Residential conditions and Quality of Life among locals and immigrants in two Norwegian neighbourhoods

by

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Preface

This thesis is submitted in fulfilment of the requirements for the degree of Philosophiae Doctor (PhD) at the University of Stavanger (UiS), faculty of Science and Technology. The work has been carried out between August 2016 and February 2020. The sole exception in this regard was in 2018 when I spent two months at SDSU, San Diego State University (California), as a visiting scholar in the Department of Sociology.

Throughout my doctoral studies, I was able to attend several conferences and PhD courses nationally and internationally. One of the PhD courses gave me the opportunity of succeeding in a course for innovation and commercial perspectives where I was funded with a grant by *Plogen Program* in 2018.

Most of this research has been conducted at the University of Stavanger where the research environment has been highly engaging and involving, letting me participate in other parallel research programs as IRIS Samfunnsforsking, in 2018.

One of the most rewarding experiences through these years has been the participation on the *Forsker Grand Prix* TV Program. A valuable lesson about sharing knowledge to the world, from an entertaining and academic perspective.

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It is a pleasure for me to express my gratitude to all the people and institutions that made this PhD thesis possible. I first would like to thank Daniela Müller-Eie, my supervisor and in parallel, friend and confident. Thank you for your patience, positivity and motivation.

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Thanks to these professors, colleagues, friends and everyone else who have been partakers of my PhD at some point, your interest and involvement have meant a lot in this journey.

Finally, I want to thank everyone who, 3000 km away, has been living this experience with me. My family that is always there unconditionally. Iván Cabrera i Fausto, thank you for being so supportive through my experience in Norway, you initiated it.

I also want to thank the entire educational and administrative system at UiS that exists behind each research project, as well as every participant who contributed to this study.

Summary

The housing circumstances and neighbourhood aspects (residential conditions) under which an individual lives can influence his/her Quality of Life. Residential conditions are considered a significant indicator of Quality of Life and well-being. Identifying the residential conditions under which the population lives in Norway is a concept worthy of attention due to its position on worldwide Quality of Life indexes. More specifically, and due to the Norwegian migrant situation, the interest not only relies on how residential conditions influences Quality of Life but if this impact is different among the local and immigrant population.

As in many European countries, migration has been one of the main justifications of development, change and transformation of urban areas in Norway, a factor of urban and social transformation, specifically since the 60s, and more attenuated during the last decade. Two urban neighbourhoods are selected due to their high share of immigrants (20%): Storhaug (in Stavanger) and Grünerløkka (in Oslo). While Storhaug and Grünerløkka differ in terms of demography, dimension, housing layout, physical and environmental aspects, and transport infrastructure, local and immigrant residents have been interviewed in both neighbourhoods (238 participants in total) and these populations groups are being compared.

This study considers the neighbourhood level as the most optimum scale to carry out this research, being more adequate for collecting data of residents living in the study areas as well as for carrying out a spatial registration within certain limits.

To achieve an understanding of the influence of residential conditions on both population groups, the following research question is explored: *How do residential conditions affect perceived Quality of Life for local and immigrant populations in Storhaug and Grünerløkka?*

Objective and subjective information has been gathered to obtain a complete framework of the residential conditions of the research areas, together with participant's satisfaction with certain dimensions, i.e., physical, mobility, social and psychological.

This PhD dissertation focuses on urban, social and environmental issues where a compound of different methodologies are applied: spatial analysis, questionnaires, desktop research, GIS and statistical analysis.

Among the different methodologies, this dissertation enforces and develop subjective mapping as a method for linking activities and place perceptions to spatial and physical referents. It enables us to be responsive to people's needs when studying at a neighbourhood level and combining objective and subjective components.

This research determines that certain housing and neighbourhood conditions can impact on perceived Quality of Life. It identifies that the immigrant population lives under worse residential conditions than Norwegians do, despite living in the same neighbourhood, i.e., they are less satisfied with their residences, their neighbourhood conditions and their Quality of Life in general. However, when comparing results in Storhaug and Grünerløkka, results show that the perceived Quality of Life among the participants is similar in both research areas, despite their different demographic, physical and environmental characteristics.

Results are expected to help Norwegian authorities respond to new developments and concerns, to provide a setting where governments can compare policy experiences, seek answers to demographic and urban problems, identify good practise within urban domains and work to co-ordinate domestic and international policies.

Table of Contents

Preface iii

Acknowledgements iv

Summary v

1 Introduction 1

2 Background 10

2.1. Quality of life 10

2.2. Residential conditions 15

2.2.1. Housing circumstances 16

2.2.2. Neighbourhood conditions 19

2.3. Immigration 22

2.4. Three-way relationship between RC, QoL and immigration 27

3 Methodology 29

3.1. Research Design 29

3.1.1. Case Study Approach 31

3.1.2. Selection of indicators 32

3.1.3. Data collection 34

3.1.4. Data analysis 40

3.1.5. Limitations 43

3.2. Case Study Presentation 45

4 Findings and discussion 61

4.1. Relationship between Residential Conditions and Quality of Life 64

4.1.1. Housing circumstances and Quality of Life 69

4.1.2. Neighbourhood conditions and Quality of Life 72

4.2. Differences between population groups 75

4.3. Differences between cases: Storhaug and Grünerløkka 77

4.4. Objective Data Vs. Subjective Data 80

5 Contribution to knowledge 82

5.1. Theoretically: Relationship and differences between population groups 82

5.2. Practically: Implications 84

5.3. Methodologically 88

5.4. Future considerations 89
6 Conclusion 92
7 Publications of the thesis 94
8 References 101
Appendices 113
Appendix 1 – Residential Conditions for Immigrant Population. 113
Appendix 2 – Quality of Urban Life and Its Relationship to Spatial Conditions. 126
Appendix 3 – Mapping local perceptions with geographic information. 139
Appendix 4 – An Approach to Subjective Mapping: Using Maps to Investigate Local User Perceptions of Urban Quality in Hillevåg, Norway. 160
Appendix 5 – Approaching Societal Safety from the Urban Perspective. 179
Appendix 6 – Housing circumstances and Quality of Life among local and immigrant population in Norwegian neighbourhoods. 188
Appendix 7 – Neighbourhood conditions and Quality of Life among local and immigrant population in Norway. 218

Table of Figures

Figure 1: Dimensions of Quality of Life, by Eurostat. 2
Figure 2: Better Life Index (a) and Human Development Index (b), 2018. 12
Figure 3: Ranking for Quality of Life indicators in Norway by Eurostat, 2018. 14
Figure 4: Maslow's pyramid (Maslow, 1943). 18
Figure 5: Population changes in Norway. Birth, deaths, immigration and emigration. 1951-2016 (Statistikkbanken, 2019b). 24
Figure 6: Immigration according to entry categories, and total. 1990–2017 (Statistikkbanken, 2019b). 26
Figure 7: Research design and research questions. 29
Figure 8: Paper map-based questionnaire of the pilot study. 37
Figure 9: Paper (a) and digital (b) map-based questionnaires created for this study. 39
Figure 10: List of independent and dependent variables of this study. 42

Figure 11: Local and immigrant participants' residence locations in Storhaug (a) and Grünerløkka (b). 48
Figure 12: Population in Storhaug and Grünerløkka depending on age and gender (Statistikkbanken, 2019b). 49
Figure 13: Participants of this study in Storhaug and Grünerløkka depending on age and gender. 49
Figure 14: Southeast of Storhaug. Currently under construction. 51
Figure 15: Daily-shopping services and educational services in Storhaug (a) and Grünerløkka (b). 52
Figure 16: Residence typologies in Storhaug (two upper pictures) and Grünerløkka (two bottom pictures). 53
Figure 17: Residence types in Storhaug (a) and Grünerløkka (b). 55
Figure 18: Transport structure and parking system in Storhaug (a) and Grünerløkka (b). 57
Figure 19: Examples of public transport in Storhaug (left picture) and Grünerløkka (two right pictures). 58
Figure 20: Urban layout and green areas of Storhaug (a) and Grünerløkka (b). 59
Figure 21: Examples of green areas in Storhaug (two upper pictures) and Grünerløkka (two bottom pictures). 60
Figure 22: Relationship between the independent variables and the dependent variables. 62
Figure 23: Design model of the current study (a). 64
Figure 24: Degree of satisfaction with QoL among Norwegian and immigrant participants, Storhaug and Grünerløkka. 66
Figure 25: Design model of the current study (b). 67
Figure 26: Degree of satisfaction with the residence among Norwegian and immigrant participants, Storhaug and Grünerløkka. 72

List of Tables

Table 1: Migration in Norway, 2017 -2018 (Statistikkbanken, 2019b) 24
Table 2: Immigrants in Norway by reason for immigration (Statistikkbanken, 2019b). 25
Table 3: Objective and subjective indicators included in the current study. 34

Table 4: Actual and projections of the local and immigrant population in Oslo and Stavanger. 45
Table 5: Population data, Storhaug and Grünerløkka (KommuneProfilen.no, 2019). 46
Table 6: Most representative nationalities of the immigrant population in Norway, 2019. 46
Table 7: Percentage of residences according the type, 2018. Norway (Statistikkbanken, 2019a). 53

1 Introduction

This study aims to identify the relationship between residential conditions and Quality of Life of the local and immigrant populations in two Norwegian neighbourhoods. Residential conditions, understood in this study as housing circumstances and neighbourhood characteristics, under which individuals live are considered a significant indicator of Quality of Life. Storhaug (Stavanger) and Grünerløkka (Oslo) are the Case Study areas, selected due to their percentage of immigrant population as well as their urban, social and environmental characteristics. Local and immigrant residents have been interviewed in both neighbourhoods (238 participants in total). These population groups are being compared based on their residential conditions and their perceived Quality of Life.
In regards to the methodology used for the research, this study aims to contribute by developing a subjective mapping method where individuals' satisfaction and perception are linked to spatial and physical features.
This study addresses thus a method for researching Quality of Life on the local and immigrant populations at a neighbourhood level based on their residential conditions.

…….…...…...… Background ……..…….

The first section of this study is focused on the main concepts of this research, i.e., Quality of Life (QoL), Residential Conditions (RC) and immigration, from an urban and spatial perspective. A literature review has helped to formulate hypotheses that relate the three concepts.

This relationship between the concepts is the basis for the first publications of this dissertation. First, a publication that relates the concept of residential conditions with the immigrant population (Llopis and Müller-Eie, 2017b). Second, a publication that connects the concept of Quality of Life with spatial conditions (Llopis and Müller-Eie, 2017a).

Quality of life (QoL) is a complex, multifaceted concept that requires multiple approaches from different theoretical angles (Diener and Suh, 1997). Dalkey and Rourke (1973) defined QoL as 'a person's sense of well-being, satisfaction or dissatisfaction with life, or happiness or unhappiness'. Eurostat, together with representatives from the EU Member States, has designed an overarching framework in order to analyse it through dimensions such as material living conditions (financial situation and housing conditions), natural and living environment, social relationships and leisure activities, economic and physical safety, governance and basic rights, health, education and employment (Eurostat, 2019) (Fig.1). All these dimensions relate to people's capabilities to pursue their self-defined well-being, according to their own values and priorities. The subjective dimension, the overall experience of life, refers to the personal perception of life satisfaction.

Figure 1: Dimensions of Quality of Life, by Eurostat.

Over the last two decades, urban planners and academics have increasingly developed QoL indicators (Swain and Hollar, 2003; McMahon, 2002) often using them to measure the progress towards social sustainability. In the context of urban planning, planners and

academics consider that QoL is affected by how the built environment is situated to enhance the individuals' capability, i.e., how much individuals could access opportunities that can be improved by better urban design, housing conditions, the mix of buildings and land use or green areas among others.

Numerous studies (Streimikiene, 2015; Keles, 2012; Sirgy and Cornwell, 2002; McCrea, 2007) have addressed the relationship between QoL and urban environment since, from all the dimensions that define the concept of QoL, this refers to one of the most relevant of human's needs: the housing and its local environment. This study refers to these concepts as ***residential conditions*** (RC), defined as the combination of housing circumstances and neighbourhood conditions. Housing circumstances are understood as the residence itself and its characteristics. Neighbourhood conditions include more aspects than the residence itself, since the physical, environmental and mobility infrastructure are included, as well as concepts such as the maintenance of the neighbourhood or the quantity and quality of services in the area. RC can be understood from different perspectives; however, this research has approached them from the urban, social and environmental perspectives.

There is a wide variety of world-wide studies focused on *QoL* (Beckett and Godoy, 2010; Lee and Park, 2010; Westaway, 2009), *migration* (Fullaondo and Garcia, 2007; Bolt et al., 2010; Musterd and Deurloo, 2002) or *residential aspects* (Joop and Aslan, 2009; Peck and Kay Stewart, 1985; Bramley and Power, 2009; Zebardast, 2009; Kyttä et al., 2016) separately. However, this study aims to present the relationship of these three concepts jointly, which has not adequately been study, more specifically in Norway.

One of the contributions of this study is to identify the impact of this relationship on specific population groups. In this case, a comparison between the ***local and immigrant population in Norway***. Including the immigrant group has been due to the relevant migration situation in

Norway. As in many European countries, migration has been one of the main justifications of development, change and transformation of urban areas in this country, a factor of urban and social transformation, specifically since the 60s, and more attenuated during the last decade. Norway's migration policy refers to four immigrant categories (UDI): (1) labour immigrants, (2) persons with close family ties to somebody residing in Norway, (3) students, trainees or *au pairs* and (4) refugees and persons who qualify for a residence permit on humanitarian grounds.

Participants of this study belong in majority to groups (1)-(2)-(3), with no distinction between them. The intention is to recruit participants who voluntarily have decided where to reside in terms of housing and neighbourhood. Category (4) is under state protection at least at an early stage, meaning they are directly located in specific areas and given a place to reside. The obtained data if considering participants who did not decide themselves where to reside would not provide meaningful results.

…..…… Methodology ……..….

The second section explains the methodology used in the study. For the purposes of breadth and depth of understanding of urban, social and environmental issues involved in this study, this research combines elements of qualitative and quantitative research, where a spatial/geographic approach is also included. In this study, qualitative data provides a detailed understanding from the participants while quantitative data provide a more general understanding of the RC in the Norwegian neighbourhoods. Quantitative data has been gathered by spatial analysis and desktop research, while the qualitative data has been collected by paper-based and digital questionnaires specifically designed for this study to interview the participants.

These questionnaires, map-based paper and digital formats, have been created for this study as a tool for gathering participants' (personal) information, as well as perception and satisfaction with urban, social and environmental aspects. GIS software has been used to link participant's

collected information to specific urban areas, connecting spatial characteristics of the neighbourhoods to participant's satisfaction with them.

This study thus aims to contribute by developing a new interpretation of subjecting mapping where individuals' perception and satisfaction is linked to spatial and physical referents.

This methodological approach has served as a basis for two publications addressing subjecting mapping and the use of GIS (Llopis and Müller-Eie, under review-b; Müller-Eie and Llopis, 2019).

…….. Limitations ……..….

The current study presents specific limitations in terms of data collection, recruitment of participants and limitations on the research results.

These concepts are studied and reflections on how these limitations could be answered are proposed.

…….. Case Study ...……..….

The Case Study areas are presented in the methodology section.
Storhaug and Grünerløkka are the selected neighbourhoods. This is due to their percentage of the immigrant population (20%) as well as their urban, social and environmental characteristics.

Immigration to Norway has increased gradually since the late 1960s until 2011. The number of immigrants arriving in the country in 1960 was 13.536, being 31.149 in 1987, reaching the highest peak in 2011 where 79.498 immigrants arrived in Norway. From 2011, the number has been descending, 52.153 in 2019.

The notable reason for migrating to Norway has always been the labour market, especially in 2008 and 2011. Family reasons have been the

second most notable argument for migrating to Norway followed by asylum claims (highest peak in 2016) and education.

Norway's population is 5.372.355 (16th July 2020), being the immigrant population 790.497 (14,7% of the total). From the five most populated cities in Norway, Oslo and Stavanger differ from the others. Oslo, (685.811 total population, 33,1% immigrant population) the capital of Norway, attracts a larger number of immigrants with diverse background and ethnics as a central core. Stavanger, fourth-largest city (134.037 total population, 18,7% immigrant population) is an economic referent in the country, considered as the nerve centre of the oil industry attracting particular work immigrants linked to the oil industries or related.

Within these cities, Grünerløkka, in Oslo, (60.844 inhabitants and 20,5% of the immigrant population) and Storhaug, in Stavanger, (17.174 inhabitants and 20,6% of the immigrant population) have been selected as the Case Study areas.

Unlike existing studies focused on QoL, migration or residential aspects, this study uses 'the neighbourhood scale' as the research-scale. The neighbourhood level is considered the most optimum scale for collecting data of residents living in the study areas as well as for carrying out a social and spatial registration more detailed than the city or national level does. Furthermore, this scale results more adequate to serve as an example for other countries that may focus their attention on the Norwegian demographic and migrant situation, urban structure or policies due to Norway's position on world-wide QoL indexes (HDR, 2019b; Eurostat, 2019; BetterLifeIndex).

This study does not compare the research areas since they differ in their urban layouts, transport systems or demographic characteristics. Grünerløkka dimension is 17,4km^2 compared to Storhaug's dimension 11,5km^2. The housing structure in the research areas is opposite since Grünerløkka is mostly built up by quarters of apartments while Storhaug presents a wider variety of residences. Regarding public transport,

Grünerløkka offers more modes of transport than Storhaug. Regarding green spaces, both areas have a similar percentage of 15%. However, considering the corresponding populations, Storhaug benefits from a higher share of green surface per habitant.

This study, therefore, compares particularly the population groups, locals and immigrants, living in the considered neighbourhoods.

The spatial analysis of the neighbourhoods has been conducted to link it to participants' perception and satisfaction with the physical and environmental characteristics from where they reside and be able to understand how the physical conditions influence their QoL.

…….…..…….. Findings ...…..……..….

The findings of the study follow the methodology section. This section starts presenting the findings related to the RC, followed by the differences between population groups as well as between cases (Storhaug and Grünerløkka). It concludes with the findings related to the objective and subjective indicators and the collected data for the study.

Two publications reflect the findings of this research. To be able to expose the findings in detail, the concept of RC is divided into housing circumstances and neighbourhood conditions.

The first publication explores the relationship between QoL and housing circumstances between immigrant and local population in the two Norwegian neighbourhoods (Llopis and Müller-Eie, under review). The second publication explores the relationship between neighbourhood conditions and QoL among local and immigrants in the same neighbourhoods (Llopis and Müller-Eie, under revision).

Findings of this research determine that certain housing and neighborhood conditions can improve or decrease perceived QoL. The main findings of this research are:

- The immigrant population lives under worse residential conditions than Norwegians do, even in the same neighborhood. They are less satisfied with their residences, their neighborhood conditions and their QoL in general.
- Despite the differences between Storhaug and Grünerløkka (population density, urban structure, public transport network and housing stock), perceived QoL among the participants is similar in both research areas.

Besides the findings that concern populations' QoL, the current study contributes to existing studies of similar approach from a methodological perspective. It contributes to existing methodologies by combining a set of subjective and objective components linked to spatial features, where residents of small settings (neighbourhood scale) share their perception and satisfaction with urban and environmental elements. This is a potential methodological achievement orientated to include the subjective component into spatial researches, certainly essential for today's demographic, urban and social developments.

…….... Contribution to knowledge ……..

This study concludes with a section of contribution to knowledge preceding the last part, conclusion.

The main contributions are towards theoretical input, practical implications, methodological improvements and future considerations.

Practical implications for planning practice are promoting multi-generational neighbourhoods in mixed-land communities that include a wide range of services and a variety of residential typologies. Preserve the local scale where residents benefit from open and public spaces, services and recreational areas within walking distance, promoting the sense of community and enhancing social interactions.

Future considerations are specified for possible replication or standardization or the research. Methodological improvements need to be considered, i.e., recruitment of participants, participatory inclusion of specific population groups.

The social dimension should be included in the case of future replications of the research. Socio-cultural and socio-economic indicators would additionally enrich the current data and provide essential information that would help to determine the differences in the results when assessing participants' QoL.

……..……..……..... Conclusion ……..……..……..

The final section of this dissertation compiles the research process, highlighting the most relevant aspects that are intended to complement existing knowledge and methodologies.

The study indicates that certain housing circumstances and neighbourhood conditions affect on perceived QoL, identifying that the immigrant population lives under less favourable residential conditions than the local does. However, when comparing results in Storhaug and Grünerløkka, the perceived QoL among the participants is similar, despite their different demographic, physical and environmental characteristics of the neighbourhoods. Personal circumstances, economic situation, employment status, social aspects or migratory circumstances and stages may be the reason.

This dissertation enhances the subjective mapping method proposed to link activities and place perceptions of spatial and physical referents as an essential method for this research and substantial input for researches of similar scale and purpose.

2 Background

This study has theoretically approached (literature review) two relationships. First, the relationship between residential conditions (RC) and the immigrant population (Llopis and Müller-Eie, 2017b). Second, the relationship between RC and QoL (Llopis and Müller-Eie, 2017a). Several hypotheses are established based on existing literature and the previous studies that have addressed these concepts.

Subjective data has gathered participants' satisfaction with their residences, with housing circumstances, neighbourhood conditions and QoL. This data combined with objective indicators and spatial analysis helps to identify if individuals perceive different QoL despite living under the same RC.

2.1. Quality of life

Schalock (1996) considers the concept of QoL as an organising principle that can be applied in the improvement of society through social, political, technological and economic transformations. However, the usefulness of the concept is mainly related to human services, used to assess people's needs or their level of satisfaction with different services.

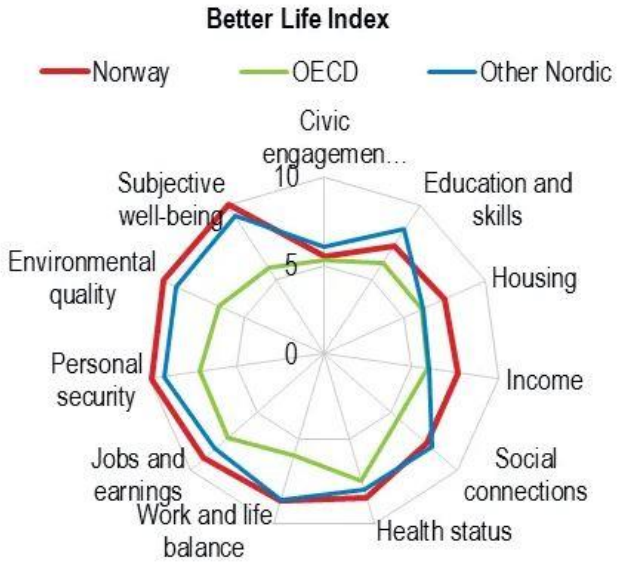
Due to the diversity in the definition of QoL, there is still a lack of consensus on this concept and its evaluation (Felce and Perry, 1995). There are two basic approaches: one that conceives it as a unitary entity, and one that considers it a construct composed of a series of dimensions (Borthwick-Duffy, 1992). Two perspectives - objective and subjective - represent investigations of QoL (Campbell, 1976). The objective measurements determine QoL using objective measures of environmental factors such as crime rates, housing costs, pollution. However, since QoL can be appreciated differently depending on the individual, objective data may not necessarily reflect what makes a person happy within his or her community. Thus, based on the

assumption that QoL is a subjective experience and objective conditions themselves do not express the true and complete quality of the attributes, the subjective measurement focus is on individual's perceptions and satisfaction.

The conceptualization of QoL in the urban planning context began with the age of the industrial revolution when the living environment worsened, while the application of QoL index to decision making has only been focused since the 1960s (Marans, 2012). Over the last two decades, urban planners and academics have increasingly developed QoL indicators (Swain and Hollar, 2003; McMahon, 2002) often using them to measure the progress towards sustainability. Leitmann (1999) described that QoL indicators are relevant to the extent that they can yield information about whether the intervention is moving a city towards or away from sustainable development. Nussbaum and Sen (1993) argued that QoL is to be assessed in terms of the capability to achieve valuable functioning. In the context of urban planning, the authors consider that QoL is affected by how the built environment is situated to enhance the individuals' capability, i.e., how much individuals could access opportunities can be improved by better urban design, the mix of buildings and land use, or green areas.

Norway performs very well in many measures of well-being concerning to most other countries in the Better Life Index, i.e., a forum where governments work together to address the economic, social and environmental challenges of globalisation (BetterLifeIndex). Out of the 35 countries around the world that conform OECD, Norway ranks top in personal security, environmental quality and subjective well-being, and ranks above the average in jobs and earnings, income and wealth, education and skills, housing, work-life balance, civic engagement, social connections, and health status (fig.2).

(a)



(b)

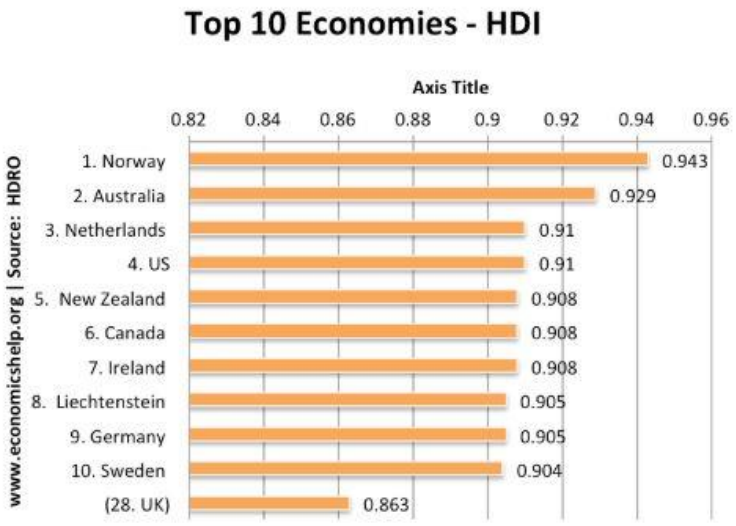


Figure 2: Better Life Index (a) and Human Development Index (b), 2018.

Similarly, The Human Development Index (HDI) is a composite statistic of life expectancy, education, and income per capita indicators. It is used to distinguish whether the country is a developed, a developing or underdeveloped. Norway stands at the top of this index as well (Fig.2).

The fact that Norway stands at the top of the several indexes when referring to subjective well-being, positions Norway as a worldwide pattern in many domains for the other countries. The concept of subjective well-being or QoL has been studied from different viewpoints over time, presenting a wide range of possibilities to measure involved factors. A literature review on the concept of QoL within sociology, psychology, human geography, as well as the environmental design fields reveals that QoL is compound of several dimensions, such as health, economics, social activity and individual perception (Ferriss, 2004; Higgs et al., 2003; Sirgy, 2012).

Numerous researches focus their study on the Norwegian health system and its relation with QoL, i.e. HRQOL (Drageset et al., 2008; Lerdal et al., 2011; Dahl et al., 2011; Wändell, 2005; Astor et al., 2016; Løyland et al., 2010; Michalsen et al., 2015; Westlie et al., 1993; Bjordal et al., 1994). Similarly, several research studies about Norway and its welfare-state system address economic, labour or merely social issues (Blom and Henriksen, 2009; Gudbrandsen, 2010; Steen, 2010; Hellevik, 2003; Nyseth and Sognnæs, 2013; Christensen, 2012).

The housing domain in Norway also seems to present fairly satisfactory conditions physically and socially when compared to other European countries (Brattbakk and Hansen, 2004). These conditions have been a result of continuous processes of social and physical change in the urban areas, which concludes on the need of a better understanding of the relationships between physical characteristics and the processes of social change and vice versa. Numerous studies focus their attention on the Norwegian housing domain at a country level (Høyer and Holden, 2001; Hjorthol and Bjørnskau, 2005; Nordvik, 2015; Søholt et al., 2012;

Aarland and Nordvik, 2009) or a city level (Thomsen and Eikemo, 2010; Mastekaasa and Moum, 1984; Andersson et al., 2010; Vassenden, 2014).

Similarly, studies related to social and migration aspects at a national level in Norway are plentiful (Andersson et al., 2010; Andersen et al., 2013; Filandri and Olagnero, 2014; Nordvik, 2015). However, Norway is rarely included in international or European comparative housing research, probably because Norway is not a member of the European Union (EU) and due to the population, density and extension of the country, which would turn into not significant or adequate comparisons.

Figure 3: Ranking for Quality of Life indicators in Norway by Eurostat, 2018.

Eurostat (2019) defines QoL as a compound of eleven indicators. Norway ranks at the top (out of 35 countries) in environmental quality, personal security and subjective well-being (fig.3). It also stands the third in the list in housing and labour dimension.

The highest ranked indicators for well-being in Norway, according to Eurostat (2019), are addressed in the current study. The focus of this study is on the perceived QoL of local and immigrant residents of Norway neighbourhoods from an urban perspective, where housing and environmental quality dimensions are included in the concept of RC. Eurostat approaches these indicators objectively and subjectively (fig.1). This study operates with part of these indicators but also includes others not applied by Eurostat.

Personal security, also considered as a relevant indicator in the Norwegian well-being system, is also approached from an urban perspective in the current study (Llopis and Njå, 2019). The paper that refers to this concept is a contribution to assess spatial conditions to the safety concept and connect both to the concept of QoL. The Case Study of this paper is Storhaug, one of the project areas of this dissertation.

Studying the highest-ranked indicators that define the Norwegian well-being system, from an objective and subjective perspective, can help to identify in which degree these dimensions impact on residents' QoL.

2.2. Residential conditions

Environmental planners and designers have given more attention to the residential environment than to any of the systems that interact to make up metropolitan areas (Marans, 1976). The residential environment is understood as the place where an individual can relate himself socially and functionally to the complex world around him. It is considered diverse, both physically and socially speaking, and under a constant urban and demographic development. By urban planning and designing, planners get the opportunity to improve the quality of the physical surroundings and consequently, the liability of metropolitan areas.

Planners and designers often suggest that improving the quality of the residential environment can profoundly affect individuals' QoL (Nakanishi et al., 2013; Keles, 2012; Westaway, 2009).

In this study, RC has been divided into housing and neighbourhood conditions. Housing conditions are understood as the residence itself and its characteristics. However, neighbourhood conditions are a wider scale than the residence itself, since the physical and environmental surroundings are included, as well as the transport system, maintenance of the neighbourhood or accessibility, quantity and quality of services in the area.

2.2.1. Housing circumstances

Housing satisfaction is recognized as an important component of individuals' general QoL. For most people, housing is the largest consumption item in their lifetime, and home is the setting where one finds refuge, rest and satisfaction (Adams, 1984). The home is the place in which people experience intimate relationships and thus the home tends to affect QoL.

