy ☐ Happy ☐ Not so happy ☐ Not happy at all

Thank You

Annex 2: Data Collection Instrument (Questionnaire: Dutch version)

Quality of Life Survey

Notitie: Alle informatie die u in de enquête heeft verstrekt, wordt alleen voor academische doeleinden gebruikt en zal vertrouwelijk zijn.

Respondent geslacht:

Respondent Leeftijd:

1. Ik heb gemakkelijke toegang in mijn buurt naar veel **winkels, supermarkten en warenhuizen.**

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

2. Mijn buurt biedt gemakkelijke toegang tot **culturele en recreatieve faciliteiten**, zoals bioscopen, gemeenschapshallen, speelplaatsen.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

3. Er zijn veel **parken en natuurgebieden** in mijn buurt.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

4. Mijn buurt heeft voldoende **bomen en landschappen.**

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

5. Er zijn aanwezigheid van **openbare vergaderplaatsen** in mijn buurt.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

6. Er zijn aanwezigheid van **multifunctionele gebouwen** in mijn buurt.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

7. Het is handig om **openbaar vervoer** (bus, tram, metro) in mijn buurt te gebruiken.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet oneens zijn ☐ Sterk oneens

8. Er zijn veel **banen** in mijn stad.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet onees zijn ☐ Sterk oneens

9. Ik voel me **verbonden** met de mensen die in mijn buurt wonen.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet onees zijn ☐ Sterk oneens

10. Het is gemakkelijk om **goede gezondheidszorg** in mijn stad te krijgen.

☐ Sterk mee eens ☐ Mee eens ☐ Niet eens, niet oneens ☐ Hiet onees zijn ☐ Sterk oneens

11.. Mijn huidige burgerlijke staat is

☐ Getrouwd ☐ Gescheiden ☐ Weduwe ☐ Nooit Getrouwd

12. Ik kan mijn gezondheid beoordelen als

☐ Uitstekend ☐ Erg goed ☐ Goed ☐ Slecht ☐ Heel slecht

13. Mijn inkomen per maand valt onder de categorie

☐ Minder dan 1100 Euros per maand ☐ 1100 tot 1500 Euros per maand

☐ 1500 tot 2000 Euros per maand ☐ 2000 tot 3350 Euro per maand

☐ 3350 Euro en meer per maand

14. Met alles samen, hoe blij ik zeg dat ik ben?

☐ Heel gelukkig ☐ Gelukkig ☐ Niet zo gelukkig ☐ Helemaal niet gelukkig

Dank Je

Annex 3: Marginal Effects (I)
(Objective measures of Urban design features and Happiness)

VARIABLES	Happiness=1	Happiness=2	Happiness=3	Happiness=4
Income	-0.0104*** (0.00103)	-0.0382*** (0.00230)	-0.0147*** (0.00169)	0.0633*** (0.00348)
Health	-0.0391 (0.0394)	-0.144 (0.145)	-0.0553 (0.0558)	0.238 (0.239)
SocialTies	-0.00287 (0.00369)	-0.0106 (0.0136)	-0.00406 (0.00523)	0.0175 (0.0225)
Gender	-0.00202 (0.00157)	-0.00745 (0.00578)	-0.00286 (0.00224)	0.0123 (0.00956)
Age	0.000156*** (4.49e-05)	0.000576*** (0.000159)	0.000221*** (6.47e-05)	- 0.000953*** (0.000262)
Playground	0.00663 (0.00582)	0.0244 (0.0213)	0.00938 (0.00826)	-0.0404 (0.0353)
Green	-0.0175** (0.00871)	-0.0646** (0.0317)	-0.0248** (0.0124)	0.107** (0.0524)
Multifunction	-0.0362 (0.0221)	-0.133* (0.0808)	-0.0512 (0.0314)	0.221* (0.134)
PublicSpace	0.0858 (0.126)	0.316 (0.465)	0.121 (0.179)	-0.523 (0.769)
CulturalFacility	-0.00432 (0.00415)	-0.0159 (0.0152)	-0.00612 (0.00589)	0.0264 (0.0252)
DailyneedShop	-0.00447 (0.00487)	-0.0164 (0.0179)	-0.00632 (0.00690)	0.0272 (0.0296)
Trees	0.000127 (0.00104)	0.000466 (0.00383)	0.000179 (0.00147)	-0.000772 (0.00635)
TransportNodes	-0.00470 (0.00773)	-0.0173 (0.0284)	-0.00666 (0.0109)	0.0287 (0.0470)
Observations	4,919	4,919	4,919	4,919
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				0

Annex 4: Marginal Effects (2)

(Subjective measures of Urban design features and Happiness)

	Happiness=1	Happiness=2	Happiness=3	Happiness=4
Income	-0.0157*	-0.119***	0.0101	0.125***
	(0.00855)	(0.0297)	(0.0161)	(0.0268)
Health	-0.0208*	-0.159***	0.0134	0.166***
	(0.0114)	(0.0370)	(0.0221)	(0.0265)
Socialties	-0.00734	-0.0559**	0.00473	0.0585**
	(0.00465)	(0.0236)	(0.00697)	(0.0262)
Gender	-0.00353	-0.0269	0.00228	0.0282
	(0.00485)	(0.0347)	(0.00432)	(0.0366)
Age	-6.19e-05	-0.000471	3.99e-05	0.000493
	(0.000190)	(0.00145)	(0.000140)	(0.00151)
Job	-0.00152	-0.0116	0.000979	0.0121
	(0.00402)	(0.0292)	(0.00249)	(0.0311)
Supermarket	-0.0106*	-0.0804***	0.00680	0.0841***
	(0.00604)	(0.0238)	(0.0104)	(0.0253)
Trees	-0.00673	-0.0512	0.00434	0.0536
	(0.00612)	(0.0403)	(0.00803)	(0.0406)
Publicspace	-0.00593	-0.0452*	0.00382	0.0473*
	(0.00444)	(0.0270)	(0.00624)	(0.0280)
Transport	-0.00616	-0.0469*	0.00397	0.0491
	(0.00476)	(0.0285)	(0.00636)	(0.0300)
Park	0.00439	0.0334	-0.00283	-0.0350
	(0.00527)	(0.0370)	(0.00555)	(0.0383)
Multipur	0.00701	0.0534**	-0.00452	-0.0558**
	(0.00448)	(0.0214)	(0.00696)	(0.0228)
Marital	-0.00198	-0.0151	0.00128	0.0158
	(0.00257)	(0.0164)	(0.00242)	(0.0173)
Observations	102	102	102	102
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

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