Housing is crucial to national development and socio-cultural growth in any human society. Housing is universally acknowledged as the second most essential human need after food and is considered a major economic asset in every nation, recognized as a factor for the assessment of human development and societal civilization (Kothari, 2006).

Adequate housing and people's ability to afford it, in a safe environment is important for meeting basic needs. Housing quality can be seriously decreased by several issues, e.g. structural problems of the dwelling, overcrowding and space shortage, housing deficiencies, lack of natural light or ventilation, or general satisfaction with it (Eurostat, 2017). These issues can be responsible for health inequities among different groups of people based on social and economic class gender, and ethnicity. These health inequities refer to the concept of social determinants of health, SDOH, defined as complex circumstances under which individuals live and can affect their health (Catalyst, 2017). Housing characteristics can thus contribute to improve or decrease an individual's QoL (Westaway, 2009; Potter and Cantarero, 2006; Theodori, 2001). Previous research has demonstrated that housing is an important domain that contributes to the overall QoL (Zebardast, 2009; Streimikiene, 2015; Stamsø, 2009).

If a residence is considered non-habitable, it can affect the QoL of a person (McCray and Day, 1977; Mohit and Nazyddah, 2011). Olmos and Hayde (2008) define habitability as the degree to which a residence meets the needs and expectations of its inhabitants. Mercado et al. (1994)

define habitability as the relationship of human beings with housing, the oldest and most important interaction scenario, both individually and collectively, since it is the fundamental human unit that is closely related to family life. Corral-Verdugo et al. (2011) define the concept of habitability as the satisfaction derived by a person from a specific setting or group of settings. Habitability is defined as a series of psychological dimensions attributed to space, i.e., overcrowding (Stokols, 1978; Lindberg, 1993), temperature, lighting and noise, or distribution of the space (Sirmans et al., 2006).

The habitability of a residence goes according to the degree on which the expectations of each person are fulfilled based on their needs and lifestyle (Ortiz and Doménech, 2004). Housing becomes the place where human beings can carry out a large number of social activities by offering them a spatial location.

One of the most essential – and at times challenging – tasks facing people in host countries is ensuring that they can meet their own needs, and one of their most important needs is housing (Maslow, 1943). Studies suggest an individual's QoL is influenced by a combination of social and physical domains; being housing domain a significant indicator (Campbell et al., 1976; Oswald et al., 2003; Sirgy and Cornwell, 2002; Richards et al., 2007). Based on the Maslow pyramid (1975), a residence is part of the first category i.e., is the first stage of the hierarchy of needs.

Figure 4: Maslow's pyramid (Maslow, 1943).

When referring to Maslow's pyramid needs, five categories are established (fig.4). These follow one another on an ascending scale (pyramid figure) and are organized as a growing and cumulative sequence from the most objective to the most subjective. In that order, the individual has to meet the needs of the lowest (most objective) levels to be motivated or driven to meet higher (more subjective) needs (Maslow, 1975). The last two categories suggest aspects of a psychological, individualistic and subjective nature while the first three are more general and objective. *Physiological needs* are the most basic needs that require material elements for their satisfaction, and their absence threatens human survival itself. Seen from an architectural or urban perspective, it refers to the residence that must present the minimum infrastructure to perform the basic physiological activities within a protected space, defined by favourable circumstances.

The current study considers several indicators as essential when analysing a residence and its circumstances. *Firstly*, the residence is identified depending on its *type*, understanding it as a whole (physiological). Preferences about the type of residences, if given a choice, can affect individuals (Burgess and Skeltys, 1992; Winston,

2014; Ewing et al., 1994). *Secondly*, the *reason for location* of the residence is also considered as a relevant housing circumstance and personal need (second category). People frequently prioritize certain characteristics or urban areas such as environmental amenities (Rouwendal and Meijer, 2001; Bhat, 2015), good maintenance (Gawande and Jenkins-Smith, 2001; Nowak, 2002), perspective views and natural environment (Hörnsten and Fredman, 2000) (Lindhagen and Hörnsten, 2000), recreational opportunities including green areas and open public spaces (Colwell et al., 2002; Knetsch, 1963; Greenberg and Lewis, 2000; Mabelis and Maksymiuk, 2009), the presence of nearby service facilities (Bowes and Ihlanfeldt, 2001; Apparicio and Séguin, 2006; Dowler and Turner), as well as the housing itself (Sirmans et al., 2006; Margulis, 2002; Follain and Jimenez, 1985). *Thirdly*, and related to social needs, this study also considers the *number of people and the number of bedrooms* in the residences. *The last* objective indicator analysed in this study is the *type of ownership*. Some studies suggest that homeowners enjoy better quality housing and greater housing and neighbourhood satisfaction than renters (Elsinga and Hoekstra, 2005; Iwata and Yamaga, 2008; Boehm and Schlottmann, 2008; Mulder, 2006).

This study considers the named indicators as essential and fundamental for identifying if participants live under favourable housing circumstances.

2.2.2. Neighbourhood conditions

Some researchers suggest that neighbourhood satisfaction is a significant predictor of life satisfaction (Campbell, 1976; Rogerson et al., 1989; Lee and Guest, 1983; Sirgy and Cornwell, 2002). Findings suggest that the satisfaction effects of the neighbourhood physical, economic and social features tend to play a role in the neighbourhood satisfaction, which in turn influences life satisfaction.

One of the major indicators of the quality of the urban environment is *the presence and accessibility of green areas*. Green areas are mainly parks and landscape areas, forests, cemeteries, parkways or gardens at an individual level. The greenery is part of the environment of a city and its urban structure and fulfils ecological, recreational, cultural and aesthetic functions (Supuka et al., 1991; Nordh and Østby, 2013).

Landscape components in the physical environment are significantly related to neighbourhood satisfaction. Previous researchers found that natural areas are the most positive factors when referring to neighbourhood satisfaction (Kaplan, 1985). Kearney (2006) also found that the presence of shared natural areas and green landscapes are positively related to neighbourhood satisfaction. Kweon et al. (1998) determine that an increased presence and use of green outdoor common spaces predict stronger neighbourhood social ties and sense of community.

Another major indicator is the availability of services. The first is education, considering education and the will to learn one of the most important human activities in general. The level of education shows how much a region is developed, and it is not only the accessibility of educational institutions which determines its level of development but also their quality. Similarly, the availability of health-care services in a neighbourhood is considered necessary. Equivalently to the services related to education, the availability and quality of these services are important factors and indicators of QoL. Concerning commercial facilities, meeting everyday-needs, the concentration of this type and their capacity also influences the QoL of inhabitants.

Similarly to educational, health-care and commercial services, public administration should be constantly changing to maintain its effectiveness. Urban planners and designers should incorporate method and concepts from social sciences such as psychology, behavioural ecology and sociology to structure community environments to best suit

their residents. Professionals should work with community experts to serve the area based on social, economic, political, religious and other cultural desires and concerns of residents.

Colwell et al. (2002) support an increase in mixed-use communities in which many commercial and social establishments are within walking distance from residences. Kim and Kaplan (2004) also found land use to influence the well-being of people's everyday life; mixed-land use communities are thought of as more liveable neighbourhoods. Residents living in a community with a wider mix of land use, i.e., retail, service and residential, are more satisfied with their community's physical character and feel more attached to their community than those living in typical suburban subdivisions.

Accessibility and connection defined by the transport system is another indicator of neighbourhood conditions. If public transit systems are constructed, traffic can be reduced and the social ties to the outside social connections can be strengthened. The implementation of mixed-used neighbourhoods, public transit systems and increased emphasis on walkability will also encourage more interaction among the citizens. Previous research found that streets systems and parking areas can have both positive and negative influence on individuals' satisfaction (Kaplan, 1985). If parking areas meet residents' utilitarian and aesthetics needs, then they may have a positive influence on satisfaction with the physical environment. However, busy inappropriate arranged street systems harm neighbourhood satisfaction. A good transport structure facilitates access to services, green spaces and social interactions. The transport system of a neighbourhood can influence on the perceived physical integration of an individual, meaning the satisfaction of residents about how connected they feel to the rest of the city (Hull, 2008; Cervero, 2013; Musterd and Deurloo, 2002; Bolt et al., 2010). Physical integration is a subjective concept and therefore can be perceived differently from each participant. However, it seems to be an indicator of QoL, since the accessibility and

the public transport possibilities in a neighbourhood can influence its residents' satisfaction with the area they live in.

Another aspect considered in this study has been the maintenance of urban areas. The maintenance of a public space includes all municipal services and changes that are determined day by day to a favourable development of the city, guaranteeing citizen welfare and facilitating urban evolution and transformation with green and biodiversity, water or energy in the city (Carrera, 2004; Wolff et al., 2017). The physical features of neighbourhoods are a significant predictor of neighbourhood satisfaction, including the maintenance of the built layout, the neighbourhood landscape or quality of the environment (Sirgy and Cornwell, 2002).

The last indicator included in the current study refers to the psychological dimension that defines QoL. It refers to the individual perception and *satisfaction with the neighbourhood*, an important component of life satisfaction, influenced by individual and community variables. The characteristics and quality of neighbourhoods are important factors of residents' QoL (Galster, 1987). Neighbourhood satisfaction is a significant predictor of community satisfaction, which is a predictor of life satisfaction (Sirgy and Cornwell, 2002). Satisfaction with QoL is a subjective indicator included in the study. It is the last concept participants were asked about since they are expected to consider all the previously mentioned dimensions when reporting their degree of satisfaction with their QoL. All the indicators that define RC are expected to have been considered in their answer, from the housing circumstances to the neighbourhood conditions, including both objective and subjective indicators.

2.3. Immigration

Immigration is defined as an action by which a person establishes his or her usual residence in a country for a period that is at least 12 months,

having previously been usually resident in another country (Eurostat, 2016). Immigration has become one of the key components of population change, since the arrival of immigrants in European cities is transforming their structure, leading to irreversible changes of territorial and social concentrations of ethnic diversification, changing social and cultural composition and generating new social needs, with the consequent problems of coexistence and urban segregation (Llovera and Cabral, 2009).

Within issues related to the city, urban life or urbanization processes, the migratory phenomenon is a major actor. Sáez (1997) confirms that immigration stands out as the fundamental demographic factor itself that influences urban growth, while natural population growth relies on a second level.

In the European literature, there is a consensus that immigrants and minority ethnic groups face a disadvantage in the housing domain (Filandri and Olagnero, 2014; Martínez et al., 2016). The literature on segregation and the housing market position of ethnic minorities in Western European cities has shown that minorities have typically been confined to the least desirable private or social/public rented housing in the inner city or peripheral estates (Andersson et al., 2010; Young, 1999; Accetturo et al., 2014). This is also the case in four Nordic countries: Denmark, Finland, Norway and Sweden. These welfare states all belong to what is called the Scandinavian social democratic welfare model (Esping-Andersen, 1990), distinguished from other welfare state models by their tendency to greater levels of equality. These Nordic countries have experienced substantial immigration over the last 25 years, which has changed the composition of the population and therefore an interest in the emerging social and urban development (Stamsø, 2009).

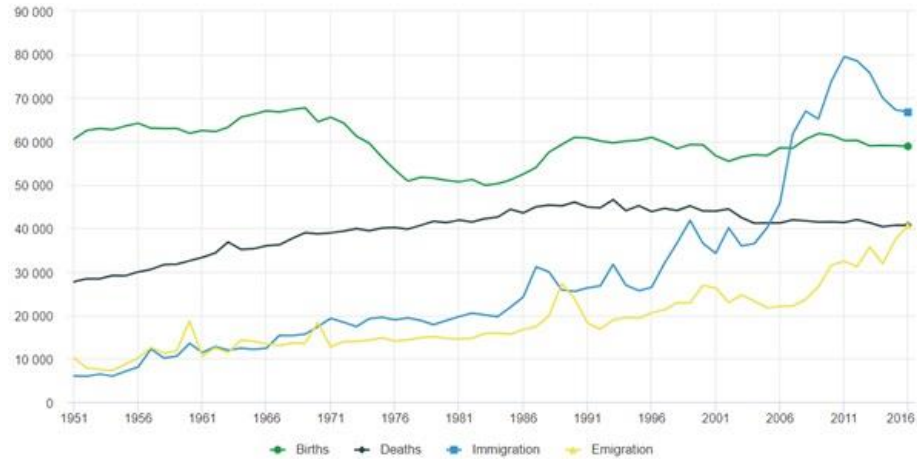


Figure 5: Population changes in Norway. Birth, deaths, immigration and emigration. 1951-2016 (Statistikkbanken, 2019b).

Immigration to Norway has increased gradually since the late 1960s (fig. 5). Norway defines the "immigrant population" as persons having both parents born abroad, even if they were born in Norway (Ministries, 2018). As of 2001, most of the immigrant population was from Pakistan, Sweden, and Denmark, though new flows in 2004 largely came first from Sweden, then Russia, Denmark, and Poland.

Table 1: Migration in Norway, 2017 -2018 (Statistikkbanken, 2019b)

In-migration and out-migration, by citizenship				
	2018			**2017**
	Immigration	Emigration	Net immigration	Net immigration
Total	**52485**	**34382**	**18103**	**21349**
Norway	8079	9856	-1777	-1802
Foreign	44406	24526	19880	23151
EU28/EEA countries (including Norway)	30822	28573	2249	305
European countries outside EU28/EEA	2374	504	1870	1814
Africa	3548	717	2831	3705
Asia including Turkey	13000	3429	9571	13905
North America	1200	667	533	380

South and Central America	1150	316	834	618
Oceania	190	144	46	82

As a result, net migration, i.e., the balance between emigration and immigration flows, was negative until the mid-1960s but has steadily increased, peaking at 44,000 annually during the 1995-2000 interval (Ministries, 2018).

Norway, which received its independence from Sweden in 1905, was first known not as a destination country for immigrants, but as a population prone to emigration. Nearly 850,000 Norwegians emigrated to foreign countries between 1825 and 1945, putting Norway second only to Ireland in terms of emigrants as a percentage of the population. By 1890, most Norwegian emigration was temporary labour migration to the United States, and as many as 150,000 may have eventually returned to Norway for permanent settlement (Ministries, 2018).

In the late 1960s, a combination of a booming economy and a population shortage led Norway to accept several labour migrants from Morocco, Yugoslavia, Turkey, and particularly Pakistan. These guest workers, though expected to be temporary, remained in the country and were eventually followed by other migrants, including refugees and family reunification candidates.

Table 2: Immigrants in Norway by reason for immigration (Statistikkbanken, 2019b).

Immigrants by reason for immigration (2019)						
Total	Labour	Family	Refuge	Education	Other	Unknown
37 469	16 077	12 474	4 340	4 175	379	24
Total immigration since 1990						
906 589	308 239	325 412	173 506	93 446	5 285	701

Norway has many advantages as a destination country for immigrants and refugees. According to Human Development Program HDR (2019a), Norway's standard of living - so high that has been named the world's country with the highest standard of living for four years running - provides a distinct incentive for the country to avoid being lumped with greater Europe.

The Immigration Act of 15 May 2008 regulates the right of foreigners to enter, reside and work in Norway. In the statistics on immigration, four main entry categories immigration are distinguished:

(1) Labour immigrants, i.e. persons who have a concrete job offer
(2) Persons with close family ties to somebody residing in Norway
(3) Students, trainees, au pairs and participants in an exchange program
(4) Refugees and persons who qualify for a residence permit on humanitarian grounds

The identification of these categories is based on information from the Norwegian Directorate of Immigration (UDI) (fig.6).

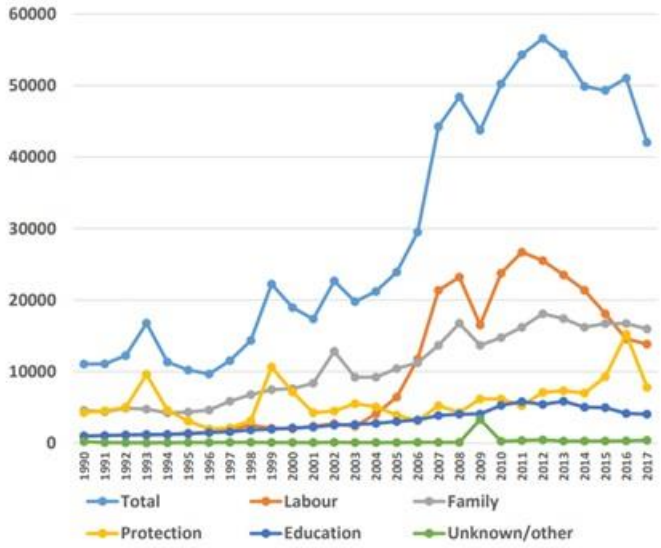


Figure 6: Immigration according to entry categories, and total. 1990–2017 (Statistikkbanken, 2019b).

According to the current and relevant situation of Norway related to the migration process presented, the importance of this study is evident in terms of including this particular group of population in the research. However, it should be noted that from the four previous mentioned immigrant groups, in this study the majority of participants belong to groups (1)-(2)-(3). Immigrants belonging to category (4) -*refugees*- are underrepresented. The reason is due to the focus of the study into RC, where the housing domain has great relevance, and factors such as type of ownership or reason for location are considered.

A large part of the refugees, at least at an early stage, is under the protection of the Norwegian state and are directly located in specific areas and specific residences. The obtained data if interviewing this specific group of people would not provide significant results since they have not chosen their place of residence nor the dwelling in which they reside.

Besides, as an added filter in this study, information has been gathered from those participants who have already resided in the selected areas for at least one year and therefore have sufficient knowledge of the area to provide significant data. Similarly, participants who reported living with their parents (mostly young participants) were not included in the study, since their parents instead of themselves would provide valuable data.

2.4. Three-way relationship between RC, QoL and immigration

QoL is a concept that is studied from different perspectives according to the dimensions that define it. Parallel, numerous studies focus their research on the Norwegian health system, economy, labour or social issues.

Studies related to the housing domain and migration aspects in Norway at a national or city level are plentiful. However, this study approaches the relationship between RC and QoL in a different research-scale, i.e., neighbourhood scale, from and urban, social and environmental perspective. Besides, this study focuses on the local and immigrant group, due to the relevance of the migration concept in Norway.

The literature review of existing studies has helped to formulate the hypotheses that connect the main concepts of this research, i.e., QoL, RC and immigration.

(Hypothesis 1)

The residence and the urban environment where individuals live influence their Quality of Life.
This study has analysed indicators that define RC and related them to participants perceived QoL to refute or confirm this hypothesis.

(Hypothesis 2)

Immigrants live under less favourable residential conditions (RC) than locals do.
Objective indicators have helped to identify under which RC live each population group.

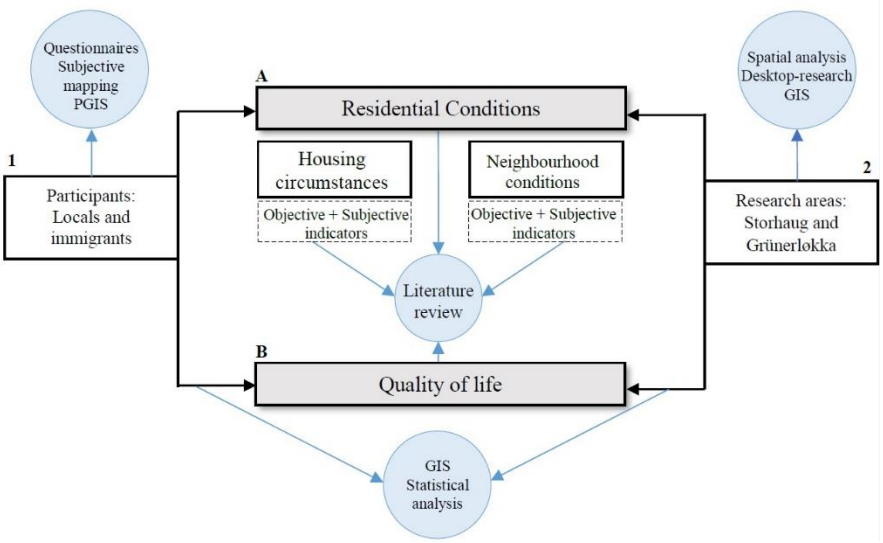
(Hypothesis 3)

Immigrants report lower values on perceived Quality of Life than locals do.
Subjective data has helped identified perceived QoL of both population groups.

3 Methodology

3.1. Research Design

This research design presents the methodologies used in the study as well as the relationship between the main concepts (fig.7). Research questions are also established.



RQA-B: How do residential conditions relate to an individual's perceived QoL?
RQAB1-AB2: Are there differences between these relationships among the population groups and/or research areas?

RQ1A: What are the residential conditions for each population group?
RQ2A: What are the residential conditions for each research area?

RQ1B: How is the perceived QoL of the residents in each population group?
RQ2B: How is the perceived QoL in each research area?

Figure 7: Research design and research questions.

Researching QoL needs to consider a subjective and objective perspective (Rogerson et al., 1989; Van Kamp et al., 2003). A subjective (or endogenous) approach focuses on feelings, perceptions, opinions and mental states of the individuals or studied groups. An objective (or exogenous) approach is focused on a wide range of measurable or observable indicators. This study combines a compound of different methodologies as well as objective and subjective indicators to approach urban, social and environmental aspects that define, together with other dimensions, the concept of QoL.

The combination of these methodologies is present in existing Norwegian studies focused on social and urban aspects (Andersson et al., 2010; Thomsen and Eikemo, 2010; Andersen et al., 2013; Mastekaasa and Moum, 1984). However, this study has linked subjective information to spatial representation into GIS as a substantial contribution, adapting to new technologies fundamental for today society's development, needs and challenges.

In this study, data collection and data analysis are a combination of several methods:

(1) Literature review
(2) Spatial analysis/registration
(3) Desktop research
(4) Questionnaires (paper/digital). P-GIS and subjective mapping
(5) GIS
(6) Statistical analysis

A (1) *literature review* has approached the relationship between the main concepts of this study, i.e., QoL, RC and immigrant population (Llopis and Müller-Eie, 2017a; Llopis and Müller-Eie, 2017b). This has helped to define the gaps in knowledge and formulate hypotheses.

A (2) *spatial registration/analysis* has been used to gather objective information of Storhaug and Grünerløkka as well as mapping the RC of each research area.

Desktop research (3) has provided part of the objective data related to demographic and physical information.

Map-based questionnaires (4) were created to interview participants. P-GIS and subjective mapping helped to collect objective and subjective information from the participants. Paper and digital questionnaires were designed for this study. These have helped to map RC as well as identifying participants perceived QoL.

GIS (5) *Geographic Information System* has served as a tool for gathering objective data as well as for registering subjective data linked to spatial figures.

A statistical analysis (6) has been used to examine, determine and validate results of the collected data.

3.1.1. Case Study Approach

Storhaug and Grünerløkka are the Case Study areas. These two neighbourhoods are selected due to the high percentage of the immigrant population (20%) as well as their actual urban and social development. However, this is a non-comparative study between the research areas. From an urban perspective, they differ in demographic, physical, environmental and transport infrastructure aspects. The comparison carried out in the current study is between the population groups, i.e., locals and immigrants.

This study has considered the neighbourhood level as the most optimum research scale. This scale is considered as the most adequate for collecting data of residents living in the study area as well as for carrying out a spatial registration within certain limits.

Two neighbourhoods are considered for the Case Study. However, they do not belong to the same city. The purpose is to observe and contrast different housing, environmental and mobility structures and identify how they affect the QoL of both population groups. Considering the different scenarios, it can be described in which degree the urban, social and environmental dimensions influence perceived QoL of the participants and observe the differences between Storhaug and Grünerløkka.

3.1.2. Selection of indicators

Table 3 presents the list of indicators used in this study. All the information regarding the participants have been collected by questionnaires designed for this study. First, participants were registered by a set of objective and subjective indicators. A list of indicators (objective and subjective as well) regarding housing circumstances and neighbourhood conditions follows the sequence of the questionnaire.

This study must consider subjective indicators since participants' feelings, perceptions, opinions and satisfaction need to be included as well as objective aspects related to the urban, social and environmental aspects.

Participants' registration includes the neighbourhood they live in (address), their age, gender and nationality (eventually grouped as locals or immigrants).

Additional information could have been added, as their economic situation or employment status. However, part of the collected data of this study relies on participants' use and satisfaction with the urban and environmental aspects in their neighbourhood. Participants are expected to use and take advantage of their neighbourhood independently on their economic or job situation. While these aspects (economy or employment status) can influence participants' QoL, this research is focused on how

residential conditions impact on their perceived QoL setting apart concepts such as economy or job status when addressing it.

Data could have been grouped and analysed according to participants' age, gender or nationality. However, this study has exclusively grouped the participants as locals or immigrants, since the purpose is to compare these two population groups based on their perceived QoL. Omitted variable bias is a prevalent threat against the fundamental assumptions of regression analysis – the population orthogonality condition to be more specific - in most studies. However, while age and gender are well-known to be associated with QoL (Blanchflower, 2020; Easterlin, 2006), descriptive statistics shows no systematic difference between the local and immigrant group in this sample. The exclusion of these variables does not, on their own at least, cause the regression coefficients to lose their causational interpretation.

The indicators that represent the residential conditions have been considered based on a literature review. Housing circumstances involve other components not included in this study, i.e., the dimension of the residence, the existence of specific spaces in the residence, natural illumination or ventilation among others. However, this study considers the selected indicators sufficiently relevant for identifying if participants live under favourable housing circumstances. The compound of indicators regarding housing circumstances are also considered to produce reliable results for understanding participants' situation and satisfaction with their residences.

Residential conditions, similarly to housing circumstances, can also be defined by other indicators not included in this study, i.e., number of administrative and religious services or population density among others. However, this study also considers the selected indicators reasonably satisfactory to understand participants' use and satisfaction with their neighbourhoods.

Table 3: Objective and subjective indicators included in the current study.

Participants registration	
Objective Indicators	***Subjective indicators***
Neighbourhood of residence (Research area)	Reason for migration
Age	
Gender	
Nationality (Group of population)	
Address	
Housing circumstances	
Objective Indicators	***Subjective indicators***
Type of residence	Reason for location
Type of ownership	Satisfaction with the residence
Number of people in the residence	
Number of bedrooms in the residence	
Neighbourhood conditions	
Objective Indicators	***Subjective indicators***
Carried out activities	Satisfaction with services
Number of visited green areas	Satisfaction with the maintenance of the area
Used transport modes	Satisfaction with green areas
	Satisfaction with transport aspects
	Physical integration
	Satisfaction QoL

3.1.3.Data collection

- (2) Spatial registration/analysis

Spatial analysis in this context refers to everything that is geo-referenced (Wilson, 2014), and classical urban spatial analysis is often executed by urban designers, planner and architects. This typically includes topographic information about underlying landscape features and morphological information about street patterns, building structures and

open and green spaces, as well as functions, property structures and transportation systems (Müller-Eie and Llopis, 2019). Aggregate information about population density or demographic characteristic of the local population can also be included.

In this study, a spatial analysis about demographic data, housing circumstances, green areas, transport structure and social aspects has been carried out in Storhaug and Grünerløkka.

- (3) Desktop research

Much of the quantitative objective data has been collected through desktop-research. Sources are official governmental websites, including census data and geographic information systems sources (GIS). Both Stavanger and Oslo municipalities have official websites where demographic and spatial information has been gathered (OsloKommune; StavangerKommune). At the national level, *Statistisk Sentralbyrå (Statistics Norway),* has provided for this study much of the objective data related to social and physical aspects (Statistikkbanken, 2019b).

- (4) Questionnaires (paper/digital). P-GIS and subjective mapping.

Questionnaires have been created in this study as a tool for gathering participants' (personal) information, as well as perception and satisfaction with urban, social and environmental aspects.

The participants of this study live either in Storhaug or Grünerløkka. They were randomly reached as they passed by public streets, green areas or open public spaces around their neighbourhoods. The selected areas for conducting the questionnaires are located around the neighbourhood and distanced from each other, expecting to reach as many participants as possible living the different areas of the neighbourhood.

During the one-year and a half period of conducting the questionnaires, the areas were visited during different seasons, as well as different days of the week and hours. The purpose of it was to collect as many participants as possible, considering the possibility of meeting different residents if visiting the areas during the morning on weekdays or during the weekends for instance.

Participants were firstly approached without indeed knowing if they were residents of the project areas. Some participants happened to just be visiting the area and therefore excluded for the study since the purpose is to inquire participants' satisfaction with their residences and neighbourhoods living in Storhaug and Grünerløkka. By confirming their residence location, participants were informed about the research study. Essential questions were firstly asked to assure the participants' contribution to the study, i.e., their length of residence in the area or voluntary decision to reside there.

A pilot study funded by Stavanger *Kommune* was carried out in collaboration with IRIS (*International Research Institute of Stavanger*), with a similar purpose as the current study but reduced research area as well as the number of participants. As part of a larger initiative to improve the QoL in Hillevåg, a central mixed-use neighbourhood in Stavanger, a socio-cultural analysis of the neighbourhood was conducted in 2017/2018 (Jonvik et al., 2018). This encompassed interviews with both local stakeholders and community groups, as well as children and immigrants. Semi-structured interviews were conducted with the help of A3 paper maps, specifically designed for that study (fig.8). These maps helped to create the map-based questionnaires for the current study based on the feedback and the experience from the pilot one (Müller-Eie and Llopis, 2019).

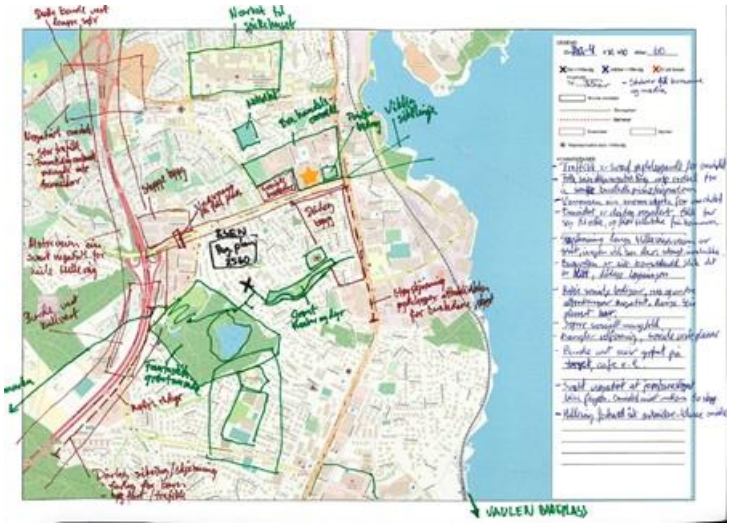


Figure 8: Paper map-based questionnaire of the pilot study.

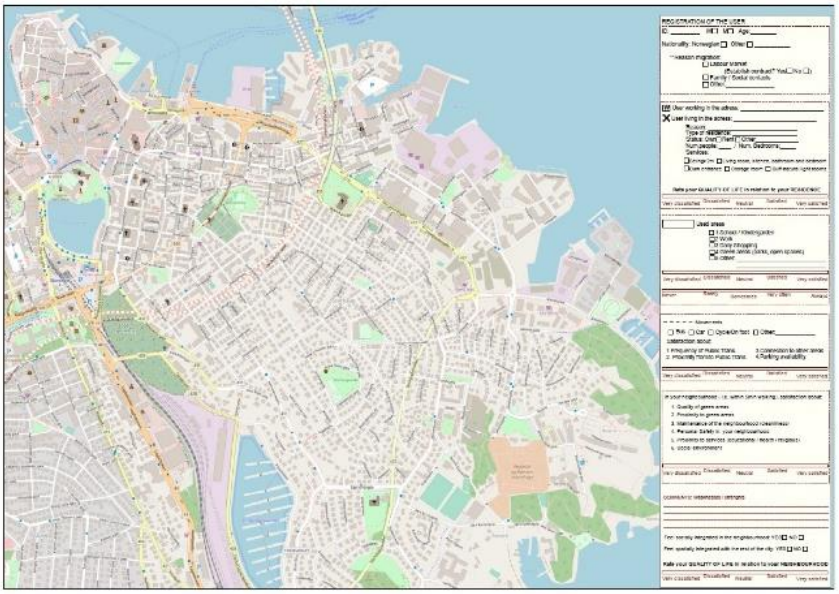
Paper-based and digital questionnaires have been designed for this specific study (Llopis and Müller-Eie, under review-b) (fig.9).

i) Paper-Based Questionnaires Maps. Maps were printed in A3, showing sufficient detail on the maps, where street names were placed on the map along with a few landmarks to help orientate the respondents. On the A3 paper-map, one quarter is used for the questionnaire section, while the other three quarters constituted the cartographic background map of the study area. The questionnaire section contains a list of questions on both objective and subjective aspects regarding personal information and satisfaction with urban, social and environmental aspects. A sequence from the personal information to the housing and the neighbourhood level will follow up the structure of questions, concluding with a question regarding perceived QoL. The questionnaire has also designated space for comments or additional information that respondents are willing to provide.

ii) Digital application. A digital application has been developed in collaboration with the Department of Electrical Engineering and Computer Science at the University of Stavanger, Norway. It is designed

with a similar structure as the paper-based questionnaire. A map and a list of questions are displayed simultaneously. The same sequence of questions are presented to the participants.

The purpose of this application is to replace existing methodologies such as questionnaires and interviews, but with an improvement: linking the participant's collected information to specific urban areas into a software program, to create cohesion between objective characteristics of spaces and participant's satisfaction or perception, use and behaviour about them (Llopis and Müller-Eie, under review-b).

(a) 

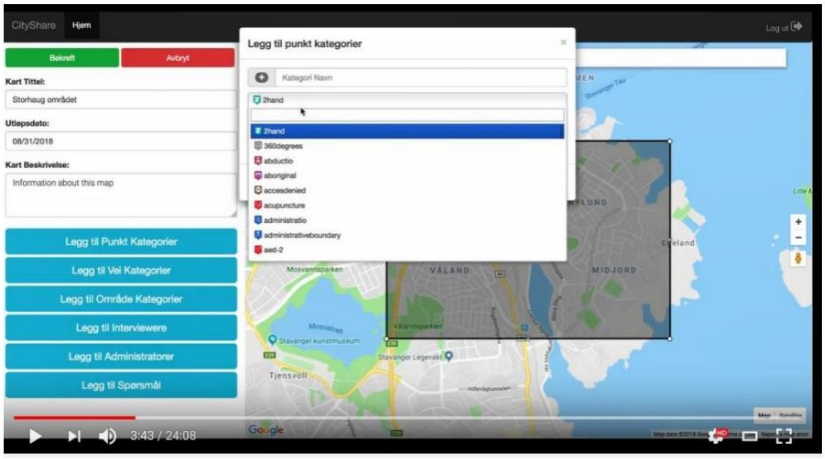
(b) 

Figure 9: Paper (a) and digital (b) map-based questionnaires created for this study.

In both types of questionnaires, subjective mapping and *Participatory GIS* (P-GIS) is present. P-GIS started in the late 1980s (Downs and Stea, 1973), being most represented in studies with a spatial and subjective character (Coulton et al., 2001; Dekker, 2007; Ferreira, 2016; Riedel et al., 2014; Martínez et al., 2016; Kyttä et al., 2016). Subjective mapping is a concept currently used to geo-reference user perceptions, satisfaction or meanings in general. Subjective mapping and P-GIS are considered an effective arrangement of public participation that provides the ability to reach a broad spectrum of people and a production of high quality and versatile knowledge. They combine a range of geospatial information management tools and methods such as sketch maps, participatory models, aerial photographs, satellite imagery and GIS to represent people's spatial knowledge virtually or physically used as interactive approaches for spatial learning, discussion, information exchange, analysis, decision-making and advocacy (Dunn, 2007).

3.1.4.Data analysis

- (5) GIS *Geographic Information System*

Database management, visualisation, spatial analysis, and spatial modelling are the main uses of GIS in urban planning (Marble and Amundson, 1988; Yeh, 1999). In this study, GIS programs contribute to gather objective data related to spatial or physical aspects. Part of the housing and neighbourhood data is collected and displayed with the help of GIS software's. Desktop-research data is also registered into GIS.

Besides serving as an instrument for collecting objective data, GIS has served as a tool for linking subjective data from the participants to spatial components.

All the spatial representations of Storhaug and Grünerløkka are displayed using GIS. The program allows selecting, overlaying and illustrating specific data from the overall registered information.

- (6) Statistical analysis

Statistical analysis has been used to describe qualitative and quantitative data as well as validating it.

The methodological approach used in the study a cross-sectional ordered logit regression model with self-assessed satisfaction with "Satisfaction with the residence" and "Satisfaction with Quality of Life" as the dependent variables and a set of explanatory independent variables: a population group variable, and a research area variable. Furthermore, a set of dummy variables for housing circumstances as the type of residence, ownership or occupation. Another list of variables regarding neighbourhood conditions: number and specifically carried out activities, number of visited green areas and satisfaction with public transport, parking system, green areas and maintenance. Finally, a dummy variable for physical integration (Table 3,Table 4, Appendix 6 and Table 1, Appendix 7) .

"Satisfaction with the residence" and "Satisfaction with Quality of Life" are measured with a five-point Likert scale. As they are discrete and ordered variables rather than continuous, it has been used an ordered logit regression with **m**aximum **l**ikelihood **e**stimation (MLE) in the analysis.

Internal validity is maintained to the extent that the underlying assumptions of the regression analysis are fulfilled. Reverse causality or simultaneous equation bias, systematic measurement errors and omitted variable bias are typical endogeneity issues that could occur.

Whether there is external validity is debatable. It is well documented that there is heterogeneity in level of satisfaction with QoL across different population groups. Whether there is external validity in terms of other cities within Norway, is fundamentally unverifiable without extending the sample to other cities. There could be differences when comparing other neighbourhoods or at a city or national level.

These are the list of independent variables (Research areas, population groups, housing circumstances and neighbourhood conditions) and the dependent variables (fig.10).

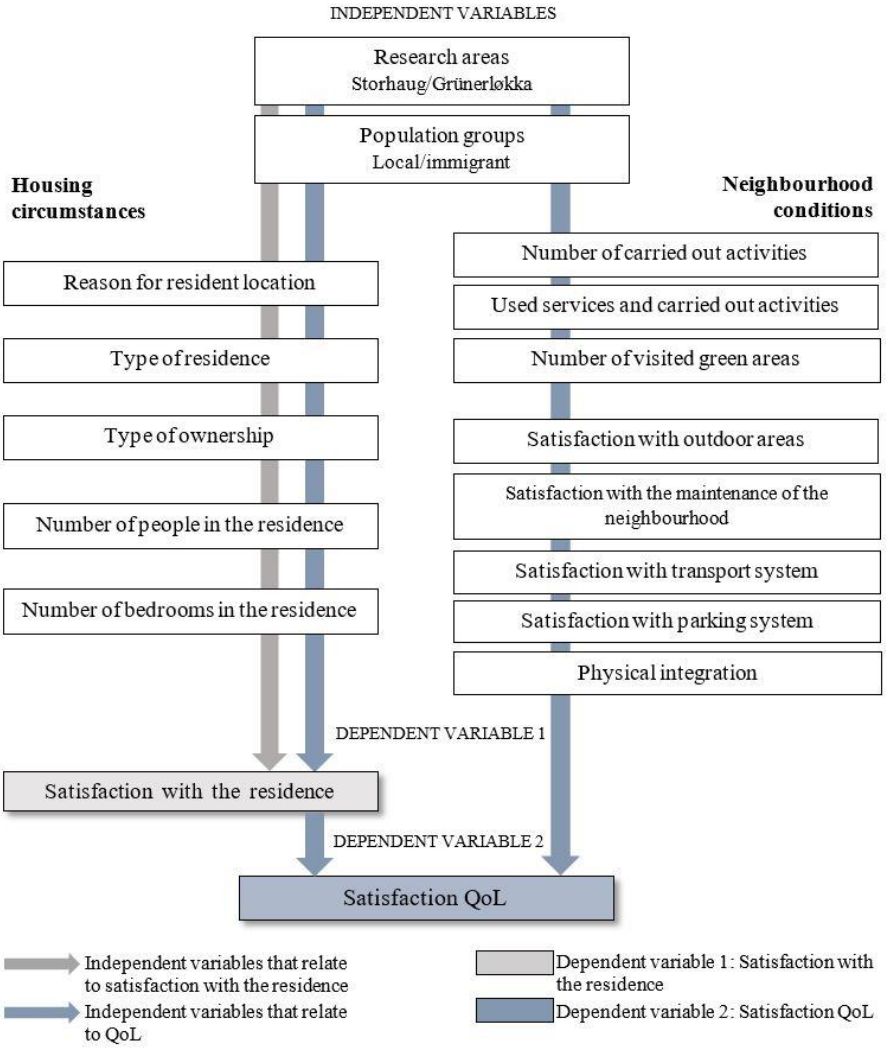


Figure 10: List of independent and dependent variables of this study.

3.1.5.Limitations

To understand the contribution of this study to existing knowledge and methodologies, it is necessary to reflect its limitations.

This study presents a list of objective and subjective indicators used for research participants' QoL. Part of these indicators refers to the use of the spaces in their neighbourhoods. Behaviour mapping could have been applied in this study for observing and recording individuals' behaviour in these particular settings. The information provided would have enriched the existing information since results now indicate whether participants use (or not) specific services or visit particular areas. By using behavioural mapping, this study could have indicated the activities happening in the areas, the time that each participant spends in each location, and of high interest, whether there are differences between population groups' behaviours.

Another limitation is the Norwegian overrepresentation in the number of participants. Data collection was conducted in outdoor spaces, public streets and green areas. A higher number of Norwegian participants confirm the use of these spaces, assuming that it resulted easier to find more Norwegian participants than immigrants in these areas. Another encountered difficulty was the immigrant population not willing to share their satisfaction, perception or mere opinion regarding their QoL. The immigrant group may be more concerned to expose their situation or QoL especially if they consider it is still different from what they are aiming for; and therefore, not willing to contribute to this research by answering the questionnaires.

Referring to the collected data of the participants, this study has not considered aspects as the country of origin or their economic situation or employment status. Data has been limited to aspects directly related to their RC. However, socio-cultural or socio-economic characteristics of the participants would have enriched the data, allowing a better discussion between objective and subjective indicators and their

relevance on individuals' QoL. Especially, regarding the similar levels of satisfaction with QoL between population groups and their different living conditions (type of residence, type of ownership), including other personal aspects such as economic and employment status or stages of establishment would have helped to clarify which indicators are determinant apart from their RC when defining their satisfaction with QoL.

The majority of the immigrant participants in this study belong to the first three groups (based on the four categories established by UDI) since they were requested to have lived/moved to their residential areas voluntarily. Grünerløkka itself has a large number of refugees and the provided data if having interviewed them would have enriched the current data, as well as being representative of a percentage of the population living in Grünerløkka. Despite possibly not qualifying for specific topics of this research (reason for residence location), this group could have been included in the research with a special questionnaire defined for the case.

Time and resource limitations narrowed the studied to be conducted as it is. These limitations are also the reason why only two neighbourhoods are part of this study. Including other Norwegian neighbourhoods would have enriched the research, as well as comparing the Case Studies with other neighbourhoods within the same cities.
Therefore, the collected data is limited to the studied areas and not generalizable. Extended data, including other neighbourhoods within the same cities, and even contrasting with other Norwegian cities would allow more generalizable and representative results.

3.2. Case Study Presentation

As in many European countries, migration in Norway has been one of the main justifications of social and urban development, change and transformation. Since the 60s Norway has become a multi-ethnic city, diverse society in languages, religions, cultures and traditions. A new society is led to a sudden, rapid social change that is difficult to assimilate. This new change is a concept worthy of study that requires attention at a social and urban level.

Norway's population is 5.372.355 (16th July 2020), being the immigrant population 790.497 (14,7% of the total). Norway has five cities that differ from the others in terms of population: Oslo (685.811), Bergen (255.646), Stavanger/Sandnes (222.697), Trondheim (183.378) and Drammen (117.510) (Statistikkbanken, 2019b).

From these five cities, the research is focused in Stavanger and Oslo. Both cities are also within the five most populated regarding immigrant population.

Table 4: Actual and projections of the local and immigrant population in Oslo and Stavanger.

	Total population	Immigrant population	Immigrant population (%)	Total pop. expectations (2030)	Immigrant total pop. expectations (2030)	Immigrant % pop. Expectations (2030)
Oslo	685 811	222 843	33,1%	788 928	305 731	38,7%
Stavanger	134 037	25 044	18,7%	141 634	46 511	32,8%

Oslo is the capital of Norway and differs from the other cities in terms of population. However, Stavanger is a reference city of the country economically speaking, since it is considered the nerve centre of the oil industry. Oslo, the capital, attracts larger numbers and more diverse immigrants as a central core, while Stavanger attracts particular work immigrants for the petrol and related industries.

In Stavanger and Oslo, the districts with the highest immigrant percentage of population have been identified as the Case Study for this research, corresponding to Storhaug and Grünerløkka.

Table 5: Population data, Storhaug and Grünerløkka (KommuneProfilen.no, 2019).

	Total Population	Immigrants	% immigrant	Dimension
Storhaug (Stavanger)	17174	3544	20,6%	11,5 km^2
Grünerløkka (Oslo)	60844	12497	20,5%	17,4 km^2

According to immigrant population in Norway, these are the five most representative countries at a national level:

Table 6: Most representative nationalities of the immigrant population in Norway, 2019.

	Poland	Lithuania	Sweden	Somalia	Germany
Immigrant population	98 691	39 300	35 586	28 642	24 567

These are the most represented nationalities in each study area: in Storhaug, 15,7% are Polish, followed by 6,1% Swedish and 5,9% of English (Statistikkbanken, 2019b). In Grünerløkka, the biggest community is Swedish, 16,2%, followed by 13,5 of Polish and 4,7% of Spanish (Statistikkbanken, 2019b).

In this research study, 238 participants have been interviewed. These are inhabitants of the two research areas and therefore considered individuals who can provide significant data about their RC and their perception and satisfaction with RC and QoL.

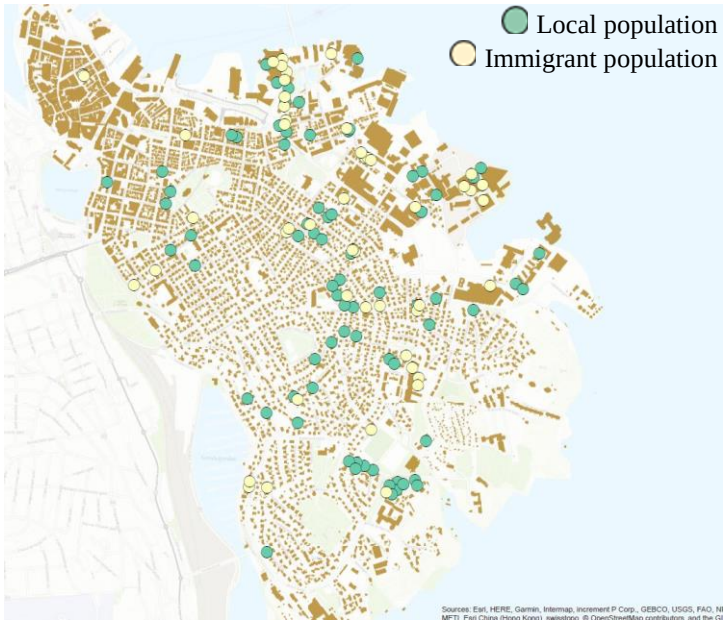
In Storhaug, 124 people have been interviewed, 74 Norwegians (60%) and 50 immigrants (40%). Among these respondents, the most prominent immigrant nationalities were 8% Polish, 6% Portuguese and 6% Spanish. In Grünerløkka, 114 people have been interviewed, 68 Norwegians

(60%) and 45 immigrants (40%). The most prominent nationalities in Grünerløkka have been 6% Somali and 4% Spanish.

In the current study, the nationalities are not considered when studying the results since the categorization of the participants is either local or immigrant. However, the Polish group is represented in the participants from Storhaug as well as the Spanish group in Grünerløkka, being prominent nationalities in the corresponding research areas.

Figure 11 shows participants' residence locations in Storhaug and Grünerløkka. Interviews were carried out in different areas of Storhaug and Grünerløkka (streets, public spaces and green areas) since the purpose has been to obtain a considerable equal distribution of residence locations in each neighbourhood. However, there is a skewed distribution of participants' residence locations in both neighbourhoods (fig. 11). The central area of Storhaug is not as represented as the other areas as well as most of the participants in Grünerløkka live in the south/west part of the neighbourhood.

(a) Scale 1:30000



(b) Scale 1:40000

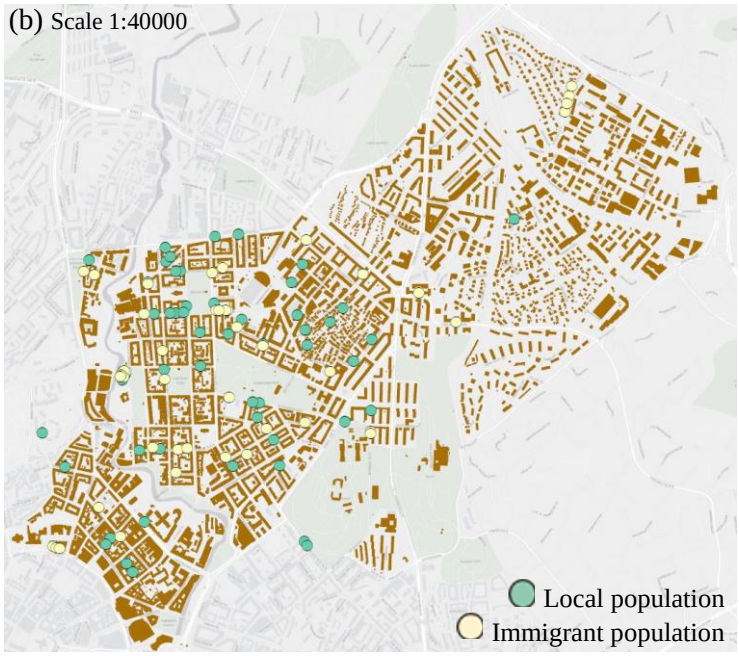


Figure 11: Local and immigrant participants' residence locations in Storhaug (a) and Grünerløkka (b).

Figure 12 shows the population distribution in Storhaug and Grünerløkka based on age and gender.

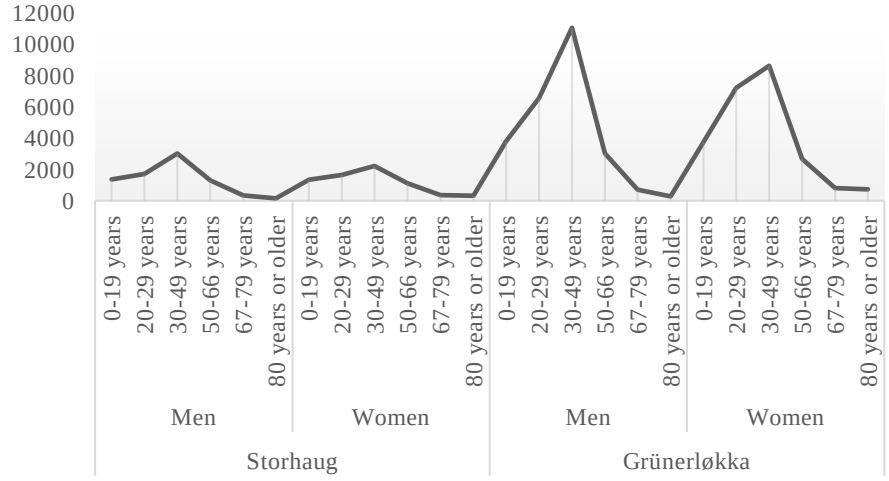


Figure 12: Population in Storhaug and Grünerløkka depending on age and gender (Statistikkbanken, 2019b).

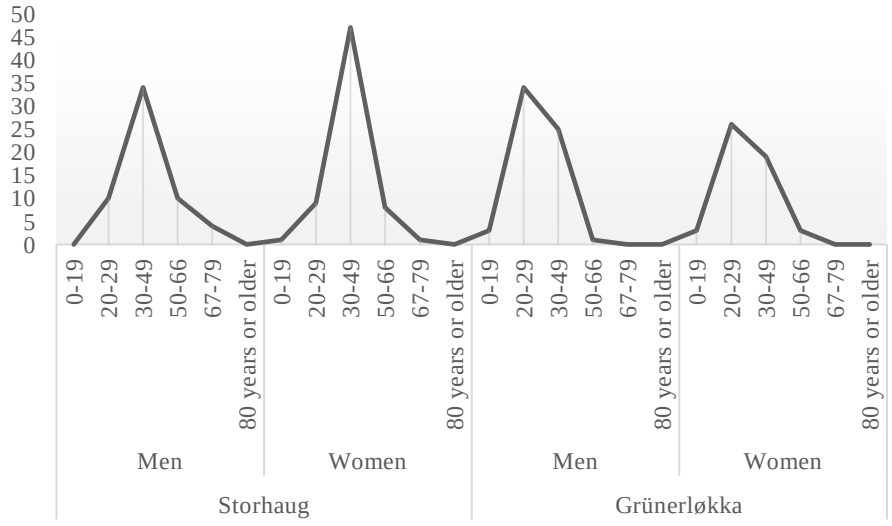


Figure 13: Participants of this study in Storhaug and Grünerløkka depending on age and gender.

Figure 13 shows the participants' distribution in Storhaug and Grünerløkka based on age and gender. In the current study, ages from the participants in Storhaug are ranging from 19-74 years old, being 40% of the participants between 30 and 55 years old, where 53 % of the respondents are women and 47% are men (fig.13). In Grünerløkka, participants are ranging from 18-65 years old, where 64% are between 22-35 years old, being 45% of the respondents women and 55% are men (fig.13). Participants in Grünerløkka are younger than in Storhaug. This may be due to the educational services in this neighbourhood, especially university level, considered as a factor of attraction for young people who may be under university education.

Besides the demographic differences between the neighbourhoods, Storhaug and Grünerløkka also differ in terms of urban structure, i.e., physical distribution of services, housing types or transport system. Each of these concepts has been spatially registered and analysed before linking it to the participant's given information.

Despite the differences between Storhaug and Grünerløkka, each neighbourhood also differs internally. Some areas in Storhaug present a specific type of residence (block of apartments along the shore, single-family type in the central part) or include more green areas (south part). Similarly, in Grünerløkka there are certain areas with different housing typology as the majority of the neighbourhood, as well as with more green areas (southwest of the neighbourhood). These differences based on housing layout can be certainly connected to social or economic differences within the same neighbourhood, where certain housing typologies or residential locations can be considered more favourable than others can.

Referring to the distribution of services in the neighbourhoods, this study is focused on the education services (kindergarten, school, university or similar), services related to daily shopping and green areas or public outdoor spaces.

Figure 15 shows the education and daily-shopping services in both neighbourhoods. It can be seen that both neighbourhoods include these types of services. However, in Grünerløkka there is a higher quantity, probably due to a larger number of residents, and a more spread distribution of these services. Must be considered that the southeast part of Storhaug is under construction since the last decade, where new blocks of apartments are being built and the areas are still under development, urban and demographically (fig.14). This may imply a new and more extended provision of services in this area in the coming future.

Figure 14: Southeast of Storhaug. Currently under construction.

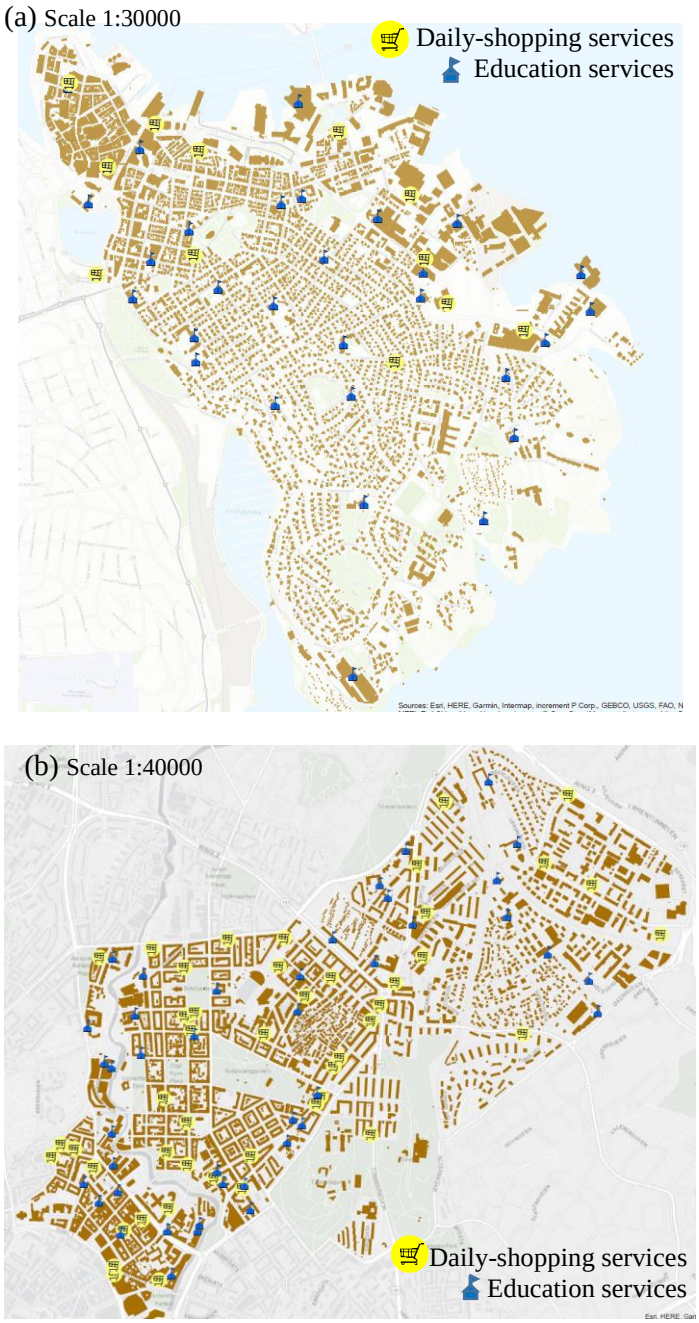


Figure 15: Daily-shopping services and educational services in Storhaug (a) and Grünerløkka (b).

The most prominent contrast between the neighbourhoods is the residence typologies, since 93% of the residences in Grünerløkka are apartments, compared to a more diverse type of residences in Storhaug (fig. 16).

Table 7: Percentage of residences according the type, 2018. Norway (Statistikkbanken, 2019a).

	Block of apartments	Terraced House	Semi-detached	Single-Family House	Other
Norway	19,3%	11,8%	9,7%	56,2%	3,0%
Storhaug	31,6%	13,2%	31,7%	18%	5,5%
Grünerløkka	93%	1,9%	1,3%	0,9%	2,9%

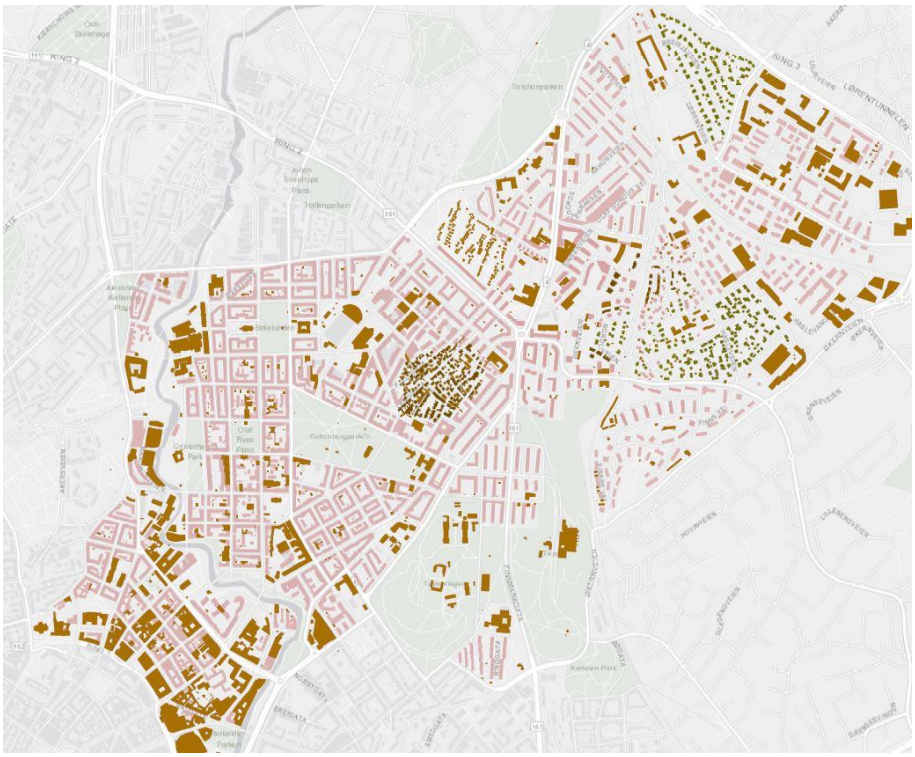
Figure 16: Residence typologies in Storhaug (two upper pictures) and Grünerløkka (two bottom pictures).

Figure 17 shows the housing distribution in Storhaug and Grünerløkka. Storhaug presents a variation of typologies spread around the neighbourhood where most of the block of apartments are located along

the shore, being most of them built during the last two decades. In Grünerløkka, on the contrary, the most represented typology around the neighbourhood is the blocks of apartments, except in three specific areas where single-family and detached houses are more predominant (fig.17).

(a) Scale 1:18000

Apartment
Terraced House
Semi-detached house
Single-family house



(b) Scale 1:25000

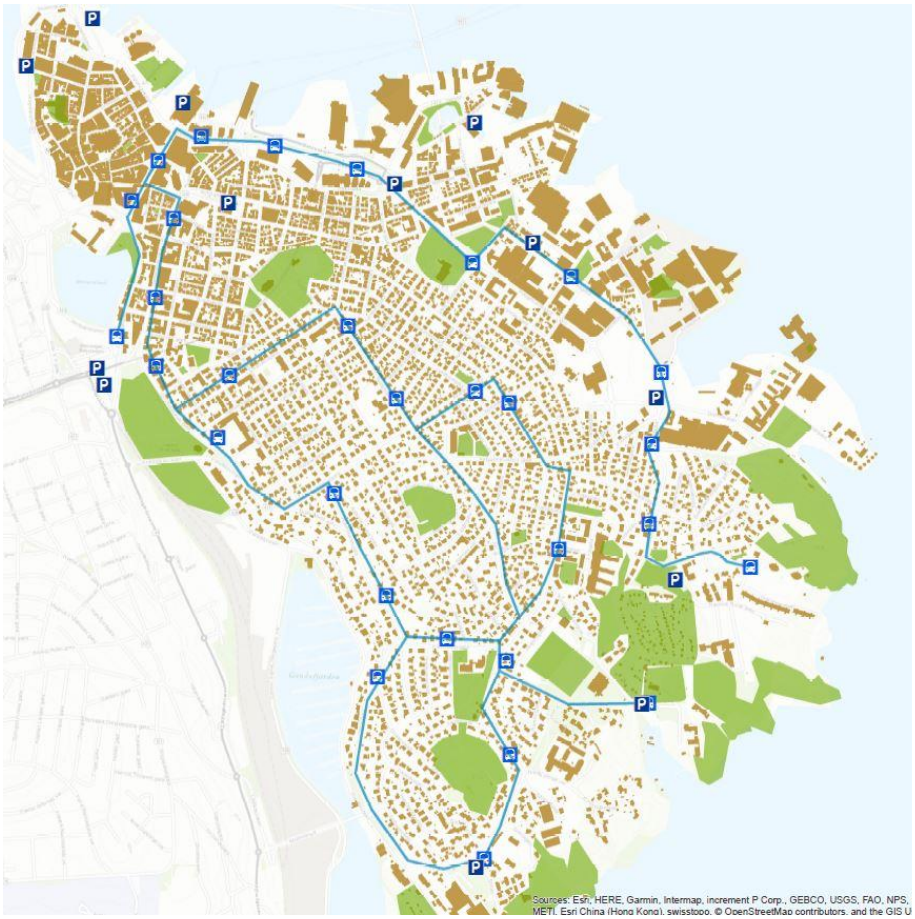
Apartment
Terraced House
Semi-detached house
Single-family house

Figure 17: Residence types in Storhaug (a) and Grünerløkka (b).

According to public transport, Grünerløkka offers more possibilities (bus, tram, tube and el-cycle) than Storhaug does (bus) (fig.18). This can be due to the affluence of people under university level that commute to Grünerløkka because of the education services situated in the area. Also, Grünerløkka is part of Oslo, which in dimension is larger than Stavanger and has a more extended transport system infrastructure than Stavanger.

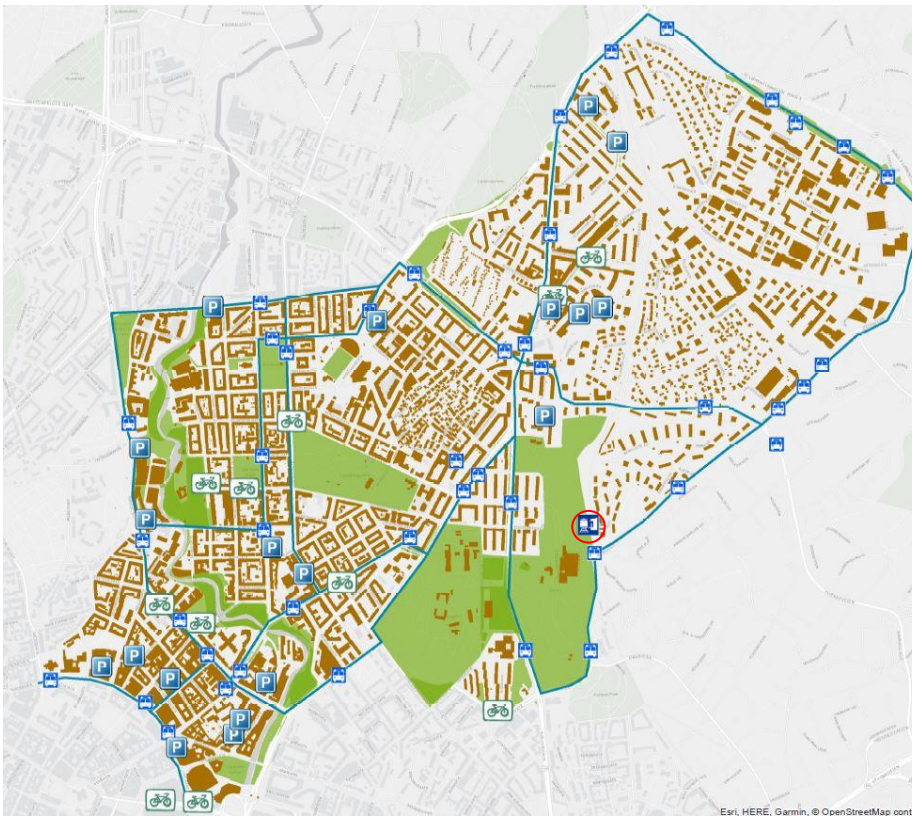
Parking provision also differs between the study areas, since Storhaug has more private parking places due to the residence typologies (single-family houses, detached and terraced typologies are usually designed with private parking spaces). Grünerløkka, on the contrary, is mainly

filled by block of apartments where residents are expected to park in the parking spaces at the streets nearby their residences (fig.18).



(a) Scale 1:18000

Bus stops
Bus routes
Public parking



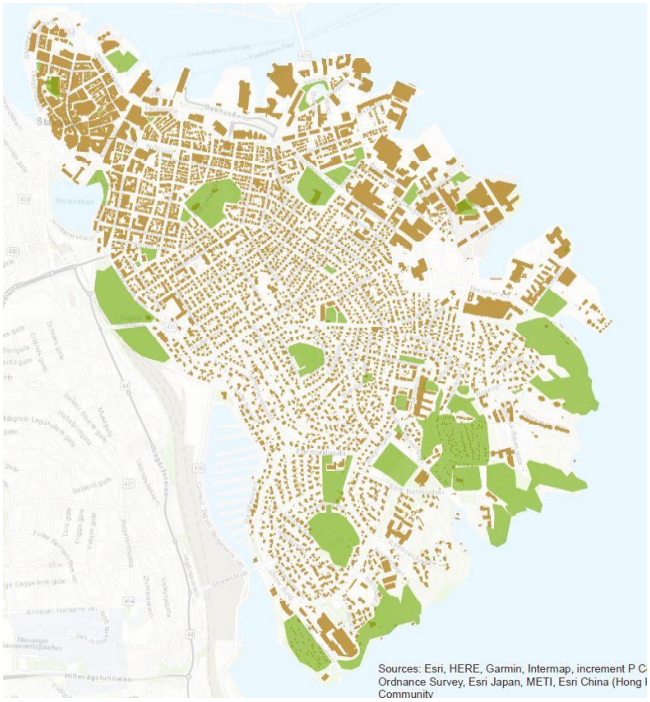
(b) Scale 1:25000

Bus stops
Bus routes
Public parking
El-Cycle stations
Tube station

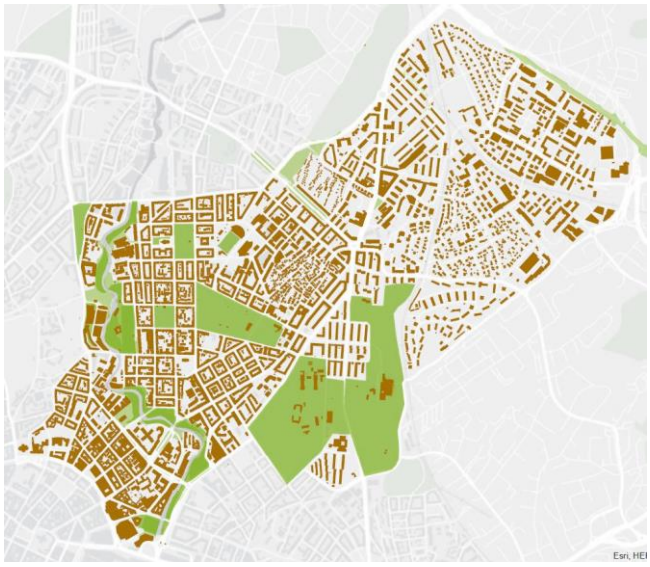
Figure 18: Transport structure and parking system in Storhaug (a) and Grünerløkka (b).

Figure 19: Examples of public transport in Storhaug (left picture) and Grünerløkka (two right pictures).

Storhaug and Grünerløkka have similar percentages of green areas (15%). However, considering the corresponding populations, Storhaug benefits from higher share of green surface per habitant (100m^2/person in Storhaug compared to 42m^2/person in Grünerløkka). In Storhaug, most of the green areas are located along the shore, while in Grünerløkka (which is not directly connected to the waterfront) the green areas are located around the neighbourhood (fig.20). Grünerløkka has two large green areas (*Sofienberg* and *Tøyen*) and a green belt along the river that crosses the city (*Akerselva*). These green areas are the most crowded and visited among the participants. Storhaug has not as large green areas as Grünerløkka, but they are more connected between them since part of them are located by the seafront.



(a) Scale 1:30000



(b) Scale 1:40000

Figure 20: Urban layout and green areas of Storhaug (a) and Grünerløkka (b).

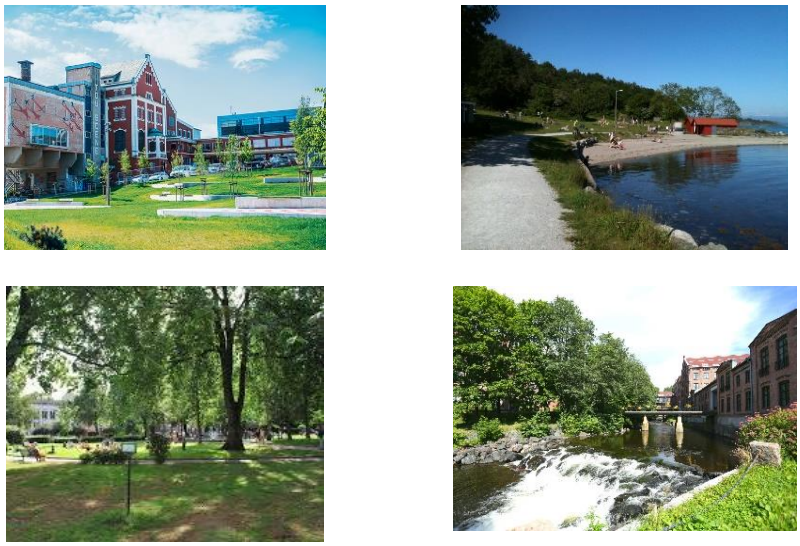


Figure 21: Examples of green areas in Storhaug (two upper pictures) and Grünerløkka (two bottom pictures).

The current study does not compare the research areas. It is a non-comparative study between the neighbourhoods, however comparative between the population groups. Storhaug and Grünerløkka differ from each other in urban, demographic and environmental aspects. However, in order to understand in which degree these aspects impact on participants' satisfaction with their neighbourhoods and QoL, a spatial registration and analysis has been carried out.

4 Findings and discussion

The study confirms that specific housing and neighborhood conditions can improve or decrease perceived QoL. The main finding of this research is that the immigrant population lives under worse RC than Norwegians do, even in the same neighborhood. They are less satisfied with their residence, their neighborhood conditions and their QoL in general.

Several indicators that certain studies found as representative (Boehm and Schlottmann, 2008; Mulder, 2006; Sarmiento et al., 2010; Bolt et al., 2010), may not be significant in this study, as the type of ownership, occupancy, the transport structure or the physical integration. Figure 22 presents which of the studied indicators influence participants' perceived QoL based on the regression model.

The combination of objective and subjective indicators has allowed this dissertation to study participants' QoL from an urban and environmental perspective. The subjective mapping method has been used for linking activities, perceptions and satisfaction to spatial and physical referents at a neighbourhood level. The relevance of including the subjective component in this research has served to gather data beyond an urban analysis and registration of environmental and spatial components. The subjective component enables registering at this urban scale the spatial elements to residents' perception and satisfaction with them.

The findings of this study may not be innovative or representative if compared to existing studies that refer to immigrant vs locals' QoL. However, the methodological approach enhances it, since it enables urban planners to be responsive to people's needs by studying the neighbourhood scale and including subjective components that help to identify certain indicators that in similar studies may not have been representative.

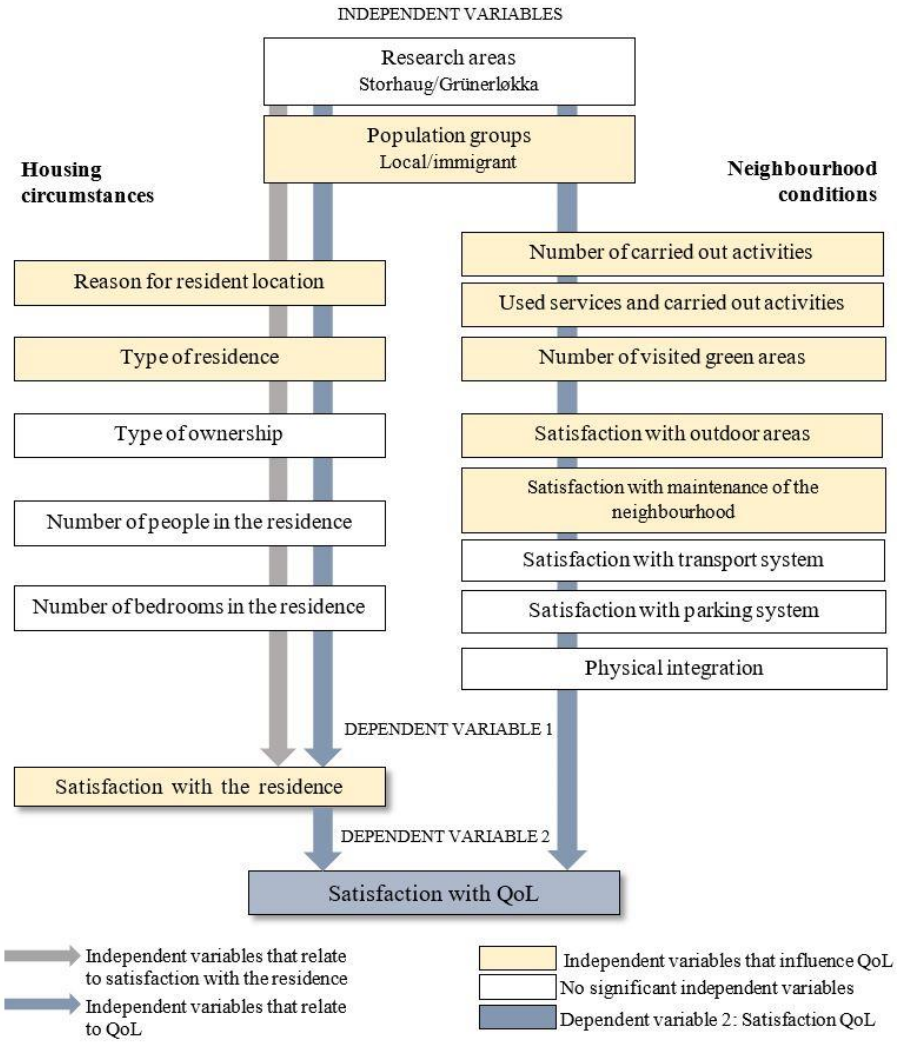


Figure 22: Relationship between the independent variables and the dependent variables.

QoL refers to the concepts of life-satisfaction and subjective well-being. It can be assumed that an individual satisfied with his/her QoL is an individual who lives under favourable characteristics of the dimensions that define the concept of QoL.

Based on established hypotheses in the current study:

- *(Hypothesis 1)* ***The residence and the urban environment where individuals live influence their Quality of Life.***

Results confirm that certain RC influence positively on participants perceived QoL. More specifically: the social environment under which individual lives (due to the reason for location), their satisfaction with the residence, the quality and the amount of green spaces at their residential area, the number of services and activities offered at the residential area and the maintenance of the residential area. Locals and immigrant participants who are satisfied with these aspects reported higher values on perceived QoL.

- *(Hypothesis 2)* ***Immigrants live under less favourable residential conditions (RC) than locals do.***
- *(Hypothesis 3)* ***Immigrants report lower values on perceived Quality of Life.***

Objective indicators have helped to identify under which RC each population group lives. Subjective data has helped to identify perceived QoL for locals and immigrants. Gathering this information confirms that immigrants live under worse (less favourable) RC than locals, and that locals report greater values of perceived QoL.

Individuals can be differently satisfied with their residences and their neighbourhood environment. Their perception is subjective, and it depends from one individual to another, being possibly affected by other dimensions that define QoL, i.e., job, economic, social or personal aspects.

Collected data in this study include objective information about housing circumstances and neighbourhood conditions as well as the satisfaction of the participants with QoL and with aspects that define RC. This subjective information has been connected to the objective characteristics of Storhaug and Grünerløkka. This has helped to define whether participants living under the same residential conditions perceive different QoL.

It can be confirmed that even living under the same urban and environmental conditions, locals and immigrants perceive different QoL. Urban and environmental dimensions are therefore not the only ones impacting on participants' satisfaction with QoL, assuming that other dimensions define QoL that are the reason why the two groups of the population are differently satisfied.

4.1. Relationship between Residential Conditions and Quality of Life

Figure 23 is a design model that explains the relationship between RC and QoL for locals and immigrants as well as in the research areas.

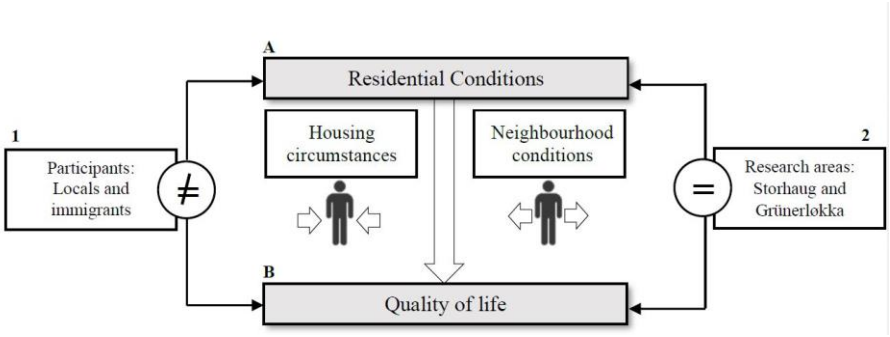


Figure 23: Design model of the current study (a).

RC is divided into housing circumstances and neighbourhood conditions. The *housing circumstances* under individuals live are connected to the individual. It can be understood that the economic and labour status (or

simply preferences) of each individual can influence on the residence in which one lives, and therefore, being more or less favourable conditions. However, *neighbourhood conditions* are external characteristics (independent) to the situation of each individual, since it refers to the urban layout, public transport or green areas that individuals find in their residential area. The level of participation, engagement or use that residents do at their neighbourhood environment (as well as the perception about it) is individual and depends from one person to another as well as overtime.

Local and immigrant participants of this study are mostly satisfied or very satisfied with their residences, their neighbourhoods' conditions and their QoL. However, the greatest differences are when comparing both population groups at the highest level of satisfaction, where locals perceive greater QoL than immigrants (≠). However, when comparing Storhaug and Grünerløkka, results are similar (=) (fig.24).

This study considers two neighbourhoods with different characteristics, urbanistically and demographically speaking, where different results and perceptions would be understandable. However, percentages of satisfaction with QoL in Storhaug and Grünerløkka are very similar, even at the highest degree, where 38% of the participants in Storhaug are very satisfied with their QoL compared to 32% in Grünerløkka (fig. 24).

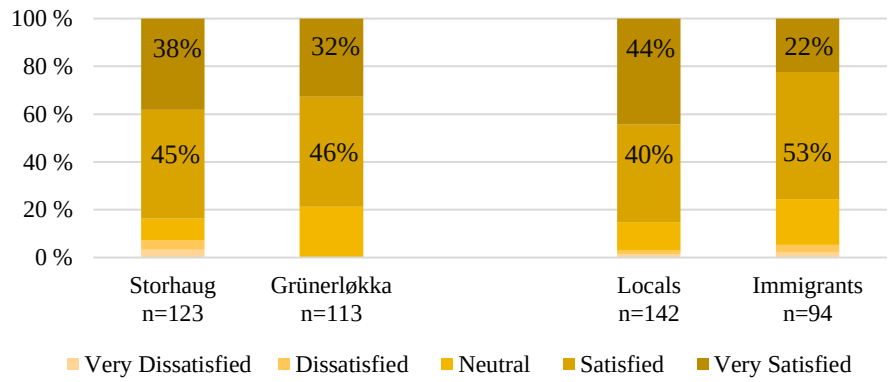


Figure 24: Degree of satisfaction with QoL among Norwegian and immigrant participants, Storhaug and Grünerløkka.

These results induce to consider several aspects:

- Despite different residence typologies, percentages in perceived QoL are similar
- Despite a different transport system structure, percentages in perceived QoL are similar
- Enhances the importance of green areas and services in the residential area. These aspects are similar in both research areas and its relevance has been reflected in participants' perceived QoL
- Participants in both research areas selected their residences' location due to social or family reasons. This enhances the social dimension as a reason why participants locate their residences in Storhaug and Grünerløkka and thus influence their satisfaction with the neighbourhood conditions due to its social environment.

  This highlights the importance of a future study about the social dimension that can be connected to the current study.

- Indicators related to the social dimension, the economic situation or the labour status might help to understand similar results obtained when studying participants' satisfaction in Storhaug and

Grünerløkka. Other reasons than the urban and environmental aspects could be behind the similar results of perceived QoL despite living in different urban areas and under different RC.

Locals and immigrants are influenced by their housing circumstances and neighbourhood conditions on their perceived QoL. However, the social dimension and personal situation of a specific group (in this case the immigrant) can be more significant or persuasive than the urban and environmental aspects under which they live and influence more on their QoL than the considered dimensions in this study (fig.25).

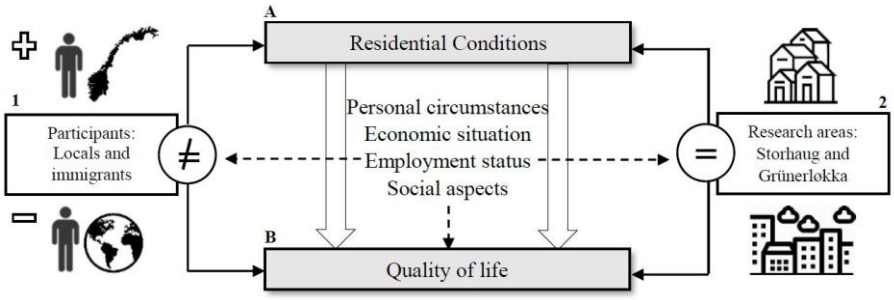


Figure 25: Design model of the current study (b).

Based on the research questions proposed for this study (fig.7):

- **RQA-B** There is a relationship between RC and QoL.

Within all the dimensions that define QoL, the housing and its environment must be highly considered by individuals when aiming for favourable values of QoL.

The home is the place in which people experience intimate relationships, where family unifies and personal and social ties occur. An individual's residence and its location should satisfy and contribute to a favourable QoL. Individuals' residences, a positive social environment in the residential area, and quality and accessible recreational, green areas and services distribution must promote individuals' QoL.

- **RQ1B** This relationship is different for locals and immigrants. Locals perceive greater values of satisfaction with their residences, neighbourhood conditions and QoL.

The immigrant population has an initial disadvantage when arriving in the country of destination since in most of the cases it differs in linguistic, cultural, social or religious terms.

It may be possible that the immigrant group arrives with a lack of knowledge to the host country, and therefore a disadvantage when it comes to integrating, socially, geographically or in labour perspectives.

Immigrants go through several stages, arrival, settlement and stabilization. During these stages, there may be other factors, not only urban and environmental, that can influence their QoL, i.e., insertion in the labour market, participation in the housing market or social integration. Aspects that are not related to RC but still can influence on their QoL.

Referring to the local group, these factors generally do not exist. It can be the case of national migration by the local group, where individuals can settle in areas they are not familiar with, but generally, the local group do not suffer linguistic, cultural or lack of knowledge within their countries.

However, economic, labour or social issues can affect both groups equally. In the current study, it is considered that the immigrant group is more influenced by these factors than the local, since other reasons that urban or environmental may be the explanation for different perceived QoL.

- **RQ2B** Participants living in different urban and environmental conditions perceive similar QoL.

This study has presented Storhaug and Grünerløkka from a spatial and demographic perspective. Urban, environmental and demographic characteristics have demonstrated we face different neighbourhoods in Norway. However, results confirm that participants perceived similar QoL despite the neighbourhood they live in (fig.24). This fact confirms the importance of the individual perception on the satisfaction with RC and QoL. This perception and satisfaction can differ from one to another and indeed differ for the same individual considering different periods. Personal circumstances, economic and employment status or social aspects can influence participants' satisfaction.

QoL includes more dimensions than included in this study. When asking participants about their QoL they can, therefore, be influenced differently by other dimensions than the urban or the environmental ones. Certain dimensions can be more representative than others depending on each individual and his/her situation in specific periods. The reason why perceived QoL is similar in Storhaug and Grünerløkka despite referring to different urban areas can be due to the subjective character and personal perception under each individual lives. The Norwegian welfare, jobs and earnings, the work and life balance, labour security and other indicators that position Norway on the top of well-fare indexes, can also influence participants.

4.1.1.Housing circumstances and Quality of Life

In this study, RC has been divided into housing circumstances and neighborhood conditions. Each of the concepts has been related to perceived QoL. The relationship between RC and QoL has been also addressed from a conceptual perspective (Llopis and Müller-Eie, 2017a). An investigation about the housing circumstances and their impact on QoL (Llopis and Müller-Eie, under review-a) among local and

immigrant population in Norwegian neighborhoods has been carried out. The main finding of this relationship is that certain housing circumstances seem to relate to individuals' perceived QoL. These circumstances are *Satisfaction with the residence, Reason for location and Type of residence*. More specifically, the results show that 12% of the variance in perceived QoL is explained by *satisfaction with the residence* (Table 4, Appendix 6). Considering the magnitude of QoL and all the dimensions it covers, this percentage results relevant and to be considered when focusing on which factors impact the most on individuals' life satisfaction.

Reason for location, either due to social or physical aspects, has an impact on an individual's QoL (fig. 6, Appendix 6). More specifically, participants who chose their residence location due to social or family reasons (social aspects) are the ones perceiving higher QoL. This result demonstrates the importance of the social dimension on QoL, where migration aspects, such as pull factors or migratory stages may be behind. The number of immigrants in a given area has an attraction effect itself, so the higher the number of existing immigrants, the greater is the area's power of attraction (Rogers and Henning, 1999). The tendency for immigrants to settle in neighbourhoods where other immigrants are present, regardless of the country of origin, appears to be important as first initial location choice of an urban area. However, the reason for location due to social aspects is not only represented in the immigrant group, since it has also been the most predominant response among locals. The social environment seems to be important for both groups. This fact, with other components that define the social dimension, could be further studied based on existing data. Aspects such as satisfaction with the social environment, with social integration or personal safety, could be included. This will help to identify in which measure the social dimension impact on participants' QoL.

Type of residence in this study has been the housing circumstance that strongly predicts satisfaction with the residence as well as perceived QoL

(fig.7, Appendix 6). More specifically, participants living in single-family houses have reported the highest perceived QoL. Certain types of residences can be associated with other dimensions that define QoL, e.g., economic or labour market dimension. Single-family houses in most cases represent the largest and most expensive types of residences. Therefore, participants living in this typology are considered to live under favourable conditions referring to economic, labour, migration or other personal aspects. In this study, 36 participants live in single-family houses, being 33 of them locals.

Unlike other studies (Elsinga and Hoekstra, 2005; Mulder, 2006), homeownership did not seem to be a significant predictor of satisfaction with QoL in this study (fig.9, Appendix 6). This can be due to other aspects, especially within the immigrant group, where the stage in the migration process, future expectations or the economic situation can drive them to rent their residence instead of becoming owners. It could be expected that individuals who own reflect higher QoL understood as an economic, employment or more adequate personal situation than those who rent. However, this study presents similar percentages of perceived QoL regardless of whether participants own or rent their residences. In Grünerløkka, 64% of the participants are 22-35 years old. Knowing the number of educational services located in Grünerløkka and the high percentage of participants who located their residence in Grünerløkka due to the distance to educational services, it can be assumed that most of the participants are under education period. This may be a reason why participants rent their residences, considering Grünerløkka a temporal location. Renting would, therefore, be the most convenient type of tenancy in this case.

In Storhaug, 22% of the participants located their residence in this neighbourhood due to its connection to the city centre (fig.6, Appendix 6). This can be understood as a relevant characteristic for participants to establish their residences in this area. Besides, the variance of residences in Storhaug may indicate different economic profiles, i.e., individuals

living in single-family houses can be associated to live under favourable economic conditions and therefore becoming owners. This may be the reasons why 66% of the housing in Storhaug is owned, compared to 43% in Grünerløkka (fig.3, Appendix 6).

Two conclusions can be drawn from the relationship between housing circumstances and perceived QoL in this study. Firstly, the participants of this study are highly satisfied with their residences, regardless of the neighbourhood they reside in. Secondly, there is a difference when comparing the two population groups, especially at the highest degree of satisfaction, where 40% of the local participants are very satisfied compared to only 28% of the immigrant group (fig. 26).

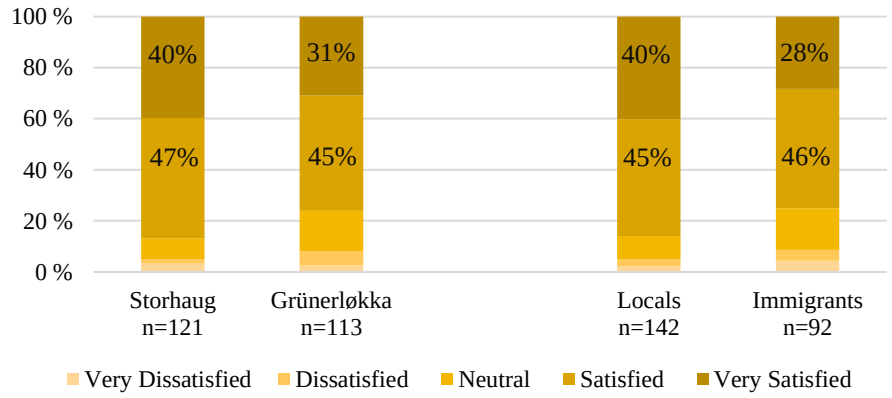


Figure 26: Degree of satisfaction with the residence among Norwegian and immigrant participants, Storhaug and Grünerløkka.

4.1.2.Neighbourhood conditions and Quality of Life

The other concept that defines RC is neighbourhood conditions. Appendix 7 (Llopis and Müller-Eie, *under revision*) studies the relationship between neighbourhood conditions and QoL among local and immigrant population in Storhaug and Grünerløkka. This study

confirms that certain neighbourhood conditions can contribute to improve or decrease individuals' perceived QoL.

The *number of activities and services* offered in an urban area, as well as their *quality and their maintenance*, can have an impact on people's QoL. This study demonstrates that participants who visit more services or carry out more activities report higher perceive QoL. Equally, participants who are more satisfied with the maintenance of their neighbourhood have also reported higher results on perceived QoL. It seems that participants in this study consider that a well-designed urban space with a *variety of services and activities* contributes to higher satisfaction with QoL. Storhaug and Grünerløkka offer services related to education, social and administration, daily amenities and accessibility to recreational activities and green areas. Participants carrying out more activities are the ones perceiving greater QoL.

In this study, *the use of green spaces* as well as participant's satisfaction with these areas have been the neighbourhood conditions that strongly predicts satisfaction with QoL (fig.7 Appendix 7). Participants who visit more green spaces and are more satisfied with them have reported higher perceived QoL. Storhaug and Grünerløkka have 15% of their surface occupied by green areas. These areas are understood as recreational places, where social ties and sense of community can be developed. Due to the importance of the social aspects as a reason for location (social or family reasons), green areas are considered as the open and public spaces where these relationships can happen.

Besides these physical aspects, *the transport structure* of an urban area must also be considered when referring to a well-design urban space. The *connection between the different activities or services* of an urban space is a concept that can influence an individual satisfaction with it, and therefore, with his/her QoL. In this study, a high percentage of participants is not satisfied with the public transport system (34%) and the parking arrangement (39%) (fig.9 and fig.10, Appendix 7). However,

this dissatisfaction does not seem to affect significantly on participants perceived QoL. This may be due to the research-scale of this study, i.e., neighbourhood level. In this scale, participants' residences are expected to be located within walking distance to services, daily amenities, green areas or public areas, where the transport structure may not be as needed or relevant as if we refer to a city or larger scales, where the transport-structure may be crucial for the daily commuting. The *transport structure* may additionally become subordinate due to the high variety of services and possibilities that the neighbourhood areas offer. These can result so attractive that enhance the residential areas giving secondary importance to other aspects such as the transport system, especially at a neighbourhood level.

Unlike previous studies (Hull, 2008; Cervero, 2013; Musterd and Deurloo, 2002; Bolt et al., 2010), *physical integration* does not seem to be a significant predictor of satisfaction with QoL in this study. Regardless of participants' residence location or proximity to public transport, participants are equally satisfied with their physical integration in both research areas (fig. 11, Appendix 7). Storhaug is well-connected (walking distance) to the city centre of Stavanger. Grünerløkka on the other side is further from the city centre of Oslo but offers more possibilities for public transport. These can be the reasons why participants feel physically integrated to the rest of the city where they live.

The relationship between neighbourhood conditions and perceived QoL in this study concludes with several results. It can be confirmed that the local population takes more advantage of the physical, environmental and mobility dimension at their residential areas, given the higher levels of services, activities and public transport modes they use. This seems to be directly related to their satisfaction with QoL, confirming that locals are the ones reporting higher perceived QoL even living in the same neighbourhood than the immigrant group.

The urban layout, disposition of services or green areas in Storhaug and Grünerløkka can influence participants' QoL. However, participants' use and engagement seem to be more relevant and determine how satisfied an individual is with his/her residential area. Under the same physical and environmental conditions, it has been confirmed that locals and immigrants make different use of them, which results in different degrees of satisfaction with QoL.

This study also addresses the relevance of neighbourhood conditions on QoL as a concept itself. The regression model of the study explains that the neighbourhood conditions named in this study explain 33% of the variance of participants' perceived QoL (Table 1, Appendix 7). QoL is a wide concept that includes other dimensions than the studied in this research, i.e., financial situation, social aspects, economic and physical safety, health, education, employment and basic rights. However, this study confirms the importance of the physical environment on participants' QoL.

This study affirms that certain housing circumstances and neighbourhood conditions under which individuals live can impact on their QoL. Individuals' homes and their urban and environmental surroundings can impact on individuals' QoL as much as other indicators that define this concept. However, these indicators can also influence indirectly on individuals' satisfaction with their residences and the neighbourhood they live in. This impact can be more attenuated on specific population groups, immigrants, as this study has addressed.

4.2. Differences between population groups

When studying the differences between population groups, two aspects must be considered. Firstly, housing circumstances are different among locals and immigrants. The residence where an individual lives is the result of a complex situation that includes economic, labour, social and personal aspects. These aspects vary among individuals, and more

specifically, among locals and immigrants, where the migration process can influence in each of the mentioned aspects.

However, and secondly, neighbourhood conditions are equal for both population groups, since the physical, urban and environmental dimension do not differ from one person to another. The use and perception of the neighbourhood are individual, since individuals may take more or less advantage of the area where they live, as well as having different perception about it.

The immigrant group lives under different housing circumstances than locals, mostly considered as less favourable. The immigrant population lives in a smaller typology of residences, most of the cases apartments, with renting is the predominant homeownership type (fig.2 and fig.3, Appendix 6). This typology and type of ownership can be associated with less favourable economic and labour conditions, probably related to certain migration process (arrival stage) under which immigrants live. In most cases, the arrival stage can be connected to an unstable employment situation, lower economy or uncertain forthcoming situation than in future stages (settlement and stabilization stage). This is reflected in their satisfaction with their residences since 45% of the locals are satisfied and 40% of them very satisfied with their residences compared to 46% of the immigrant population satisfied and only 28% very satisfied (fig. 26).

Local population has greater satisfaction with QoL than the immigrant population does. 84% of the local participants are either satisfied or very satisfied with their QoL, compared to 75% of the immigrant population. Similarly to satisfaction with the residence, the highest difference is to observe when comparing satisfaction at the highest degree, where 44% of the locals are very satisfied compared to 22% of the immigrant group (fig.24).

Personal aspects and other dimensions than the physical or environmental ones influence participants' satisfaction with QoL. QoL is a compound of several dimensions and these findings confirm it, since

under the same physical, urban and environmental dimensions, participants perceive different QoL. This may be due to social, economic, labour or personal aspects that influence individuals and their perception with other dimensions that define QoL.

4.3. Differences between cases: Storhaug and Grünerløkka

Despite facing a non-comparative study, results allow studying the differences between the research areas in terms of perception and satisfaction with QoL. Referring to perceived QoL in Storhaug and Grünerløkka, there are no substantial differences.

Storhaug and Grünerløkka have been selected due to the high percentage of immigrant population as well as their urban, physical and environmental characteristics that position them as interesting case studies separately. Despite similar immigrant percentages, Storhaug and Grünerløkka differ on physical, demographic and environmental characteristics.

41% of the participants in this study located their residences in Storhaug or Grünerløkka due to social or family reasons, an argument not related to physical, environment nor urban dimensions (fig.6, Appendix 6). This aspect enforces the social dimension for both groups when choosing where to locate their residences. However, 22% of the participants in Storhaug chose this neighbourhood due to its location within Stavanger, while 30% of the participants in Grünerløkka chose it due to the distance to education services or work (fig.6, Appendix 6). These reasons refer to the physical and urban dimension but still differ one from another. Storhaug is well connected to the city centre of Stavanger, by walking-distance connection and by public transport. On the other side, Grünerløkka has an excellent location with higher education services. Despite being different reasons, it seems participants have chosen their neighbourhood due to specific characteristics, and not due to the

residence itself. This fact already determines that participants have decided to live in Storhaug or Grünerløkka for a characteristic they considered it was favourable for their living conditions and it is not directly connected to the residence itself, but the neighbourhood.

The housing structure in the research areas is the opposite. Grünerløkka is mostly built up by quarters of apartments while Storhaug presents a wider variety of residences. It can be considered that certain residence typologies are connected to more or less favourable economic and employment status; therefore, it could be understood that in Grünerløkka participants are less satisfied due to a large number of apartments. However, results confirm that in Storhaug 47% of all the respondents are satisfied with their residence, and 40% are very satisfied; in Grünerløkka, 45% of all the respondents are satisfied with their residence, and 31% are very satisfied (fig. 26).

Percentages are similar in both research areas, and this may be due to the interest of the participants according to specific circumstances, i.e., high population percentage in Grünerløkka may live there due to educational services, and possibly temporarily. In this case, apartment typologies are suitable for the requirements of the population who may be under education period and in not so favourable economic situation.

Regarding the public transport system, Grünerløkka offers more modes of public transport than Storhaug. This is visible in the results, since 48% of the participants in Storhaug use public transport, compared to 75% in Grünerløkka (fig.9, Appendix 7). Storhaug only offers bus transport system, compared to bus, tram, tube and el-cycle in Grünerløkka. It can be understood that the more possibilities of public transport an urban area offer, the more advantage residents get from it.

Referring to green spaces, 15% of the area in Storhaug and Grünerløkka is occupied by green areas. Despite similar percentage, Storhaug benefits from higher share of green surface per habitant ($100m^2$/person in Storhaug compared to $42m^2$/person in Grünerløkka). A high percentage

of participants in both neighbourhoods confirm the use of green areas, being the most representative activity for both population groups (fig.4, Appendix 7). Despite the different characteristics of the green areas in Storhaug and Grünerløkka, participants confirm the use and their satisfaction with them.

Having mentioned the differences within the physical and environmental dimensions, Storhaug and Grünerløkka present high levels of satisfaction with the residence as well as satisfaction with QoL (fig.24 and fig.26).

These results confirm the importance of the individual perception on the satisfaction with residential areas. Individuals' perception and satisfaction differ from one to another, and it can indeed differ for the same individual considering different periods. More specifically, for the immigrant group, the stages in which they are (arrival, settlement and stabilization) can influence directly or indirectly their QoL. Their situation, as well as economic, employment or social aspects, can influence how satisfied they feel with their residences or the neighbourhood they live in. Individuals can adapt to the residential characteristics under they live and accept their living situation according to specific times of their lives. Personal circumstances, employment status, economic situation or simple preferences can influence individuals' residential conditions. That may be the reason why, despite living under different residential scenarios (demography, housing layout, greenery, transport infrastructure), participants may coincide on the degree of perceived QoL.

Different aspects that define QoL can affect each individual differently, and therefore, the physical, urban or environmental aspects may not be as representative as social or economic aspects in specific periods. The reason why results are similar despite referring to different urban areas is due to the subjective character and personal perception under each lives.

4.4. Objective Data Vs. Subjective Data

Among other tasks, urban designers, planners and architects produce spaces for the community. It is, therefore, necessary to study how this community understands these spaces and determine whether they fulfil the individual's requirements and needs. This can only be achieved by integrating an objective and subjective study of these spaces.

Subjective data has been gathered by participants' responses. The subjective data has been more challenging to gather, since not every individual is willing to share his/her opinion about housing or neighbourhood conditions, or his/her perceived QoL.

On the contrary, objective data is nowadays easier to collect considering websites or software's capable of registering and updating demographic or physical information. For this study, the objective data has been collected through local or national websites, where demographic and spatial information is available and has been processed with GIS programs. Objective data has been mostly collected by spatial analysis and desktop-research. Existing studies and websites have facilitated objective data of Storhaug and Grünerløkka (Statistikkbanken, 2019a; kommune, 2019).

Carrying out this study without the subjective component would have just produced a spatial and demographic registration of the areas. However, the subjective component provides information about how residents perceive these areas and their satisfaction with them. The combination of objective and subjective data is what contributes to design and plan successfully.

Numerous subjective components define QoL. This study has not covered them all since it addresses the urban, social and environmental dimensions. A literature review about QoL and RC has helped to identify the most relevant indicators to carry out this research. Other objective indicators could have been added to the study, as well as more subjective

aspects could have been addressed, since physical, environmental and psychological dimensions include numerous concepts. However, it is considered that the ones included are the most relevant (according to previous studies) when defining the concept of RC and QoL.

Map-based questionnaires (paper and digital) were created for this study. The paper-based map was more understood by the participants. Probably because they could visualize simultaneously the list of questions as well as the background map. The research area was entirely visible in the A3 paper questionnaire, with sufficient detail, allowing participants to locate their residences and visited areas easily.

However, young participants were more attracted to use the interactive map, probably being nowadays more used to visualize maps on screens than on paper. Other participants were more enthusiastic about having a conversation where the interviewer had to transcribe all the comments and answers given. These two methods have led to conclusions. Digital questionnaires are more convenient for the researcher since the data is directly saved into software and easily imported into GIS programs. However, due to a combination of spatial and personal questions, the paper-based map results easier to be conducted when interviewing the participants.

These conclusions demand, at least for this study, to find a more suitable solution for both participants and researchers where questionnaires can be conducted easily and data can be gathered efficiently.

5 Contribution to knowledge

5.1. Theoretically: Relationship and differences between population groups

The present study demonstrates how RC impact on QoL of the local and immigrant population in the two Norwegian neighbourhoods. Given Norway's position as one of the countries with the best QoL in the world for several consecutive years, studies about this concept are numerous. Among them, a Norwegian study called "*levekårundersøkelse*" gathers information about QoL of the local population and immigrant population. This study is focused on living conditions, where subjective data is not considered and the physical and environmental data are secondary. Demographic, economic, social and labour data are the most representative topics of this study.

This study, therefore, contributes addressing physical, urban and environmental aspects in two Norwegian neighbourhoods, but with implementation, linking the spatial information to objective and subjective information provided by residents of these neighbourhoods (as well as a personal registration of each participant).

Numerous studies address issues related to QoL in Norway (Stamsø, 2009; Blom and Henriksen, 2009; Christensen, 2012; Gudbrandsen, 2010). However, the current study has specifically analysed the impact of urban and environmental aspects on locals and immigrants' QoL, a subject that has not been treated adequately in a smaller setting such as the neighbourhood scale. Numerous studies focus their attention on Norwegian urban issues at a country level (Høyer and Holden, 2001; Hjorthol and Bjørnskau, 2005; Nordvik, 2015; Søholt et al., 2012; Aarland and Nordvik, 2009) or a city level (Thomsen and Eikemo, 2010; Mastekaasa and Moum, 1984; Andersson et al., 2010; Vassenden, 2014). Similarly, studies related to social and migration aspects at a national

level are plentiful (Andersson et al., 2010; Andersen et al., 2013; Filandri and Olagnero, 2014; Nordvik, 2015).

Other studies also refer to Norway and its welfare-state system addressing economic, labour or merely social issues (Blom and Henriksen, 2009; Nyseth and Sognnæs, 2013; Steen, 2010; Hellevik, 2003). This research aims to address the importance of one of the basic human's needs, i.e., housing, as well as its surroundings. A human's residence, the place where it is located and its characteristics can influence the QoL of an individual as much as the economic, labour or social situations do.

Several indicators that certain studies found as representative (Boehm and Schlottmann, 2008; Mulder, 2006; Sarmiento et al., 2010), were found to not be significant in this study, as the type of ownership, occupancy, the transport structure or the physical integration. This study considers the research scale (neighbourhood) and the specific addressed groups (and their individual circumstances) as the reason why these indicators are not significant.

Considering the results of perceived QoL between local and immigrant participants of this study (fig.24), personal circumstances, economic situation, employment status, social aspects or other indicators that define QoL are considered the reason why perceived QoL is different among locals and immigrants living in the same residential conditions.

Early studies (Andersson et al., 2010; Andersen et al., 2013; Nordvik, 2015) suggest that immigrant population may perceive lower levels of QoL due to natural circumstances such as the country of origin, linguistic affinity, educational level, stage in the migration process and administrative or labour status. On the other hand, there are external factors such as social support they receive from local society, integration or social participation as well as identification (sense of place) with the place of residence (Hernández et al., 2007). The process of social integration and its relationship with the well-being of a person is

particularly important for immigrants. Therefore, promoting and favouring the social integration of immigrants is one of the main priorities in the political and social agendas of the European continent. Social integration is a relevant indicator that defines the adaptation of immigrants in the host society. It is crucial to know if there are factors that do not promote or collaborate with this integration process. More specifically if these factors are of urban or environmental character.

Urban conditions in a neighbourhood (level of risk, social problems, availability, accessibility and quality of services and resources) can influence the levels of community support perceived by its residents, so that the greater the deterioration and the worse the quality of the neighbourhood, the residents will perceive lower community support levels and therefore, lower QoL (Llopis and Njå, 2019).

Planners must, therefore, propose urban areas that include access to services focused on the immigrant population, public areas and spaces that contribute to greater interaction between the residents of the area and promote physical-environmental maintenance to contribute to a positive perception of the environment, which encourage residents to socialize and participate in their neighbourhoods. Besides planners' responsibility of approaching a well-designed urban layout that focuses on social integration and participation, the main responsibility rests with the residents themselves, since locals and immigrant are expected to cohabitate and interact avoiding undesirable social segregation.

5.2. Practically: Implications

Having observed the population projection of the cities corresponding to the research areas, as well as the country in general, this study aims to contribute to social and urban aspects that are relevant for today's urban and social growth and development in Norway.

The current study identifies which residential features are more relevant when focusing on individuals' QoL in Norwegian neighbourhoods: *the reason for location, the type of residence and the satisfaction with the residence* when referring to the housing domain. *The accessibility to green areas or services in the neighbourhood* as well as proper *maintenance of the area* are the strongest indicators when referring to neighbourhood conditions. These features are also mentioned in previous studies as favourable for greater levels of QoL (Lee and Guest, 1983; Sirgy and Cornwell, 2002; Kweon et al., 2010).

The most mentioned answer when asking participants about their *reason for location* is social aspects. Planners should contemplate this answer, by considering spaces for socializing, recreational spaces and green areas. There may be differences between the groups when referring to socialize since the local group can understand the activity as something that occurs inside the residences. Immigrants, however, (maybe because their residences are smaller or because of their culture), may be used to socialize in public spaces or green areas. Considering the climate of this country, planners should not only focused on open spaces but providing indoor areas where social gathering can occur.

Existing indoor places created for social events and gathering in Storhaug and Grünerløkka demonstrate the need for individuals for a social gathering in other than outdoor spaces. This can be due to different cultures which may imply different activities and types of socializing, or due to the Norwegian climate that for some individuals can represent a barrier for carrying out activities outdoors.

Referring to *satisfaction with the residence*, interest or circumstances under which participants live are individual and differ from one to another and/or during periods. This interest or circumstances can be connected to the degree of satisfaction with the residence. An individual's situation can progress from an economic, labour or social perspective and therefore be interested in a different residence typology.

A well-designed urban layout should, therefore, offer different residence possibilities according to dimension and prices that are adjusted to the population' needs. Urban planners need to consider these needs and plan in the most suitable direction for society's requirements. Storhaug is under urban development where mostly new blocks of apartments are being built from the last decade. The new residence typologies are being built based on available built-up areas as well as demography needs. Grünerløkka is already built-up by mostly block of apartments. It seems this typology and the type of tenancy results favourable for residents in this area. Planners can focus on information retrieved in this study to adjust new residence typologies considering occupation and type of ownership.

In this study, visiting *green areas* is one of the most representative activity for participants, as well as one of the most influencing on their QoL. Planners must consider green and recreational areas or public spaces as necessary features when planning successful and favourable urban layouts, from physic, environmental and social perspectives. Participants of this study consider the use and their satisfaction with green areas as indicators that influence favourably on their QoL. Practically, planners must consider these spaces are representative for QoL, including them when aiming for well-designed urban spaces, like neighbourhoods.

The maintenance of Storhaug and Grünerløkka seems to be relevant for their residents. Participants perceive greater QoL if they consider that they live in a neighbourhood with proper public order, quality spaces and respect for the physical and social aspects. From community level to local government, these aspects need to be considered, i.e., starting for a community interaction among the neighbours, to the local government guaranteeing the maintenance of the public and spatial order as well as political and adequate legislation (i.e., rehabilitation of public space, control over some activities, housing policies or rational distribution of specific services).

To contribute to maintain or achieve greater satisfaction with QoL, the community level, i.e., residents, local government and planners need to communicate. A well-designed neighbourhood requires attention of several dimensions and several actors. This study could contribute on enhancing the QoL of Norwegian neighbourhoods and its residents by providing the collected information about the most relevant RC for participants and how these participants conceive their QoL from urban, social and environmental perspectives.

The implications for planning practice based on the findings are:

- Promote multi-ethnical neighbourhoods. Design spaces for socializing, public outdoor/indoor areas for recreation. Understand the residents' behaviour and needs to provide a diversity of spaces. The importance and presence of these spaces predict stronger neighbourhoods' social ties.
- Include diverse residential typologies in residential settings. Interest and circumstances of the individuals can result in different residence typologies and types of ownership according to personal aspects or interests.
- Design mixed-land use communities, considered more liveable neighbourhoods where residents are more satisfied and feel more attracted to their community. Multi-cultural spaces that offer a wide range of activities and services within these spatial settings.
- Preserve the local scale when establishing services and public spaces. Walkability also strengths the sense of community and facilitates social interactions.
- Secure physical maintenance of the residential areas, proper public order and quality of spaces.
- Involve the different actors that must contribute to achieving quality spaces and quality lives at a local scale: the residents, the local authorities and the planners.

5.3. Methodologically

The map-based questionnaire is the method used in this study for registering participants' perception and satisfaction linked to spatial information. This method, while not new, is used to geo-reference subjective information and process and export this information into GIS programs.

One of the favourable outcomes of the map-based method is the positive impact that the use of the map background has on encouraging discussion and dialogue between the participant and the interviewer. Presenting the participants a map where they can locate their residences and identify the areas they normally visit, may contribute to starting a discussion about areas they feel familiar with.

The map-based questionnaires designed for this study follow a structure that starts registering the participants, followed by the housing circumstances and neighbourhood conditions and finishes with QoL questions. This helps both the participants and the interviewer to understand the direction of the interview. Not all the participants are equally vocal and able to carry a discussion. However, this method has allowed registering information graphically or writing for those participants who are willing to share their opinion but not in a conversation.

The subjective mapping method is used in a wide range of disciplines by connecting individuals to spatial referents. The current study enhances the importance of the subjective component through this methodological approach when studying participants' QoL from an urban, social and environmental perspective at a neighbourhood scale.

This study contributes to existing methodologies by combining a set of subjective and objective components linked to spatial features, where residents of small settings (neighbourhood scale) share their perception and satisfaction with urban and environmental elements. Existing urban

studies involve spatial analysis and registration from an objective perspective, where several of them ignore the relevance of the subjective component (individuals' use, perception and satisfaction) that provides the key outcome towards future designs, social and urban developments.

5.4. Future considerations

Having concluded the research, several future considerations are worth of contemplation to improve and enrich possible replications of the research.

- Including the social dimension

This study has collected social data, i.e., the reason for migration, satisfaction with the social environment, social integration and personal safety, which could be further studied based on existing data. The social dimension has been studied and related to physical and environmental aspects treated in this research (i.e., the reason for location of the residence or the use of green spaces depending on the personal safety) (Llopis and Njå, 2019). Including the social dimension in the current study can help to understand some differences in the results, especially when comparing the population groups. The social dimension is also part of the definition of QoL. The more dimensions included when approaching QoL, the more complete and reliable results can be obtained.

- Possible confounders

Including other indicators in the research that are related to the socio-cultural and socio-economic status of the participants. This would enrich the discussion between objective and subjective components affecting participants' QoL.

Extending the list of indicators will allow a deeper reflection on how influential the personal situation of an individual is when assessing

his/her QoL. In the current study, the degree of satisfaction between population groups is similar despite their RC. Other indicators not related to the urban and environmental environment could help to identify which indicators are relevant for participants to declare similar values.

- Improvements in the methodology approach

Another consideration is re-structuring the digital map-based questionnaire and create it the most similar possible to the paper map-based. The aim is to display the map background section simultaneously with the questions for the participants. Similarly, predetermine the content of existing maps, since it is likely that these maps may not include in detail all the places that the participants would like to discuss.

Including behavioural mapping as part of the methodology, to enrich the data and study how the different nationalities experience the use of public spaces and neighbourhood services. Including the behavioural mapping would also allow gathering more information regarding participants' behaviour as the time they spend in certain areas, which activities they perform or how do they interact with other residents. The value of data would increase and help for future implications (*section 5.2*).

Another consideration is recording the discussion, if occurring, between participant and interviewer. Part of the information may not be registered if participants are commenting while answering graphically. Therefore, recording the discussion would help to register every possible input from participants.

- Participatory inclusion

Participant distribution is not equal in this study since 60% are Norwegians and 40%, immigrants. Future considerations are obtaining equal participation of the two groups, where social events or gathering people for community P-GIS would help. Focus groups can help to

ensure that immigrant population feel comfortable sharing their thoughts and perceptions to the interviewer even though these are negative or less favourable when compared to the local group.

Another consideration is studying possible particular groups of the population, i.e., based on their nationality, the reason for migration, economic status, in the research areas. These groups may be representative, in terms of share of population, and therefore essential in the study. Specific questionnaires could be defined for each case, modifying certain questions according to the participant and the group that belongs to.

- Replicability and standardization of the approach

Because this study is limited to two specific Norwegian neighbourhoods, the sample is not highly representative of the entire immigrant population residing in Norway and consequently not generalizable. Future research should replicate the present study in other Norwegian neighbourhoods and thus be able to contrast, confirm, refute or complement results and gather more information about RC at the neighbourhood level in Norway.

The above-mentioned considerations should be included if conducting similar research, to produce more holistic and reliable results.

6 Conclusion

This study approaches the importance of RC for individuals' QoL. It takes place in Storhaug and Grünerløkka due to their demographic and urban interest. Cities are constantly changing and their demography and urban layout change along with them. We are facing an era where changes are protagonists in everyday life. Norway is a country that is under constant development, and more specifically, with unstoppable population expansion. This population expansion and the urban development interact and impact one on the other.

This study has investigated how physical, environmental and urban aspects affect the QoL of 238 participants residing in two Norwegian neighbourhoods. Due to the high percentage of immigration in Norway, as well as its projections, the local and the immigrant population have been the focus of the study.

This study approaches a three-way relationship between *Residential Conditions*, *Quality of Life* and *immigration*. The study identifies the impact of certain RC on participants QoL. A literature study has helped to identify which indicators are representative when defining RC. RC are considered a significant indicator of QoL and well-being. Due to the Norwegian migrant situation, the interest has also focused on the differences between locals and immigrants when perceiving QoL.

Objective and subjective information has been gathered to obtain a complete framework of the RC in Storhaug and Grünerløkka, together with participant's satisfaction with certain dimensions, i.e., physical, environmental, mobility, social and psychological. A compound of methodologies is used in this study, where the most substantial contribution is linking subjective information to spatial representation into GIS. Besides, map-based questionnaires (paper and digital version) have been created for this study. The scale of this study, the neighbourhood scale, has facilitated the collection of data of residents

living in the study areas as well as a spatial registration within certain limits.

This research determines that certain housing circumstances and neighbourhood conditions impact on perceived QoL. It identifies that the immigrant population lives under worse residential conditions than Norwegians do, despite living in the same neighbourhood, i.e., they are less satisfied with their residences, their neighbourhood conditions and their QoL in general. However, when comparing results in Storhaug and Grünerløkka, results show that the perceived QoL among the participants is similar in both research areas, despite their different demographic, physical and environmental characteristics. Personal circumstances, economic situation, employment status, social aspects or other indicators that define QoL are considered in this study the reason why perceived QoL is different among population groups, or similar when comparing the research areas. The Norwegian welfare, jobs and earnings, the work and life balance, labour security and other indicators that position Norway on the top of well-fare indexes, can also influence participants.

Some of the RC indicators included in this study are not representative of participants' satisfaction with QoL, i.e., the type of ownership, occupancy, the transport structure or the physical integration. This study considers the research scale (neighbourhood) and the specific addressed groups (referring to the personal circumstances of the immigrant group and migration circumstances and stages) as the reason why these indicators are not significant for the perceived QoL.

Results of this study, as well as theoretical and practical implications, are provided to collaborate with Norwegian policies, improve future actions of urban and social nature, for achieving greater levels of life satisfaction between the immigrant and the local population, as well as optimal urban and physical conditions that contribute to the Norwegian well-fare system from which this country is already known.

7 Publications of the thesis

Paper 1: Residential Conditions for Immigrant Population. This paper was submitted to International Journal of Sustainable Development and Planning, Witpress. Published October 2017.

First author: Ana Llopis Alvarez
Second author: Daniela Müller-Eie

This paper approaches, based on literature review, the relationship between two of the main concepts of this study: residential conditions and immigrant population. The arrival of large immigrant populations affects the social as well as the urban structure of the host cities. Immigrants with a similar ethnic and social background often occupy segregated areas in host cities, where residential conditions are systematically different from other areas. Residential conditions consist of citywide aspects (spatial distribution, transportation network), neighbourhood facilities (public space, amenities) housing standards (size, occupation, facilities). Based on a literature survey, these concepts are defined through parameters. Specific demographic profiles of immigrants can be identified (country of origin, age, sex, employment status, economic status, religion, economic situation or length of stay in the host area) to explore specific residential conditions in the Case Study cities). The paper develops a model for relationships between urban areas, immigrant population and residential conditions as a starting point for further empirical investigation and theoretical exploration. The purpose of the model is to identify the residential conditions of a specific population group based on their physical environment, as well as significant differences in their living conditions. The model considers the level of spatial integration or segregation of particular interest. Some of these parameters are illustrated by examples from Oslo and Stavanger.

Keywords: immigration, residential conditions, neighbourhood quality, housing quality, integration, segregation.

Paper 2: Quality of Urban Life and Its Relationship to Spatial Conditions. Conference paper submitted to Ecology and the Environment 2017, Witpress. Published August 2017.

First author: Ana Llopis Alvarez
Second author: Daniela Müller-Eie

Based on the literature review, this paper presents the relationship between the concept of Quality of Life and residential conditions. The concept of quality of life within sociology, psychology, human geography, as well as the environmental design fields, makes consider some factors particularly relevant to environmental designers and urban planners. In environmental design and urban planning, a fundamental assumption is that places have environmental attributes that can be designed to enhance the quality of individual lives. This study explores definitions of quality of life, sustainable urban development and urban planning, to define the concept of quality of urban life more precisely. Quality of life and quality of urban life are presented in a comparative model where five dimensions are explained in detail (physical, environmental and mobility, social, economic and political, psychological). An indicator set is developed, combining objective indicators of the urban environment with subjective evaluations of individual behaviours and perceptions. This paper presents a holistic conceptual framework for quality of urban life, exposing its dimensions and corresponding indicators. The commonly used dimensions (physical, environmental and mobility, social, economic and political, psychological) reveal that some of them are dependent on each other. However, it confirms that the quality of urban life encompasses all dynamics and interrelations that exist among the different dimensions. The study concludes with an evaluation model that serves as a basis for further investigation of the relationships between the urban environment and the quality of urban life.

Keywords: quality of life, quality of urban life, spatial conditions, indicator development.

Paper 3: Mapping local perceptions with geographic information. This paper was submitted to Journal of Urban Technology in July 2019. The paper is under revision.

First author: Ana Llopis Alvarez
Second author: Daniela Müller-Eie

This paper approaches the subjective mapping with geographic information method, considered representative in this research. Subjective mapping involves obtaining an individuals' description of the spatial, physical, social and psychological characteristics of a relevant spatial unit, such as a neighbourhood. This paper highlights an emerging appreciation of this subjective component, particularly in spatial and socio-cultural urban analyses. Participatory geographic information systems (P-GIS) are designed for community mapping exercises to produce spatial representations of local knowledge. This paper reports on experiences from subjective mapping in three Norwegian neighbourhoods, where participants mapped their residential conditions and the quality of urban space. The collection of information in the three different neighbourhoods has helped to assess how useful this method is. This paper explores options for subjective mapping of local perceptions as a supplementary tool in spatial socio-cultural urban analyses. It also explains that the method is both relevant and reliable in terms of generating interesting local knowledge. While the digital data collection holds some strong advantages, it may be advisable to also include analogue data collection to avoid the exclusion based on digital literacy. It also seems that the method can encourage a greater level of engagement and participation among residents.

Keywords: mapping methods, participatory GIS, subjective maps, public participation, spatial analysis.

Paper 4: An Approach to Subjective Mapping: Using Maps to Investigate Local User Perceptions Of Urban Quality In Hillevåg, Norway. This paper was submitted to Journal of Urban Design February 2019. The paper was revised and resubmitted. The paper was accepted July 2019 and published September 2019.

First author: Daniela Müller-Eie
Second author: Ana Llopis Alvarez

This paper is based on a study carried out in collaboration with IRIS (*International Research Institute of Stavanger*), with a similar purpose as the current study but reduced research area as well as the number of participants. This study encompassed semi-structured interviews conducted with the help of A3 paper maps, specifically designed for this study. These maps helped to create the map-based questionnaires for this PhD dissertation based on the feedback and the experience from.
This paper discusses the theoretical and methodological aspects of using subjective maps to collect user input and its value for further development. Map-based semi-structured interviews with local users were conducted in a mixed-use neighbourhood in Stavanger, Norway. The maps geo-reference points of strength, weakness, paths, barriers and representative space. Spatial analyses map physical, geographic, demographic and functional characteristics of a place, while socio-cultural analyses investigate local social constructs. While the first might lack information on social, cultural and personal perceptions, the latter rarely relates needs or perceptions to the physical environment. The results were coherent with findings from other methods.

Paper 5: Approaching Societal Safety from the Urban Perspective. Conference paper submitted to ESREL. Accepted May 2019.

First author: Ana Llopis Alvarez
Second author: Ove Njå

This paper is a contribution to assess the spatial conditions related to the safety concept, where indicators that define the social dimension are interrelated, i.e., social integration, satisfaction with the social environment, personal safety and reason for location of residences, as well as connected to the concept of Quality of Life. Safety is seen as a key element for the use of public space, as well as a relevant indicator for people's quality of life. The various forms of interactions can lead to relevant repercussions on the feeling of safety experienced in certain spaces, which in turn will influence their use, generating a spiral restricting the use of some spaces or stimulating the frequentation of others. This paper does not encourage comprehensive surveillance of people, but rather address levels of societal safety knowledge needed amongst urban planners. This paper includes developing constraints by using system safety theory that will form the framework for social and urban practice and performance seen from the urban planning perspective.
The Case Study of this paper is Storhaug, one of the two neighbourhoods considered as Case Study in this PhD dissertation. Locals and immigrants participants are interviewed in Storhaug (same participants than in the PhD dissertation). Findings show that locals report higher levels of satisfaction with their personal safety, the social environment in Storhaug as well as reporting to feel more socially integrated than the immigrant group.

Keywords: societal safety, system theory, community behaviour, citizen coexistence, quality to urban life, spatial conditions, collective effectiveness, migration process.

Paper 6: Housing circumstances and quality of life among local and immigrant population in Norway. This paper was submitted to Journal of Housing and Built Environment in January 2020. Under revision.

First author: Ana Llopis Alvarez
Second author: Daniela Müller-Eie

This paper explores the relationship between the concept of quality of life (QoL) and housing circumstances among immigrant and local population of two neighbourhoods in Norway: Storhaug in Stavanger and Grünerløkka in Oslo. Objective data regarding housing circumstances, e.g., type of residence, dimension or occupation, is collected through spatial analysis and desktop-research. Inhabitants of these neighbourhoods are interviewed with the help of map-based questionnaires to collect both objective data regarding these housing circumstances as well as subjective data, e.g. reason for location and personal satisfaction with housing and QoL. The objective and subjective data is analysed geographically and statistically. This study finds that the immigrant group has less favourable housing circumstances than the local population. Circumstances such as type of residence, reason for location and satisfaction with the residence are predictors for satisfaction with QoL between both groups. Being local or immigrant, as well as the study area, Storhaug and Grünerløkka, or the type of ownership were not significant predictors of satisfaction with QoL in this specific study. These findings provide a base for understanding the importance of housing circumstances for QoL. Due to the high percentage of immigrant population and its projection in Norway, these investigations are expected to help practitioners identify housing features and design aspects that can impact on the overall satisfaction with QoL of both host and immigrant society.

Keywords: housing circumstances, quality of life, subjective mapping, spatial analysis, migration.

Paper 7: Neighbourhood conditions and quality of life among local and immigrant population in Norway. This paper was submitted to Journal of Urban Studies in March 2020. Under revision.

First author: Ana Llopis Alvarez
Second author: Daniela Müller-Eie

This paper explores the relationship between the Quality of Life and neighbourhood conditions between locals and immigrants in Storhaug and Grünerløkka. The neighbourhood conditions have been analysed and inhabitants have been interviewed to collect objective and subjective data. Several dimensions have been considered, e.g., physical, environmental, mobility and psychological, with different indicators defining them. Objective data related to the physical layout, green spaces, transport system or environmental aspects are studied and complemented with the subjective information such as the satisfaction of the participants with these aspects. The data collection thus includes geographic, personal and qualitative data, and is analysed with the help of geographic and statistical analysis. Differences between the population groups and between the case study neighbourhoods are determined, being possible to conclude that specific neighbourhood conditions influence participants' quality of life in these Norwegian minor settings. The local participants in this study are the ones taking more advantage of the physical, environmental and mobility dimensions at their residential area and reporting higher perceived quality of life. The results presented can provide relevant information for the effective and efficient planning and development of residential environments.

Keywords: quality of life, subjective mapping, neighbourhood conditions, spatial analysis, migration.

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Appendices

Appendix 1 – Residential Conditions for Immigrant Population.

RESIDENTIAL CONDITIONS FOR IMMIGRANT POPULATION

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ABSTRACT

The arrival of large immigrant populations affects the social as well as the urban structure of the host cities. Immigrants with similar ethnic and social background often occupy segregated areas in host cities, where residential conditions are systematically different from other areas. Residential conditions consist of citywide aspects (spatial distribution, transportation network), neighbourhood facilities (public space, amenities) housing standards (size, occupation, facilities). Based on a literature survey, these concepts are defined through parameters. Specific demographic profiles of immigrants can be identified (country of origin, age, sex, employment status, economic status, religion, economic situation or length of stay in the host area) in order to explore specific residential conditions in the Case Study cities). The paper presents a model of relationship between immigrant population and residential conditions on the different levels. Here, the level of spatial integration or segregation is of particular interest. Some of these parameters are illustrated by examples from Oslo and Stavanger.
Keywords: immigration, residential conditions, neighbourhood quality, housing quality, integration, segregation.

1 INTRODUCTION

Migration has long been an important topic in European countries. In Norway, particularly work immigration has played an important role. There seems to be a reciprocal relationship between immigration, spatial structures and residential conditions in the host city and spatial segregation/integration.

This paper therefore explores the mechanisms of immigration as well as residential conditions that meet immigrants in the host cities. These concepts are operationalised, together with their indicators and parameters, based on a literature survey.

The mutual impact that these concepts have on each other is also described. It is further of interest if there are certain spatial or social conditions that can contribute to a better spatial integration of immigration population into the host city. The purpose of this paper is therefore to get a better understanding of immigration settlement in specific areas.

2 IMMIGRATION

Immigration is defined as an action by which a person establishes his or her usual residence in a country for a period that is at least 12 months, having previously been usually resident in another country [1]. Immigration has become one of the key components of population change. Migration flows have over the past decades had a significant impact on the current population size in most EU member states. The migration network, i.e. the interaction that connects the migrant and their country of origin with the country of destination, is influenced by a combination of economic, political and social factors; either in the migrant's country of origin (push factors) or in the country of destination (pull factors)'Fig.1'[1].

In order to understand how an immigrant population is inserted in the host city we need knowledge about migratory phenomena. Migration can be viewed from a macro and micro perspective [2]. In the macro perspective, the immigrant is considered as a passive individual who responds to the structural forces that determine his mobility; in the micro perspective, the individual characteristics of the immigrant are emphasised, considering them as

influential factors for the decision and in the way in which the individual interacts and adapts to the new environment. This research therefore focuses on the latter perspective, as personal characteristics and attitudes towards the host country are most relevant.

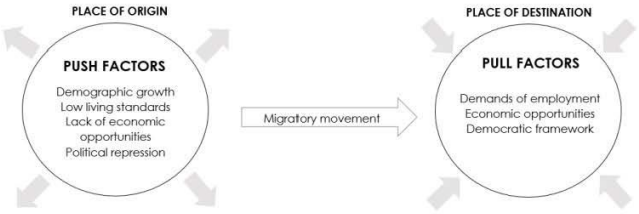

Figure 1: Push and pull factors for migration

The macro perspective has been dominant historically, representing two paradigms. First, the theory of modernization where migration is conceived as a process of improvement/progress, where the individual moves from a poor country or region to a richer one, driven both by the factors of expulsion (push) and the factors of attraction (pull). Secondly, the theory of dependence conceives migration as a macro process between countries, where migration is not an improvement process but a mechanism of extraction of surplus and income from the dependent and underdeveloped countries to the developed ones. [3].

Migration may be a consequence of demographic change, but it is also, in itself, a demographic change. Migrations constitute one of the three components of demographic change, besides birth and mortality [4]. It also interacts bidirectionally with the other two, especially with birth, meaning that immigration is both cause and consequence of population growth, birth rate and age structure. Consequence because it may be induced by the slow growth of the population, by the low fertility and by an aging age structure; and cause because it contributes to population growth through a likely increase in aggregate fertility and mitigation of an aging population.

Furthermore, immigration produces economic and social effects by itself, different from those resulting from the other components of demographic change. In fact, the social and economic impacts of immigration often matter more than demographic. Therefore, the sustained arrival of immigrants and their setting-up in new societies can assume a social and economic transformation in the future.

2.1 Immigrants and the city

The arrival of immigrants in European cities is transforming their structure, leading to irreversible changes of territorial and social concentrations of ethnic diversification, changing social and cultural composition and generating new social needs, with the consequent problems of coexistence and urban segregation [5]. Cities attract due to economic opportunities, cultural, social, sports offers; they are places of relationships, contacts, creativity and innovation. Historically, large urban centres have always been areas of greater freedom, refuge for the poor and minorities. This has encouraged many people to emigrate, not to specific countries, but to cities [6].

Sassen and Portes [7] identify global cities as those that have become central nodes for the coordination and administration of the world capitalist economy (e.g. New York, London

and Tokyo). They extend their analysis to smaller cities, which perform similar functions of order and control on a regional scale. These are considered "global cities of second rank", entities defined by capital flows, information and technology that play an important role in supranational spaces. Cities that have moved in this direction are characterised by a new cosmopolitan atmosphere and by an abundant presence of immigrant population.

2.2 Location choices among immigrant population

Immigrants have historically played an important role in demographic and economic development, particularly in cities. It is therefore important to study the factors that explain initial and subsequent location choices among immigrants.

Location preferences can be based on pull factors of the area of destination. Immigrants are attracted to regions with labour market opportunities, existing immigrant populations, housing market possibilities, as well as welfare benefits. However, these preferences may be of personal nature (education, family ties, predilection) and differ between initial and subsequent stages.

2.2.1 Labour Market

Labour market conditions, such as average wages and the level of unemployment, affect where immigrants settle [8]. Opportunities to find a job and have sufficient wages are decisive in the decision to migrate, as well as the need to guarantee economic self-sufficiency (i.e. covering the economic needs of oneself and the dependent family). In addition, access to the jobs for which immigrants are qualified or have experience in is another factor when joining the labour market in the host country. Another factor is the length of contract, being permanent or temporary. This is affected by the legal status of the immigrant, the duration of the immigrants work permit or the degree of instability of the labour sector. The majority of the immigrant population aims to integrate into the labour market to improve their economic quality of life and is therefore likely to settle in areas where a prompt and stable insertion into the labour market is possible [9].

2.2.2 Existing immigrant population

The number of immigrants in a given area has an attraction effect itself [10], so the higher the number of existing immigrants, the greater is the areas power of attraction. The tendency for immigrants to settle in neighbourhoods where other immigrants are present, regardless of the country of origin, appears to be important as first initial location choice of urban area. Due to this self-enforcing process, metropolitan areas may tend to receive more immigrants in the future[11].

2.2.3 Housing market

Other structural factors inhibit the residential insertion of immigrants, for instance the local housing market. Here, discrimination can produce an imbalance in housing tenure favouring owner occupation and residual social housing [12]. In contrast, the informal housing markets have been working as an attraction factor for migration streams, influencing location choices. Informal housing market often translated into insecure tenancies, poor housing quality, speculation and exploitation of the markets, structuring housing (sub) markets or 'unregulated' policies.

The type of the housing from the immigrant population is characterised by its size and diversity, due to the extensive family network and habitability strategies linked to the first stage of arrival of the migration process.

In a certain urban structure, the access to the house market acts as a determinant filter in the distribution of the immigrant population, meaning a spatial exclusion that directly affects the economic structure of the correspondent area.

Housing market is related to immigrant population by conditioning their location and as an indicator of the living conditions and social position of immigrants. It is therefore fundamental for the spatial and social integration process.

2.2.4 Urban Cores

Many European cities have thus become gateways for immigrants. The spatial pattern of immigration has always been characterised by a high concentration of immigrants in the central city cores of the metropolises [13].

However, this spatial pattern has recently started to change, and immigrant flows are now characterised by decentralisation. On one hand, the reason for this is that the gateways have been saturated and so the geographical concentration has ended. On the other hand, the decentralisation is related to migration settlement in working class areas on the periphery [14].

The above described mechanism of immigration can be used to identify specific immigrant groups to explore their relationship with the studied host cities, in particularly their residential conditions.

3 RESIDENTIAL CONDITIONS

In order to understand better what this encompasses, the concept of residential conditions must be explored. Residential conditions entail different scales, from the dwelling itself to the neighborhood or city in which it is located. Parameters such as availability of services and facilities in an area, habitability or required living space, accessibility and spatial distribution in the city define the concept of residential conditions.

Depending on the location of the dwelling, i.e. the spatial distribution of immigrant groups in the city leads to spatial integration or segregation. The level of integration (or lack thereof, i.e. segregation) has consequences for residential conditions.

Residential conditions are considered adequate when the dwelling is located in an urban area that allows access to employment, public urban areas and facilities, access to public transportation as well as public health and educational services, meaning that it is comparable with that of other residents in the city. Regarding housing quality, a dwelling needs to be functional, secure, habitable and accessible. The main question here is, whether specific groups of immigrants are more likely to suffer from negative residential conditions than others.

3.1 Spatial segregation and integration

The study of the spatial distribution of immigrant population in urban areas has always focused on the concept of residential segregation. The notion of segregation involves the unequal distribution of different population groups in the urban space and has a strong correlation with social differentiation [15].

White [16] identifies two types of segregation. First, the geographic, which exists when some areas show an overrepresentation and other areas an under-representation of a particular population group; second, the sociological, which occurs when there is no interaction between social groups. Spatial segregation suggests social differences, e.g. the dwellings, their characteristics or their location reflect the social hierarchy of a city. Social inequality

and unequal value of space constitute the foundations of segregation in cities. It is possible that there is sociological segregation without geographic segregation.

3.1.1 Factors of residential segregation

One of the fundamental issues with segregation is the identification of factors and characteristics. Urban structure, migration, local welfare state and the general characteristics of the local society tend to influence segregation. White [16] points out three factors inductive to this process.

First, the socio-economic factor. People with similar socio-economic conditions (e.g. low-income) cluster together. This socio-economic segregation of the population is reflected in residential segregation.

For the second, the demographic factor, Bayona and López [17] point out that the degree of residential mobility and the housing structure influence the residential differentiation among immigrants. Different migratory stages can relate to different types of housing. Thus, the evolution of the housing structure linked to residential mobility, generates different forms of settlement and segregation in a city at different stages of the migratory process.

The third factor is the ethnic factor, relating to social differences based on ethnicity. This factor affects specially collectives that differ from the host society in linguistic, religious and cultural terms and tend to reside in concentrated neighborhoods 'Fig.2'.The degree of residential segregation is also conditioned by other factors. For instance, the urban structure: Cities are defined by their structural heterogeneity and diversity. [18]. Thus, urban morphology, residential hierarchy and housing market, are the conditioning factors for the distribution of the immigrants [16].

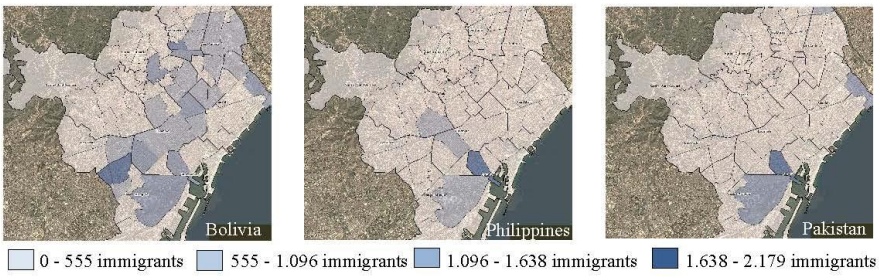

Figure 2: Distribution of immigrants after nationality, by districts, Barcelona Metropolitan Area, 2013. *(Fundació ACSAR)*

Also, the characteristics of migratory flows, meaning the intensity or type of immigration (for example migratory waves, whether legal or not): The relationship between the migratory phenomenon and the city begins with the absorption by a specific urban context of a migratory flow. The characteristics of this specific flow will influence the capacity and form in which the city will absorb the new population. The degree of intensity of the migratory flows, and the fact that they are irregular, determine the city's capacity to absorb such flows and, therefore, the degree of segregation.

Finally, the stages of migratory flows: The immigrant population's settlement in the city has to be understood as a dynamic process involving different stages; the arrival, settlement and stabilization stage. With the improvement of the economic and legal status, residential conditions and relationship with the host society will vary accordingly.

3.2 Connectivity and public facilities

The characteristics of the neighborhood are defined by several aspects, as the connectivity to the rest of the city through private or public transport, access to public spaces and services (meeting places, health facilities, daycare, schools) and daily amenities (grocery shops, pharmacy) . Access to basic facilities, such as public transportation, grocery stores and health care services within the neighborhood refers to the ability of households to cover basic needs.

An efficient public transport connection to the rest of the city is relevant for work travel, but also closely linked to the concepts of spatial integration and segregation. A good transportation system contributes to a good access to the different services and facilities that the whole city offers. Similarly, the existence of public space and green areas located in the neighborhood, allow the immigrant to socialize and integrate with other neighborhood residents. Mixed-use neighborhoods are generally strong in providing for these daily needs within a short distance of the home.

The ratio of immigrants to local population is related to the status of a neighbourhood in terms of its integration, accessibility, quality of public facilities as well as in terms of social status (security, crime, employment, income) 'Fig.3'. A common feature in European cities is that the concentration of immigrant households occurs in inverse correlation with the status of the neighbourhood, with the consequent problems of ethnic segregation in the degraded or marginal areas of the city; i.e. the lower status, the greater concentration of immigrant population [19].

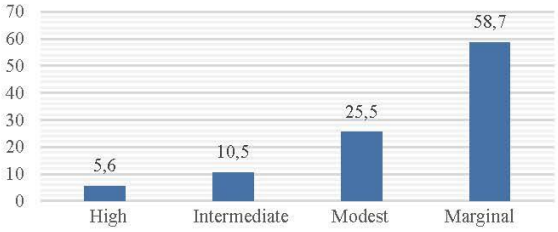

Figure 3: Density of immigrants between neighbours, according to the social level of the neighborhood. *(Colectivo IOÉ,2014)*

Other aspects of neighborhood quality are more subjective to conceptions in the population, due to different sensitivities or expectations. The most frequent complaints for both local and immigrant populations, are the lack of cleanliness in the streets, noise, vandalism, delinquency, environmental pollution and problems of connectivity and transportation to the rest of the city [20].

3.3 Housing

People's ability to afford adequate housing in a safe environment is a matter of importance for meeting basic needs. Housing quality covers a wide range of aspects: structural problems of the dwelling, overcrowding and space shortage, housing deficiencies and lack of basic amenities are key elements for assessing housing quality [21].

The rise of housing prices from the late 1990s have generated problems of polarization and segregation in the access and quality of housing for immigrants, especially for those who

are in the period of settlement and do not have consolidated family networks. Housing conditions are also a barrier for achieving a higher standard of living. The type of housing, the tenure regime, household services, economic household situation and -neighbourhood factors, define these opportunities [19].

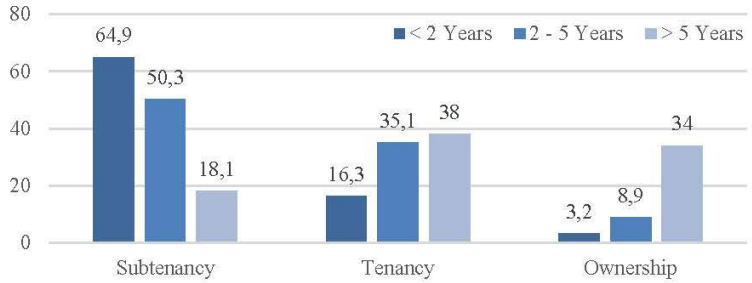

Figure 4: Housing tenure regimen for immigrant population in Spain according to length of stay, 2005.*(Colectivo IOÉ, 2014)*

Home ownership is a considerable asset for households since the property right increases the wealth of the household.In 2015 in the EU-28, 70.5 % of nationals from 20 to 64 years of age lived in owner-occupied dwellings, compared with 32.1 % of all foreign citizens of the same age group [22]. There are several reasons for differences between immigrants and locals in terms of the housing tenure. First, rental housing may be the most suitable option for arriving foreigners; however, as their stay is consolidated and the immigrant integrates in the host city, ownership can be considered 'Fig.4'.

Another element is the availability of sufficient space in the dwelling. An indicator that describes this problems is the overcrowding rate, defined by the number of rooms available to the household, the household size, its members' age and family situation [21].

Several indicators help to evaluate the quality housing conditions. However, subjective assessments on the degree of satisfaction with the dwelling are used as a measure in order to complement this evaluation. Those subjective satisfaction assessments encompass a number of factors, such as the price, space, distance from home to work and the overall quality of the dwelling.

The above presented parameters for residential conditions can be translated into quantitative and qualitative indicators, such as type of housing, tenure, occupation. This allows specific conditions to be evaluated and compared.

4 MODEL OF RELATIONSHIP

Based on the presented information, a model of interaction between the city, the immigrant population and residential conditions is developed 'Fig.5'. This model relates the three concepts based on specific parameters. Cities that are characterised by a high percentage of immigrant population are the main target of investigation. Here, the residential conditions of a certain immigrant group can be mapped and investigated. The interaction between the immigrant group with the city is reciprocal and highly defines how the immigrants are spatially integrated. At the same time, the residential conditions of immigrants also transform the city.

Any investigation of these relationships is specific to a certain period in time, in which the city is under certain social, geographical, political and economic conditions. This may vary throughout the research process, and may be specific to the city of interest.

Cities or urban areas characterized by a high presence of immigrant population are the subject of the study. Certain parameters, like the economic status, length of stay and religion, can define the group of immigrants that is investigated. Once this group is identified, the interaction between this immigrant group and the urban context can be studied, as well as the possible transformation of the host city structure due to this specific groups' settlement.

The other concept in the model is residential conditions, linked to the specific group of immigrants that is selected. Indicators at different levels, i.e. citywide, neighborhood and dwelling, define these residential conditions. These conditions can also have a transformative effect on the urban structure, but it is reciprocal. Social, political, geographic or economic changes in the city can imply transformations in the residential conditions.

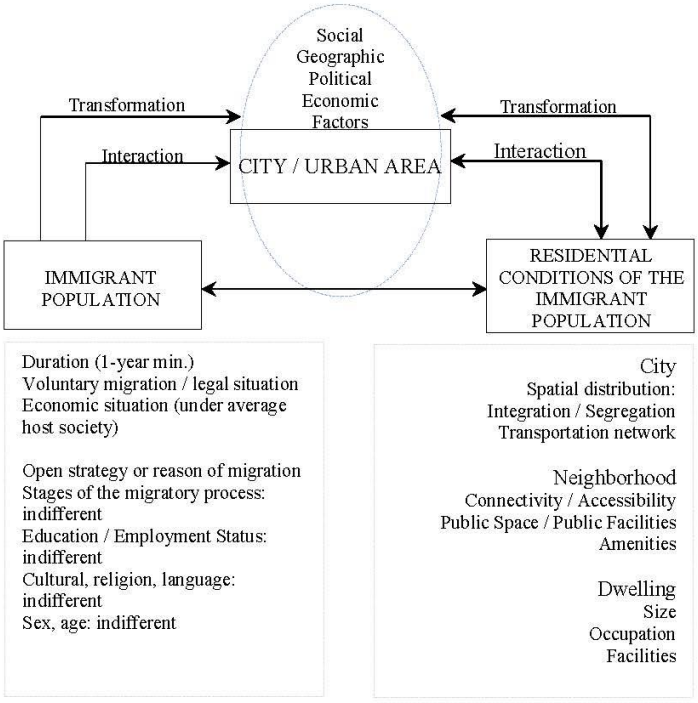

Figure 5: Relationship between the city, the immigrant population and residential conditions.

The purpose of this theoretical model is to serve as a basis for empirical investigation of immigrant settlements in specific urban areas, as well as their residential conditions. After establishing the level of spatial integration/segregation, the focus is whether certain immigrant groups live under systematically worse conditions than other immigrant group or than local residents. An additional qualitative investigation into their perception of residential conditions can help to understand the level of their well-being.

5 IMMIGRANT POPULATION IN OSLO AND STAVANGER, NORWAY

Norway, being a large country sparsely populated has always been depending on immigration. While birth rates are relatively high (1.73% in 2014) it is difficult to serve the blue-collar section of the labour market through locals. Additionally, the oil industry in western Norway has contributed to work immigration in the white-collar labour marked [1]. Today 13.4% of people living in Norway are immigrants. As Table 1 shows, both Oslo and Stavanger have a high percentage of immigrant population and its corresponding projections. While both Oslo and Stavanger have large immigrant populations, they also differ. Oslo, the capital, attracts larger numbers and more diverse immigrants; while Stavanger, the oil capital, attracts particular work immigrants for the petrol industry and related industries.

Table 1: Population data, Stavanger and Oslo. *(KommuneProfilen.no, 2017)*

	Total Population	Immigrant Population	Immigrant Population (%)	Total pop. expectations (2030)	Immigrant total pop. expectations (2030)	Immigrant % Pop. Expectations (2030)
Stavanger	132 644	29 307	22.1%	141 634	46 511	32.8%
Oslo	658 390	214 213	32.5%	788 928	305 731	38.7%

A large part of the immigrant population has migrated to Stavanger for work reasons (31.1%) or for family/personal reasons (24.5%). The rest are refugees (20.6%) or immigrants due to education or similar reasons (6.3%) [23]. In 2016, the amount of immigrant population with European background in Stavanger was 51%, while 29 % had an Asian background. In Oslo, the highest percentage was Asian (40%), followed by European (38%) and African (17%). This might be due to a higher level of work immigration in Stavanger, for instance for construction sector.

Among the immigrant population in both cities, there are certain nationalities that dominate above the rest. Fig.6 shows the seven most represented nationalities in each city.

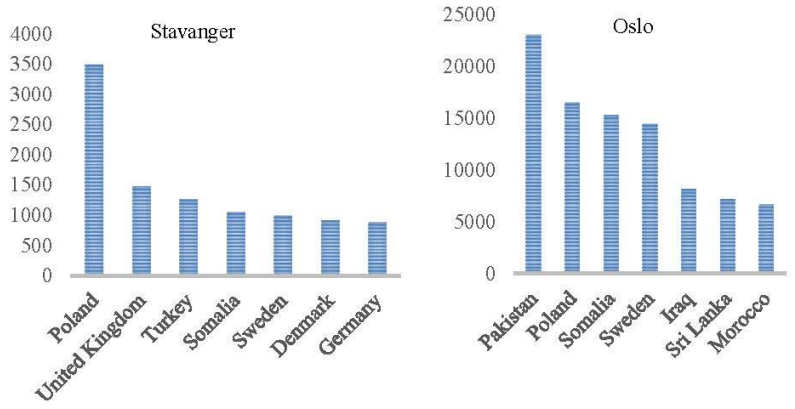

Figure 6: Immigrant population distribution in Oslo, 2016. *(KommuneProfilen.no,2017)*

The unemployment rate among immigrants is relevant. In this case, the unemployment rate is analysed according to nationalities and in comparison to the Norwegian society. This parameter helps to define the group of immigrants to be investigated, since immigrants who are economically challenged are of particular interest in the exploration of residential conditions.

In Stavanger, the largest group of unemployment immigrants in from Eastern Europe (25%) and the smallest group (4%) is from Africa [24]. This is due to a generally large population of Eastern Europeans in Stavanger.

Table 2: Employment data, Stavanger and Oslo. *(KommuneProfilen.no, 2017)*

	Total unemployment population	Norwegian unemployment population	Immigrant unemployment population
Stavanger	2,9%	2,2%	5,4%
Oslo	1,6%	1,1%	2,8%

The immigrant population in Oslo is unevenly distributed throughout the city, meaning that certain districts show higher percentages of immigrants than others. The majority of the immigrant population living in Oslo resides in the districts of Frogner, Grünerløkka and Gamel Oslo. From these districts, three smaller neighbourhoods can be selected based on a particularly high ratio of immigrants vs. locals: Lille Tøyen (25%), Haugerud (72%), Ensjø (37%) [24]. Exploring these immigrant populations and analyzing their residential conditions can help to understand living conditions for immigrants in Norway in general.

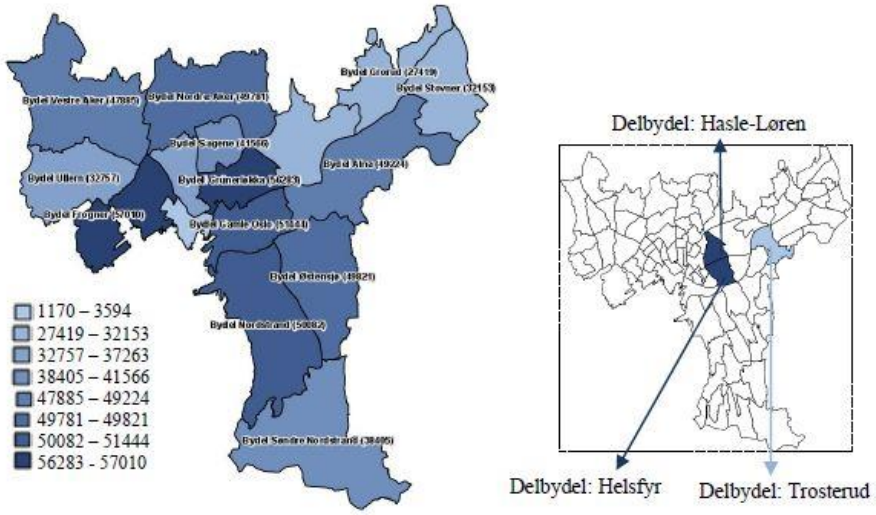

Figure 7: Immigrant population distribution in Oslo, 2016. (*oslo.kommune.no*)

In Stavanger, a similar concentration of immigrants in one district (Storhaug) can be found [25]. This uneven spatial distribution of immigrants in the host cities suggests that there are mechanisms supporting spatial segregation. It is also likely that these areas are characterised

by particular residential conditions, such as small dwellings, rental apartment and low rent. Investigating these conditions further can give some insight into how immigrants could be better spatially integrated in the host cities in the future.

6 CONCLUSION / DISCUSSION

Based on the presented literature and data, the developed model for relationships between the city, immigrant population and residential conditions is a good starting point for further empirical investigation and theoretical exploration. The purpose is to be able to describe and analyse the residential conditions of a given group of immigrant population in terms of their physical environment, in order to improve the quality of life of this population. By operationalising the concepts of immigrant population and residential conditions, it is possible to see if there are significant differences in living conditions for different population groups in Norwegian cities. The level of spatial integration/segregation is of particular interest here, since it can possibly contribute to a higher level of social integration.

This paper is part of a larger PhD study called 'Residential conditions for immigrants in Norwegian cities and their effect on the quality of life'. An investigation of specific groups of immigrant in Oslo and Stavanger, as described in this paper, is launched in order to gain a better understanding for the relationships between immigration, the urban structure, residential conditions and quality of life.

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Appendix 2 – Quality of Urban Life and Its Relationship to Spatial Conditions.

QUALITY OF URBAN LIFE AND ITS RELATIONSHIP TO SPATIAL CONDITIONS

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ABSTRACT

Based on a literature review on the concept of *quality of life* within sociology, psychology, human geography, as well as the environmental design fields, it becomes apparent that some factors are particularly relevant to environmental designers and urban planners. Places ranging in scale from the individual dwelling or local neighbourhood, to the city and region, and even the state or nation, influence people's lives and, thus, their overall *quality of life*. In environmental design and urban planning, a fundamental assumption is that places have environmental attributes that can be designed to enhance the quality of individual lives. Investigating this assumption becomes increasingly important as urban areas and their populations grow. This study therefore explores definitions of *quality of life,* sustainable urban development and urban planning, in order to define the concept of *quality of urban life* more precisely. Elements of *quality of life* and *quality of urban life* are presented in a comparative model where five dimensions are explained in detail (physical, environmental and mobility, social, economic and political, psychological). Consequently, an indicator set, that combines objective indicators of the urban environment with subjective evaluations of individual behaviours and perceptions, is proposed. The study concludes with an evaluation model that serves as a basis for further investigation of the relationships between the urban environment and *quality of urban life*, as well as interrelations between the dimensions and corresponding indicators. Thus, the *quality of urban life* in specific neighbourhoods can be identified.

Keywords: quality of life, quality of urban life, spatial conditions, indicator development.

1 INTRODUCTION

Quality of life is a notion that has been discussed in many studies as a response to problems facing the urban areas, such as traffic, crime or social segregation [1]. Due to the overarching paradigm of sustainability, much effort is put into providing for sustainable urban development. Particularly social sustainability in cities, including social equity and balance, has fostered a growing interest in urban life and its qualities.

Urban sustainability and *quality of urban life* share the subject of investigation, i.e. urban environments. Thus, it is natural that urban planning, generally seen as implementing physical and administrative measures with the objective to obtain certain goals, is one of the academic disciplines that views *quality of urban life* as an integral concept. However, urban designers are often preoccupied with physical attributes of a space or neighbourhood, whereas *quality of life* includes a wider range of factors, such as social activity and perception of the individual inhabitant. For the design disciplines, it is therefore particularly important to understand and study the relationship between physical conditions, their quality (often measured in resulting behaviour) and the user's perception. Observing which urban environments allow individuals and households, neighbourhoods and communities to achieve high *quality of life* is therefore a topic worthy of further investigation [2].

This paper sets out to establish an operational concept of *quality of urban life* that allows to investigate it under specific conditions, such as for a certain neighbourhoods and groups of inhabitants. This is done with the help of a literature survey and review of other empirical studies on the topic. An indicator set for empirical evaluation of *quality of urban life* is also developed.

2 QUALITY OF URBAN LIFE: CONCEPTS AND DEFINITIONS

Quality of urban life does not have a unified definition, since different disciplines, such as sociology or geography, are using the term differently [3]. While the quality of life in cities obviously relates to the quality of life in general, it also needs to be seen in the light of sustainable development, because it bears resemblance to aspects of social sustainability in terms of social justice and equity. It is further important to understand how the ambition of providing high quality in cities is related to the physical aspects of the urban environment; i.e. the strong focus on liveability and liveable communities[4].

2.1 Quality of Life

The interest in *quality of life* began to rise in the 1960s, when it became a concept used in areas such as health, education, economics, politics and services in general [5]. During this period, the growing interest in human well-being led to the need to measure this subjective reality through objective data.

In addition to referring to physical, economic and social conditions, *quality of life* also includes personal satisfaction (or dissatisfaction) with the physical, socio-economic, and cultural conditions under which a person lives. It is a complex, multidimensional construct, which combines multiple theoretical perspectives and methodological approaches. There have been many attempts to define what constitutes *quality of life* in the different disciplines, such as sociology or psychology. Some authors use the term interchangeably with other concepts such as *subjective well-being*, *happiness*, *life satisfaction*, the *good life* and *liveability* [3]. Adopting the definition of the Australian Major Cities Unit [6], liveable cities are socially inclusive affordable, accessible, healthy, safe and resilient to the impacts of climate change. They have an attractive built and natural environment. Liveable cities provide choice and opportunity for people to live their lives and raise their families to their fullest potential [4].

Quality of life includes the full range of factors influencing what people value in life, beyond the purely material aspects [7]. According to the Centre for Health Promotion at the University of Toronto [8], the term includes three main areas: being, belonging and becoming. *Being* represents who one is, with physical, psychological and spiritual components. *Belonging* concerns connections to one's physical, social and community environments. *Becoming* refers to activities carried out in the course of daily living, including those to achieve personal goals and aspirations.

Schalock [9] considers the concept of *quality of life* as an organising principle that can be applied in the improvement of society through social, political, technological and economic transformations. However, the usefulness of the concept is mainly related to human services, used to assess people's needs or their level of satisfaction with different services.

Due to the diversity in the definition of *quality of life* there is still a lack of consensus on this concept and its evaluation [10]. There are two basic approaches: one that conceives it as a unitary entity, and one that considers it a construct composed of a series of dimensions [11]. For this study, the latter perspective – that of a compound concept - was fruitful. The review further shows, there was and is little concern for spatial features in the definitions of *quality of life,* something that can be considered lacking in the design and planning disciplines.

2.2 Sustainable Urban Development

While the WCED definition of sustainable development [12] stands strong, together with the consequent use of the trichotomy of environmental balance, economic feasibility and social equity, there seems to be a lack of common definition for sustainable urban development, particularly with regards to its qualitative aspects [12], [13]. There is no doubt that the fulfilment of physical, social, intellectual and psychological needs of the individual is not only a precondition for social sustainability but also for individual well-being and thus for high *quality of life*. The traditional focus on mediating environmental impact of urban life has recently grown into a wider discussion on healthy and liveable urban environments and *quality of urban life* in general.

The *quality of life* and the liveability of areas have previously been studied in relation to physical features such as mixed use, compactness and densification [14], [15]. Quality of urban life can thus be interpreted as an integral part or goal of a holistic urban sustainability framework. It might be that it is an extension of the concepts of social sustainability, social justice and equity within sustainable development; and it seems that the recent focus on *quality of life* and liveability is a symptom of a more holistic approach to creating more sustainable and liveable urban environments. It is therefore important to study the relationships between sustainable urban development and *quality of urban life,* to develop a better understanding and monitoring both.

2.3 Urban Planning

Urban planning refers to a range of activities relating to urban society, political reality, economic conditions, physical environments, technological approaches and administration. It is generally described as technical and political processes concerned with the welfare of people, control of the use of land, design of the urban environment including transportation and communication networks, and protection and enhancement of the natural environment [14]; i.e. means to an end. One particular end is urban sustainable development, including the achievement of individual *quality of urban life* [5].

Other objectives of urban planning are maximising productivity, redistributing resources and avoiding dispersion; further providing public urban space, strong infrastructure and services, as well as protecting cultural heritage are goals of planning endeavours[15]. All this is done in order to enhance and secure high *quality of urban life* for urban inhabitants.

2.4 Quality of Urban Life

Benavidez Oballos [16] defines *quality of urban life* as "the degree of satisfaction with the possibility to fulfil needs and aspirations by individual's occupying an urban space" [translated]. Similarly, Pérez Maldonado [17] defines the concept as "optimal conditions that combine and determine sensations of comfort in the biological and psychosocial within the space where the man lives and act" [translated]. These optimal conditions in the urban environment are intimately linked to the degree of satisfaction with services, as well as the perception of the habitable space as healthy, safe and visually pleasing.

It can be inferred that the physical environment has an evident impact on the urban individual's *quality of life*. This correlation, while one of the underlying premises for all planning and design activity, is often tacitly assumed without further investigation, or follow-up monitoring. An exploration of this relationship is therefore prerequisite for

providing urban planners with a good tool for evaluating the effect of their actions on the resident's *quality of life*.

3 DIMENSIONS OF QUALITY OF LIFE VS. QUALITY OF URBAN LIFE

Eurostat, together with representatives from the EU Member States, has designed an overarching framework in order to analyse the *quality of life* through dimensions such as material living conditions (financial situation and housing conditions), natural and living environment, social relationships and leisure activities, economic and physical safety, governance and basic rights, health, education and employment [7]. All these dimensions relate to people's capabilities to pursue their self-defined well-being, according to their own values and priorities. The subjective dimension, overall experience of life, refers to the personal perception of life satisfaction.

The nine dimensions that define the concept of *quality of life* can be viewed from two perspectives: first, all dimensions are aggregated and the sum of all of them represents *quality of life*; second, the eight objective dimensions affect the subjective overall experience of life; i.e. they are correlated.

Quality of urban life on the other hand is a concept that places aspects of *quality of life* directly within the urban context, i.e. physical; mobility, environmental, social, economic, political and psychological conditions.

DIMENSIONS OF QUALITY OF LIFE	DIMENSIONS OF QUALITY OF URBAN LIFE
Material living conditions	Physical quality of urban life
Natural and living environment	Mobility and environmental quality of urban life
Social relations and leisure	Social quality of urban life
Economic and physical safety	Economic quality of urban life
Governance and basic rights	Political quality of urban life
Overall experience with life	Psychological quality of urban life
Health	
Education	
Employment	

Figure 1: Dimensions of quality of life based on *Eurostat (2015)* and quality of urban life based on *El Ariane (2012)*.

'Fig.1' compares the dimensions of both concepts and shows that five are common. However, there is a key difference between the two concepts: while *quality of urban life* is strongly connected to the urban environment, *quality of life* focuses on the individual. *Quality of life* includes the dimensions of employment, education or health [7], which do not directly relate to the urban context. 'Overall satisfaction' and the 'psychological quality of urban living' are subjective dimensions, focusing on the personal perception and satisfaction of the individual.

For further exploration, the dimensions are clustered into physical aspects [18], mobility and environmental aspects [19], [20], social aspects [21] and economic and political aspects [22]. Finally psychological aspects [5], [23], [24] are presented.

3.1 Physical Quality of Urban Life

This dimension covers land use, services, facilities, infrastructure, housing and buildings characteristics, as well as the urban layout.

The urban layout describes the spatial arrangement and configuration of elements of streets, blocks and buildings. Well-designed urban layouts can influence the livelihood, the use of space and thus *quality of urban life*. Streets, homes, gardens, places for leisure and parking must be carefully arranged. An accessible network of interconnected streets that define blocks of housing, open spaces and other uses should characterise a successful layout [2]. Land use describes the different functions of the urban areas. Within an urban context, the dominant land use tends to be residential, but a complete urban area requires industry, retail, offices and infrastructure, i.e. mixed use [25]. The quality of built environment refers to constructed surroundings that provide the setting for human activity, ranging in scale from personal housing to neighbourhoods and cities. The urban built environment contributes to the way people feel about where they live and impacts strongly on the sustainability of the natural environment [2].

Neighbourhood services and facilities such as accessibility to open spaces, access to daily amenities, social services or access to recreational activities are considered one of the main components of urban community, and their quantity and quality can have an impact om people's *quality of life* [25]. Public services, such as educational, health, administrative, cultural, religious and social services, are also indispensable elements that can contribute to urban qualities [26].

Another concept that is included in the physical aspect is the quality of housing. Living in poorer quality housing has been associated with poorer mental health and higher rates of infectious diseases, respiratory problems or injuries [27]. Satisfactory accommodation is at the top of the hierarchy of human needs, before physical safety, love, esteem and self-actualization, according to Maslow's hierarchy of needs [28], thus having a strong impact in *quality of life*.

3.2 Mobility and Environmental Quality of Urban Life

Environmental conditions affect human health and well-being both directly and indirectly [7]. Environmental protection is very important, with air and water pollution being the most worrying issues [29]. Indeed, pollution has direct adverse effects on fundamental resources such as clean water, but also indirect effects on ecosystems and biodiversity. Most residents think that environmental issues have a direct impact on their daily life and on the economy [29].

In urban terms, environmental quality refers to the natural aspects of the neighbourhood, i.e. quality of air, water and the local environment in general. Rapid urbanisation generates challenges such as loss of green space and natural habitats, increase of air, water and noise pollution, traffic congestion and high energy consumption [30]. Green areas in a city, such as parks and gardens, help to protect and enhance urban ecology and promote physical and mental health [31]. They also help mitigate the CO_2 emission and provide residents with opportunities for recreational activities. Provision of green space can also help foster a sense of community and pride.

This dimension also refers to mobility, including traffic safety, traffic noise, accessibility and public transportation. Transportation is necessary for today's urban society as it enables

people to access employment, education, food, health and social services, and meet with family and friends [4].

The concept of accessibility is often used in human geography for the evaluation of spatial distribution of facilities and functions; it denotes the ease with which any land-use activity can be reached from a location, using a particular transport system [32]. The frequency and modes of travelling may have important consequences for *quality of life*, as the time spent travelling cannot be used for other aspects of life.

3.3 Social Quality of Urban Life

A social life, where people can enjoy a balance between work and private interests, spending time on leisure and social interactions, is strongly associated with life satisfaction [33]. Carmona, et al. [34] confirm that urban space and society are clearly related, it is difficult to conceive a space without social content and, equally, to conceive society without a spatial component. The individuals within a society need to work together and interact in order for societies to be sustained [35].

The concept of community is fundamental to people's overall *quality of life* and sense of belonging, as social relationships are important for strong fellowship and social cohesion. Social quality is catered to by the built environments that facilitate social activities and human interaction building upon social ties and cultural communities [2].

Cities are homes to people from diverse cultures and lifestyles. Social diversification and a mix of housing and services can be promoted at the local level in order to meet the diversity of user needs and expectations and cater towards social inclusion and integration. Consequently, this dimension is closely related to the concepts of integration, both social and spatially [36]. Neighbourhoods must provide spaces for socializing, meeting, temporary activities and events. The quality of the built environment has an important role in creating public spaces that are safe and welcoming and that provide focal points for people to experience community interaction [37]. Therefore, social dimension has a direct relationship with the physical one.

This dimension includes also the concept of physical safety, including all the external factors that could potentially compromise the individual's safety. Danger of any kind, such as natural hazards or crime, can be a source of fear and worry which can have a negative impact on the general *quality of life* [7].

3.4 Economic and Political Quality of Urban Life

This dimension is divided into the economic perspective and the political one. The economic perspective characterises the neighbourhood as a place of economic activities, whereas the political dimension describes the individual's relationship to political and institutional entities.

Economic development enhances prosperity in urban communities and, thus, underpins *quality of urban life*. People's ability to purchase goods and services, obtain adequate food and housing, are some of the most important factors for life quality [2]. A concept related to the individual is economic security, which is a crucial aspect of citizens' functionality. Being able to plan and overcome a sudden deterioration in economic and wider environment has an impact on *quality of life* [7]. The concept of economic security covers aspects such as wealth, debt and job security. It also embraces aspects, such as the current situation of a household or individual and the expectations on how the situation will evolve in the future.

The political dimension encompasses trust in institutions and satisfaction with public services, as well as aspects related to discrimination, equal opportunities and active citizenship. National policies play a big role to support *quality of urban life* through the development of urban policies, strategies, laws, legislations and promoting the creation of urban design codes and guidelines. In addition such policies can promote the participation in the civil and political life [2].

3.5 Psychological Quality of Urban Life

The psychological dimension is subjective. It refers to the personal assessment and perception of the physical, environmental, social, economic and political dimensions. The city is both a spatial and social structure, which affects individual and social behaviour. The urban structure and its morphological and spatial changes are related to changes in lifestyles and social experience. Different lifestyles and social conflicts are linked to the processes of structuring the urban fabric. This explains the significance of the urban context in social life.

It should be noted that this is an individual dimension. Depending on time and place, the perception and satisfaction of the person in relation to the area where the person resides can vary [38]. It is therefore important to understand the way people react to places and be aware of the factors involved; such as which spaces can generate happiness, satisfaction, dissatisfaction or unhappiness. The individual's perception of a space affects thus the individual's *quality of life*.

4 ASSESSING QUALITY OF URBAN LIFE

The development of indicators that allow measuring data related to the social welfare of a certain population began from the social sciences [5]. These indicators had their own evolution, being at first a reference of the objective conditions, from an economic and social dimension, and later on including subjective elements [39]. The development and improvement of qualitative indicators, in the mid-70s and early 1980s, led to a differentiation between objective and subjective, and qualitative and quantitative indicators. Thus, *quality of life* became a concept that integrates all of these components [40].

Considering the difficulty of measuring the concept of *quality of urban life*, most studies rely on a set of qualitative and quantitative indicators as a tool for assessment. A concern is, whether these indicators are universal or differ from place to place or from individual to individual. Both subjective and objective indicators are therefore necessary to produce a holistic framework and yield reliable results [5].

4.1 Operationalising a qualitative concept

It is evident that the relationship between *quality of urban life* and the urban environment is complex. Personal characteristics, such as values, expectations and perceptions, as well as demographic and socio-economic characteristics can influence the satisfaction with the residential buildings, neighbourhoods or cities people live in. Individuals consider different aspects as important when judging their satisfaction with life [41]. Studying the complexity of the relationships between urban characteristics and the subjective perception can grant a better understanding of spatial-psychological relationships on a more general scale [42].

The links between objective dimensions and subjective evaluations of the urban environment confronts researchers with a challenge. The nature and strength of correlation between them (usually referred to as 'congruency') need to be tested as understanding them may be important for how planning and policy interventions can contribute better *quality of*

urban life [5]. It also needs to be tested in order to avoid simple assumptions being made, e.g. changes in the physical dimension will result in significant and direct changes in subjective *quality of urban life* [42].

4.2 Indicators

When choosing indicators, they need to fulfil certain criteria; for instance how significant and useful they are for assessing *quality of urban life*, as well as how specific and quantifiable they are. It is also convenient to use indicators than can be measured at different scales, so comparisons across cases becomes possible. Therefore, this particular research focuses on relevant indicators for which data is readily available and easy to compare (Fig.2).

Depending on the indicator, there are two approaches for data collection. Collection of s*econdary data* usually reports on objective indicators, e.g. existing aggregated data at different geographic or spatial scales (population data or number of building type). Sources can be official governmental data collections, including censuses and other geographic information systems (GIS). *Primary data* is generated for both objective indicators, i.e. field surveys and analysis of urban areas and places, and subjective indicators, i.e. social survey (questionnaires/interviews) of individuals where the focus is on people's perception of *quality of urban life* dimensions.

OBJECTIVE DIMENSIONS	INDICATORS
Physical Quality of Urban Life	Number, distance to different facilities (education, health, leisure centres) Amount of, distance to green space Walkability/accessibility of built environment Population density, housing tenure density
Environment and mobility Quality of Urban Life	Pollution rates: Air and water quality Travel times (of the different transport modes Transport affordability
Social Quality of Urban Life	Use of social and leisure facilities Number of cultural and leisure facilities Spatial integration and segregation Crime and violence rates
Economic and political Quality of Urban Life	Economic growth Unemployment rates Participation of residents in representative governance and decision making
SUBJECTIVE DIMENSIONS	INDICATORS
Psychological Quality of Urban Life	Feelings about neighbourhoods Housing satisfaction Social integration and segregation Life satisfaction, overall happiness

Figure 2: Indicator set for assessment of quality of urban life based on *El Ariane (2012).*

Much of the quantitative secondary data, such as in the physical dimensions, can be collected through desktop-research. This is true for the number of educational institutions [45], quantity of public open space, distance to and number of various services for a given population [46], number of different types of food and shops, population density and housing tenure density [46], [47]. For the mobility dimension, pollution rates [46], [48], travel times and distances, or fares of public transport [23], [34] can be found through online data

collection. For the social dimension, the number of cultural and leisure facilities [45], [46] and crime and violence rates [49] can be obtained from online maps and databases. The same accounts for economic growth [25], unemployment rates [50] and participation of residents in representative government and decision making [45], representing the political-economic dimension.

Spatial analysis also uses secondary data (e.g. for air and water quality [46], [48]), but in situ observations can supply primary data that the researcher himself generates based on observation (e.g. for use of social and leisure activities [45], walkability and accessibility of the built environment [51]). Nowadays, much of this information is registered and presented with the help of digital mapping (GIS).

Questionnaires and interviews are methods for collecting primary data for subjective indicators such as perception of personal safety [45], social inclusion, social integration and segregation [38]. Satisfaction with the neighbourhood, housing satisfaction, life satisfaction and overall happiness [4], [26] are also covered in these methods.

5 MODEL OF RELATIONSHIPS

In spite of the number of studies carried out on the concept of *quality of life*, not all are explicit about its relationship with spatial conditions. This is probably due to different approaches and focuses in social disciplines versus design disciplines. The concept's overlap with sustainable urban development contributes to the emerging focus on quality and liveability in urban areas. Since urban planning can have an impact on the individual's life, and it is crucial for design and planning disciplines to improve their understanding of the relationship between spatial conditions and *quality of urban life*.

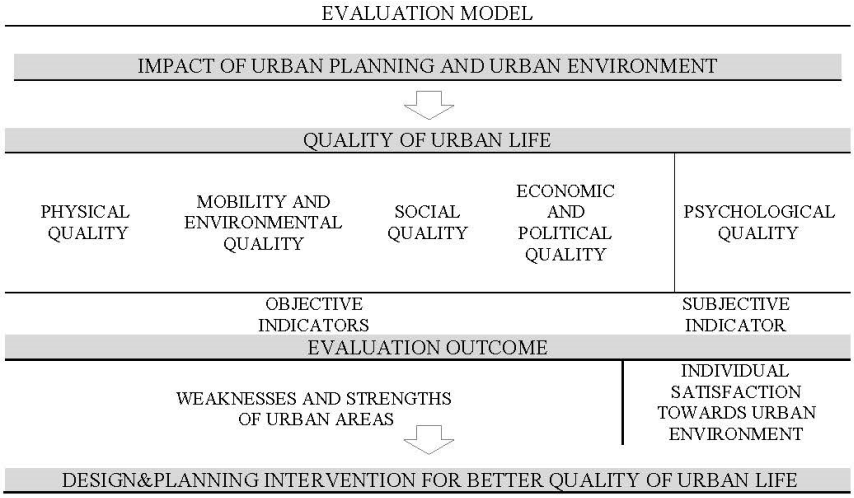

Figure 3: Evaluation model

Based on this, an evaluation model is presented in order to describe/explain the impact of urban planning and the urban environment on the *quality of urban life*. Also internal relationships between the dimensions of the *quality of urban life,* and the objective and

subjective correspondent indicators are become apparent. The use of objective indicators can help planners and designers to determine possible weaknesses and strengths of an urban area, and the subjective indicators explore individual perceptions of the urban environment. This evaluation model can serve as the basis for deeper investigation of the relationship between the physical environment and *quality of life*. When applied in concrete cases, the results of such an assessment can help designers and planner to tailor spatial interventions toward the achievement of a better *quality of urban life.*

6 CONCLUSION

The purpose of this study was to create a holistic conceptual framework for *quality of urban life*, exposing all of its dimensions and accounting for them with corresponding indicators. The commonly used dimensions (physical, environmental and mobility, social, economic and political, psychological) reveal that some of them are dependent on each other, e.g. the physical environment and the psychological satisfaction. However, quality of urban life encompasses all dynamics and interrelations that exist among the different dimensions.

The choice of relevant indicators is important, and 'Fig. 2' proposed a set of indicators for empirical investigation of *quality of urban life* as a whole. However, it is particularly interesting to study the relationship between the physical and environmental aspects and the individual perception. This exploration can help planners and designers to explore possible weaknesses and strengths of an urban area, and propose corresponding interventions.

A further investigation, based on a series of case studies employing the above evaluation model and corresponding indicators, is launched in order to gain a better understanding of the reliability of the model. Case studies will focus on the immigrant population and the impact of their residential conditions and spatial integration on their *quality of urban life*, thus, giver a deeper insight into spatial-perceptual relationships in general.

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Appendix 3 – Mapping local perceptions with geographic information.

Mapping local perceptions with geographic information

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Submitted to *Journal of Urban Technology*.
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Appendix 4 – An Approach to Subjective Mapping: Using Maps to Investigate Local User Perceptions of Urban Quality in Hillevåg, Norway.

Müller-Eie, D., Llopis Alvarez, A. (2020) *Journal of Urban Design*, 25(3), pp. 369-386. https://doi.org/10.1080/13574809.2019.1656524

This paper is not in Brage for copyright reasons.

Appendix 5 – Approaching Societal Safety from the Urban Perspective.

Llopis Alvarez, A., Njå, O. (2019) *Proceedings of the 29th European Safety and Reliability Conference,* doi: 10.3850/978-981-11-2724-3_1078-cd

Appendix 6 – Housing circumstances and Quality of Life among local and immigrant population in Norwegian neighbourhoods.

LLopis Alvarez, A., Müller-Eie, D. (2020) Submitted to *Journal of Housing and Built Environment.*

This paper is not in Brage for copyright reasons.

Appendix 7 – Neighbourhood conditions and Quality of Life among local and immigrant population in Norway.

Neighbourhood conditions and quality of life among local and immigrant population in Norway

Abstract

This paper explores the relationship between the quality of life and neighbourhood characteristics among immigrant and local population in Storhaug (Stavanger) and Grünerløkka (Oslo), two Norwegian neighbourhoods. The neighbourhood conditions have been analysed and inhabitants have been interviewed to collect objective and subjective data. Several dimensions have been considered, e.g., physical, environmental, mobility and psychological, with different indicators defining them. Objective data related to the physical layout, green spaces, transport system or environmental aspects are studied and complemented with the subjective information such as the satisfaction of the participants with these aspects. The data collection thus includes geographic, personal and qualitative data, and is analysed with the help of geographic and statistical analysis. Differences between the population groups and between the case study neighbourhoods are determined, being possible to conclude that specific neighbourhood conditions influence participants' quality of life in these Norwegian minor settings. The local participants in this study are the ones taking more advantage of the physical, environmental and mobility dimensions at their residential area and reporting higher perceived quality of life. The results presented can provide relevant information for the effective and efficient planning and development of residential environments.

Keywords: quality of life, subjective mapping, neighbourhood conditions, spatial analysis, migration.

1. Introduction

Quality of life, or QoL, is a concept often used to described citizen's satisfactions with different residential locations (Myers, 1988). The concept lies close to the heart of planning, which main purpose is the promotion of the general welfare, the public well-being or the public interest. The planning profession has embraced the concept of QoL by interventions within physical aspects such as transportation, housing or green areas. Parameters, such as availability of services and facilities in an area, transport system, environmental and social aspects, define the concept of neighbourhood conditions

(Westaway, 2009; Sampson, 2004; Badland et al., 2012). These conditions are considered adequate when a dwelling is located in an urban area that allows access to employment, public urban areas and facilities, access to public transportation as well as public health and educational services. It is thus particularly interesting to study the relationship between the physical conditions, environmental aspects and individual perception. This study can help planners and designers to explore possible weaknesses and strengths of an urban area, and propose corresponding interventions.

Norway performs very well in many measures of well-being in comparison to other European countries. Norway ranks at the top in indexes related to living standard, such as the Human Development Index (HDI), Eurostat or OECD (HDR, 2019; Eurostat, 2019; OECD). Numerous studies focus their attention on the Norwegian building environment domain at a country level (Høyer and Holden, 2001; Hjorthol and Bjørnskau, 2005; Nordvik, 2015; Søholt, 1994; Aarland and Nordvik, 2009) or a city level (Vassenden, 2014; Thomsen and Eikemo, 2010; Mastekaasa and Moum, 1984; Andersson et al., 2010). However, this study considers the neighbourhood level as the optimum scale to carry out this research. Two Norwegian neighbourhoods have been selected as case studies due to their high percentage of immigrant population as well as their relevant situation on economic and urban development. These are Grünerløkka and Storhaug. These neighbourhoods belong to Oslo (Grünerløkka), the capital of the country, and Stavanger (Storhaug), the fourth largest city in terms of population but with a crucial economic performance.

Native and immigrant population are included in this study due to the high relevance of migration in Norway. Immigration can transform the structure of urban areas, leading to irreversible changes of territorial and social concentrations of ethnic diversification, changing social and cultural composition and generating new social needs, with the consequent challenges of coexistence and urban segregation (Llovera and Cabral, 2009; Martori and Apparicio, 2011; Van Kempen and Şule Özüekren, 1998; White, 1983; Reardon and O'Sullivan, 2004). This study allows identifying whether there are differences between locals and immigrants and their actual neighbourhood conditions as well as their perceived QoL. This particular focus on the urban and environmental dimensions and the concept of QoL among local and immigrant groups leads to these research questions: 1) How do neighbourhood conditions relate to an individual' QoL?

2) Do immigrants and locals live under systematically different neighbourhood conditions, and there these conditions different in Storhaug and Grünerløkka?
Parallel research has studied a similar relationship between housing circumstances and QoL of native and immigrant population in Grünerløkka and Storhaug (Llopis and Müller-Eie, under review-a). Housing circumstances, together with neighbourhood settings define the concept of residential conditions.

2. Background

The concept of QoL can be understood as an organising principle that can be applied in the improvement of society through social, political, technological and economic transformations (Baumol et al., 1988; Kahn and Juster, 2002; Sirgy, 2012). However, this concept is mainly related to human services, used to assess people's needs or their level of satisfaction with different services (Schalock, 1996; Ferriss, 2004; Felce and Perry, 1995). Benavidez Oballos (1998) defines QoL as "the degree of satisfaction with the possibility to fulfil needs and aspirations by individual's occupying an urban space" [translated]. Eurostat, together with representatives from the EU Member States, has designed an overarching framework to analyse the concept of *QoL* through dimensions such as material living conditions (financial situation and housing conditions), natural and living environment, social relationships and leisure activities, economic and physical safety, governance and basic rights, health, education and employment (Eurostat, 2019).
The quality of the living environment has a direct impact on our health and well-being (Marans, 1976). A proper environment is a source of satisfaction, improves mental well-being, allows people to recover from the stress of everyday life and to perform physical activity.
This paper specifically explores the physical, environmental, mobility and physiological dimensions. Several indicators have been identified as determinant when referring to each of the dimensions. The *physical dimension* covers land use, services, facilities, infrastructure, housing and buildings characteristics, as well as the urban layout. The connection between the built environment and QoL are commonly the primary concerns of urban planners, architects and policymakers (Feng et al., 2018; Badland et al., 2012). Well-designed urban layouts can influence the liveability, the use of space and thus the

quality of urban life. An accessible network of interconnected streets that define blocks of housing, open spaces and other uses should characterise a successful layout. The urban built environment contributes to the way people feel about where they live and benefits strongly on the sustainability of the natural environment (Elariane, 2012; Sirgy and Cornwell, 2002). Neighbourhood services and facilities such as accessibility to outdoor spaces, access to daily amenities, social services or access to recreational activities are considered one of the main components of urban community, and their quantity and quality can have an impact on people's QoL (Masnavi, 1999). Therefore, indicators such us visited areas and services in the neighbourhood or the assiduity when using these services have been considered in this research.

The *environmental dimension* refers to the natural aspects of the neighbourhood, i.e. quality of air, water and the local environment in general. Rapid urbanisation generates challenges, such as loss of green space and natural habitats, an increase of air, water and noise pollution, traffic congestion and high energy consumption (Organization, 2010; Hörnsten and Fredman, 2000; Lindhagen and Hörnsten, 2000). Green areas in a city, such as parks and gardens, help to protect and enhance urban ecology and promote physical and mental health (Rudlin and Falk, 2009; Ambrey and Fleming, 2014; Cao et al., 2016; Colwell et al., 2002). Indicators such as the use of green spaces have been considered, as well as participants' satisfaction with the maintenance of the research areas.

The *mobility dimension* includes travel, traffic safety, traffic noise, accessibility and public transportation infrastructure. Transportation is necessary for today's urban society as it enables people to access employment, education, food, health and social services, and meet with family and friends (Badland et al., 2014; Ambrey and Fleming, 2014; Shafer et al., 2000). The characteristics of a specific urban area are defined by several aspects, as the connectivity to the rest of the city through private or public transport, access to public spaces and services (meeting places, health facilities, day-care, schools) and daily amenities (grocery shops, pharmacy). A good transportation system contributes to facilitate the access to different services, including the capacity to support mixed-use developments and accessibility to local services (Bramley and Power, 2009; Apparicio and Séguin, 2006) or other purposes as food and recreation (Burton and Matson, 1996; Sarmiento et al., 2010). Indicators such as public transportation, parking system and physical integration have been covered. Participants have been asked about which modes

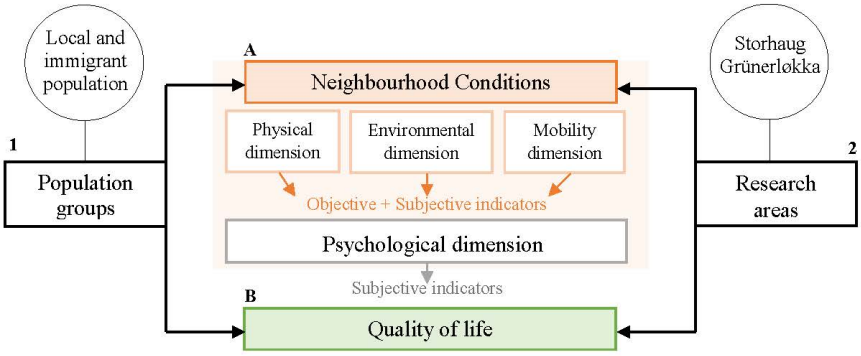
of transport they use, as well as their satisfaction with the public transport and parking system. Numerous studies (Hull, 2008; Cervero, 2013; Musterd and Deurloo, 2002; Bolt et al., 2010) include the concept of physical integration in the mobility dimension. This refers to the perception and satisfaction of the participants about how connected they feel to the rest of the city in terms of transportation. The current study also includes this indicator as relevant for individuals' QoL.

The *psychological dimension* is subjective. In this study, it refers to the personal assessment and perception and satisfaction with the physical, environmental and mobility dimensions. It is an individual dimension and therefore, depending on time and place, the perception and satisfaction of the person concerning the area where the person resides can vary (Corraliza, 2014; Cummins, 2000b; Campbell, 1976). It is of importance to understand the way people react to places and understand which spaces can generate happiness, satisfaction, dissatisfaction or unhappiness. In this study, participants have been asked about their satisfaction with certain indicators that define the physical, environmental and mobility dimensions. These indicators have been selected based on existing literature, considered necessary for evaluating neighbourhood conditions. As a concluding indicator, participants have been asked about their satisfaction with QoL in their neighbourhoods.

3. Method

3.1. Research design and data collection

This research design model presents the investigated relationship between neighbourhood conditions and QoL (Fig.1). Following this research design, this paper first presents the neighbourhood conditions, i.e., objective and subjective characteristics that define each of the dimensions. Then, the subjective data is presented to complement the data and study the relationship between the neighbourhood conditions on participants' QoL. Finally, the relationship between neighbourhood conditions and QoL is presented as well as a comparison of relationships between the two groups and the two research areas.



H1A: What are the neighbourhood conditions for each population group?
H2A: What are the neighbourhood conditions in each project area?

H1B: How is the QoL of each population group?
H2B: How is the QoL of the residents in each project area?

HA-B: How do neighbourhood conditions relate to an individual's QoL?
HAB1-AB2: Are there differences between these relationships among the population groups and/or case studies?

Figure 1: model of research design.

Considering the difficulty of measuring the quality of urban life and neighbourhood conditions, most studies rely on a set of qualitative and quantitative indicators as a tool for assessment (Marans, 2012; Gärling and Steg, 2007; Noll, 2013; Rogerson et al., 1989). Both subjective and objective indicators have been therefore necessary to produce a holistic framework and yield reliable results.

There have been two approaches for data collection: spatial analysis and questionnaires. Spatial analysis has been carried out in the two case study neighbourhoods, Storhaug (Stavanger) and Grünerløkka (Oslo), where demographic and spatial data at neighbourhood level has been analysed through desktop research. Primary data has been generated for both objective and subjective indicators, i.e. questionnaires where the focus has been on people's perception of the quality of urban life dimensions.

Much of the quantitative secondary data has been collected through desktop-research, i.e., number of educational institutions, cultural and leisure facilities, the quantity of public open space or number of different types of food and shops. Sources are official

(GIS). Both Stavanger and Oslo municipalities have official sites with demographic and spatial information (OsloKommune; StavangerKommune). *Statistisk Sentralbyrå* (Statistics Norway) has provided much of the objective data related to demographic and physical aspects.

Questionnaires have been created in this studied as a tool for gathering participants' (personal) information, as well as perception and satisfaction with urban, social and environmental aspects. Subjective data has been gathered by using map-based questionnaires (Llopis and Müller-Eie, under review-b). Map-based questionnaires, both paper and digital versions were created to interview participants. P-GIS and subjective mapping helped to collect objective and subjective information from the participants. These have helped to map neighbourhood conditions as well as identifying participants perceived QoL.

3.2. Analysis methods

A spatial analysis has been used to gather objective information of Storhaug and Grünerløkka as well as mapping the neighbourhood conditions of each research area. Spatial analysis includes topographic information about underlying landscape features and morphological information about street patterns, building structures and open and green spaces, as well as functions, property structures and transportation system. GIS has helped for gathering part of the objective information (distribution of services, green areas' dimensions) as well as producing the maps for this study. Besides serving as an instrument for collecting objective data, GIS has served as a tool for linking subjective data from the participants to spatial figures.

Statistical analysis has been used to describe qualitative and quantitative data as well as validating it.

The methodological approach used in the study a cross-sectional ordered logit regression model with self-assessed "Satisfaction with Quality of Life" as the dependent variable and a set of explanatory independent variables: a population group variable, and a research area variable. Also a list of variables regarding neighbourhood conditions: number and specific carried out activities, number of visited green areas and satisfaction with public transport, parking system, green areas and maintenance. Finally, a dummy variable for physical integration.

Satisfaction with "Quality of Life" is measured with a five-point Likert scale. As "Quality of Life" is a discrete and ordered variable rather than a continuous variable, it has been used an ordered logit regression with **m**aximum **l**ikelihood **e**stimation (MLE).

4. Neighbourhood conditions and quality of life among local and immigrants in Grünerløkka and Storhaug

Storhaug (Stavanger) and Grünerløkka (Oslo) as cases studies have been selected due to the high percentage of immigrant population as well as their economic and urban development situation. Storhaug is 11,5km ^{2}, with a population of 17.174 and 21% of the immigrant population. Grünerløkka is 17,4km^2, with a population of 60.844 and 20% of immigrant population (Statistikkbanken, 2019).

The biggest immigrant community in Storhaug is Polish (16%) followed by Swedish (6%) and English (6%). In Grünerløkka, the most prominent nationalities are Swedish with 16%, followed by 13% Polish and 5% of Spanish (Statistikkbanken, 2019). For this study, 124 people have been interviewed in Storhaug, and 114 in Grünerløkka, where 60% were Norwegians and 40%, immigrants.

4.1 Objective data: Neighbourhood conditions in the case studies

In order to identify the neighbourhood conditions in each research area, the physical, environmental and mobility dimensions have been studied by analysing some representative indicators.

Storhaug and Grünerløkka differ from each other in demographic and urban aspects, i.e., physical distribution of services, housing types or transport system. The most prominent difference between the neighbourhoods is the housing structure, where 93% of the residences in Grünerløkka are apartments compared to a more variety of residence types in Storhaug (Llopis and Müller-Eie, under review-a). This structure is reflected on the urban layout; where Grünerløkka is mostly built up by blocks of apartments compared to single-family, detached and terraced houses in Storhaug.

Another difference is the distribution of services in the neighbourhoods. Figure 2 shows the daily-shopping and educational services in Storhaug and Grünerløkka. Administrative, economic or social services are also located in the area. However, these

higher number of these services in Grünerløkka, probably due to a larger number of residents. Also, the distribution of these services seems to be more spread in Grünerløkka than in Storhaug.

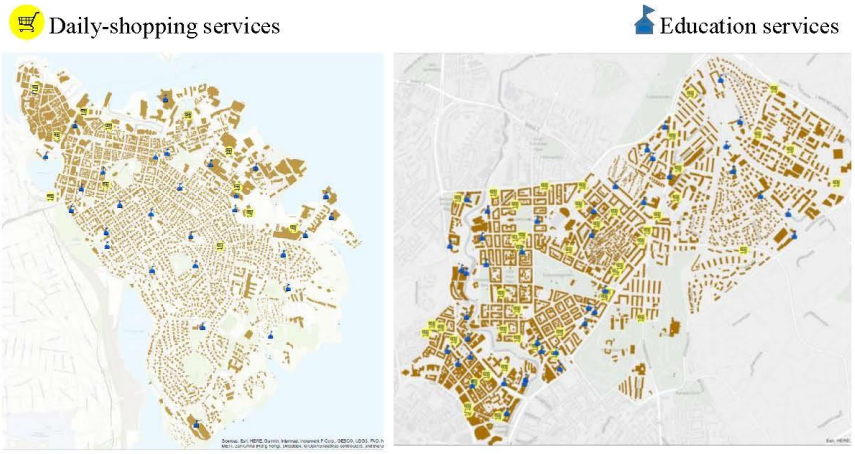


Figure 2: Daily-shopping services and educational services in Storhaug (left) and Grünerløkka (right).

Figure 3 shows the green areas and the transport infrastructure in the neighbourhoods. Both areas have a similar percentage of green areas (around 15% of their extension), but with different characteristics. Most of the green areas in Storhaug are located by the seafront and connected between them. In Grünerløkka they are spread around the neighbourhood, being two of them larger than the rest (*Tøyen* and *Sofienberg*). According to the transport system, Grünerløkka offers more possibilities (bus, tram, tube and el-cycle) than Storhaug does (bus). Probably due to a larger amount of population or the relevance of the transport system in Oslo, as a capital.

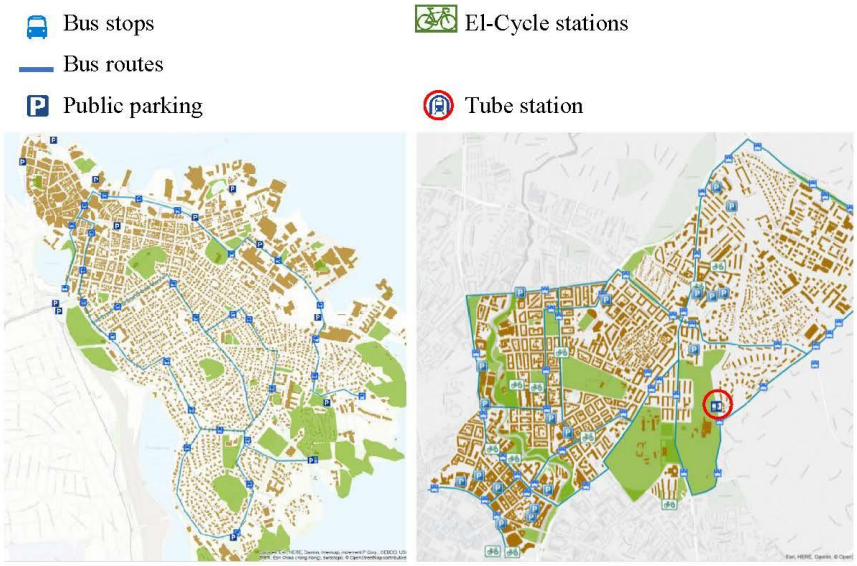


Figure 3: green areas and transport structure in Storhaug (left) and Grünerløkka (right).

Objective information regarding services and facilities in the neighbourhood, green spaces or public areas as well as the transport infrastructure have been spatially registered. Next sub-sections link the subjective information gathered from the participants to this objective information.

4.1.1 The physical dimension

Participants were asked about how many services they access or activities they carry out in their neighbourhoods. The possible answers were: participant uses education services (kindergarten, school, university or similar), works in the research area, uses services related to daily shopping, visits green areas and/or public outdoor spaces and other services/activities not mentioned in the previous options.

Locals in both research areas are the ones who carry out more activities or visit more services in their residential areas than the immigrant population. Subsequent questions help us identify possible reasons why immigrant population are less participative.

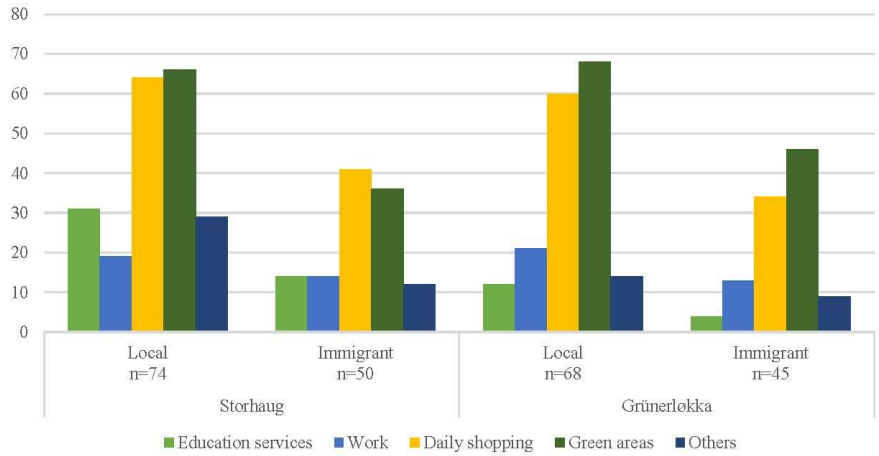


Figure 4: count of participants according the activities or services they use.

The most frequented activities are "daily shopping" and "green areas". In Storhaug, 85% of all the participants use services related to daily shopping, and 82% visit green areas. In Grünerløkka, 74% and 97% respectively.

80% of the local participants use daily shopping services, and 92% of them green areas. In contrast, 77% of the immigrant participants use daily shopping services and 84% use green areas.

Figure 5 shows green areas in Storhaug and Grünerløkka. The green and red colour indicates which participants visit (or not) the green areas in their neighbourhoods. Figure 5 indicates whether the distance between participants' residences and green areas plays a role in their behaviour. Accessibility or distance could be a reason why certain participants are not visiting green areas in their neighbourhood. However, as Figure 5 shows, it may be due to personal preferences or alternative factors why certain participants do not visit green areas since the distance from their residences is considered as a walking-distance.

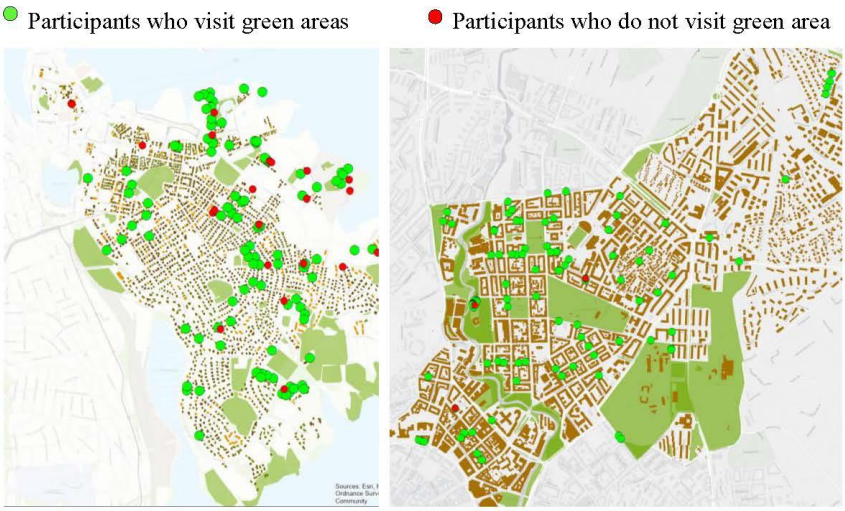


Figure 5: green areas and participants' use, Storhaug (left) and Grünerløkka (right).

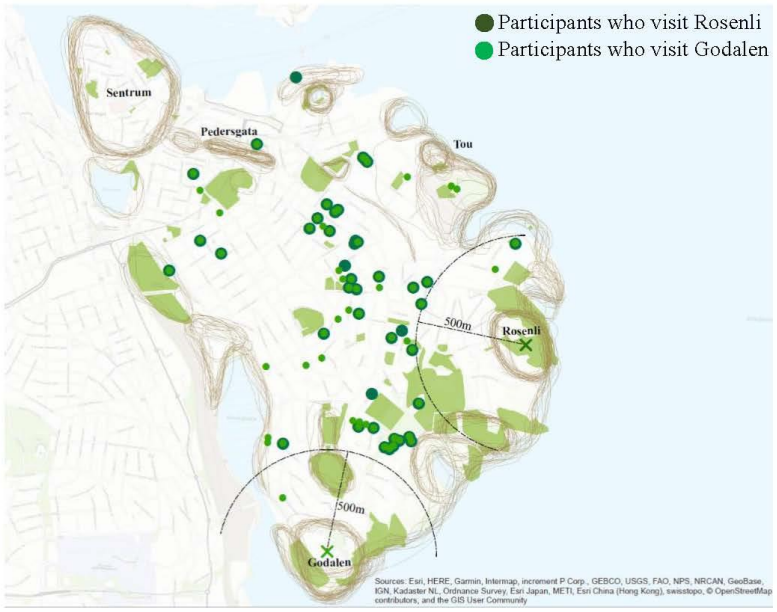
4.1.2 The environmental dimension

Storhaug (14%) and Grünerløkka (15%) have similar percentages of their surface occupied by green areas: graveyards, playgrounds or another type of green areas *(source: geographic information systems)*.

From all the participants, 90% visit green spaces, more specifically 93% of the local population compared to 86% of the immigrant population. Visiting outdoor spaces between both groups of population in both neighbourhoods is the most frequent activity (fig.4). They can be understood as recreational places that are positively related to neighbourhood satisfaction, as well as considered as common spaces for gathering and socializing. Furthermore, the spatial registration done for this study confirms that all the participants live within 500m of at least one green area. This is considered as a walking-distance and therefore favourable accessibility to these areas.

Participants were asked about which areas in Storhaug or Grünerløkka they visit more repeatedly. *Rosenli* and *Godalen* are two of the most frequently visited green areas in Storhaug; *Sofienberg* and *Birkelunden* in Grünerløkka. As figure 6 presents, participants

who visit them are not necessarily living nearby. Indeed, some of their residences are not within 500m.



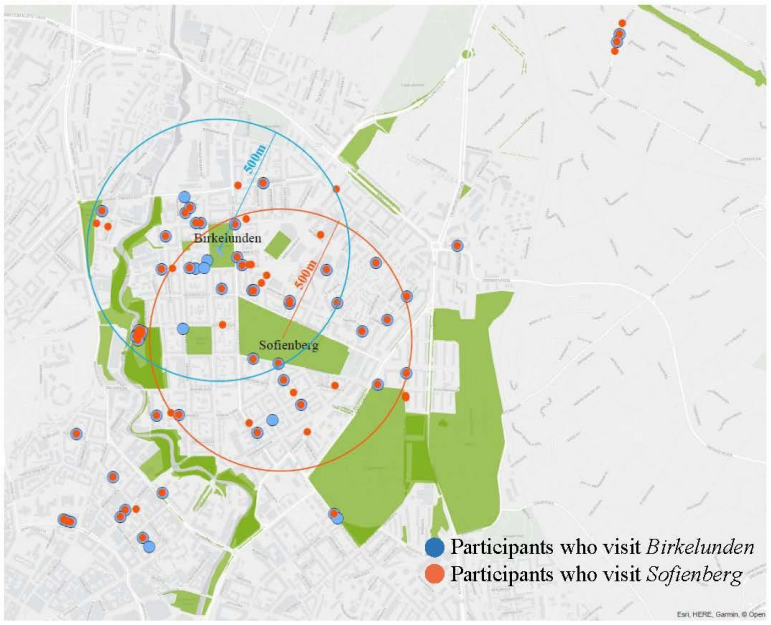


Figure 6: visited areas and participants' residences location in Storhaug (top) and Grünerløkka (bottom).

Rosenli and *Godalen* share similar characteristics, as well as *Tou,* also marked repeatedly by participants in Storhaug. They at the shorefront, is probably the reason why participants frequent them, as well as the accessibility.
Sofienberg and *Birkelunden* in Grünerløkka are the most visited. *Sofienberg* is the larger area in the neighbourhood and offers different activities, playgrounds for children or picnic areas. *Birkelunden* is smaller but located around shops, restaurants and transport connections. These may be the reasons why participants visit these areas the most.

Participants were asked about their satisfaction with green spaces or outdoor areas.

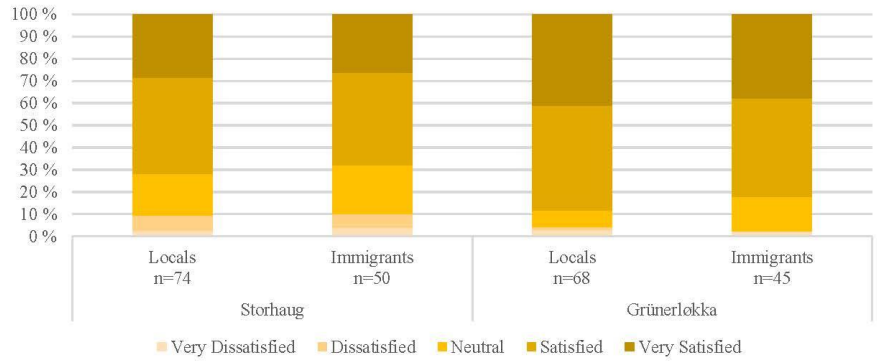


Figure 7: participants' satisfaction with green areas.

The local and immigrant population in both research areas are notably satisfied with green areas (fig.7). Referring to the two highest degrees of satisfaction, locals in Grünerløkka (88%) and immigrant group (82%) are very similar. In Storhaug, 71% of the local participants are either satisfied or very satisfied, compared to 68% of the immigrant population. This fact is not surprising, since 'visiting green areas' is the most representative activity in the neighbourhoods. The difference between population groups could be due to certain factors as the maintenance of the green areas, the environment or surroundings, the accessibility or personal factors that induce participants to perceive differently the spaces.

The environmental dimension also refers to the maintenance of the neighbourhood. The maintenance of public space includes all municipal services and changes that are determined day by day to a favourable development of the city, guaranteeing citizen welfare and facilitating urban evolution and transformation concerning green and biodiversity, water or energy in the city (Carrera, 2004; Wolff et al., 2017). Participants of each research area were asked about their satisfaction with the maintenance of their neighbourhood, where they are expected to consider aspects as cleanliness of the urban area, public order or acoustic aspects among others.

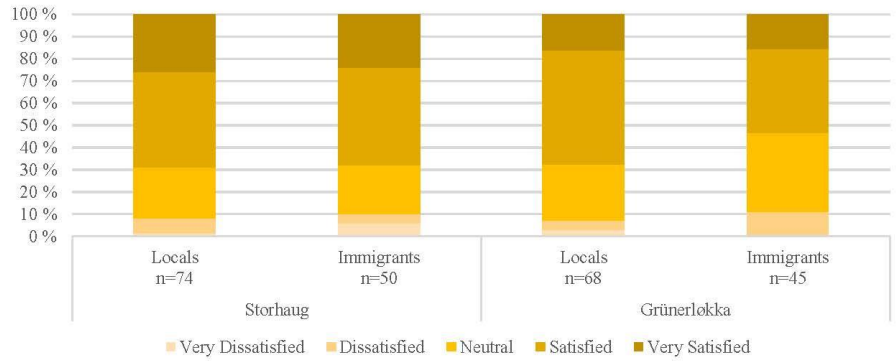


Figure 8: participants of both research areas according their satisfaction with the maintenance of Storhaug and Grünerløkka.

Figure 8 shows that most of the participants are either neutral (26%) or satisfied (45%) with the maintenance of the neighbourhoods. Comparing both research areas, 25% of the participants are very satisfied in Storhaug, compared to 16% in Grünerløkka. The perception of the maintenance of an urban area is very individualistic, since the quality of the built layout and the environment, the neighbourhood landscape or the cleanness can be understood differently from one person to another. Percentages at the highest degree of satisfaction are lower if compared with other indicators. This can be due to the concept itself since it involves many aspects (cleanliness, acoustic problems, well-preserved landscape) and therefore more complicated to achieve the highest satisfaction with all of them.

4.1.3 The mobility dimension

Participants were asked if they are satisfied with the public transport, in case they use it.

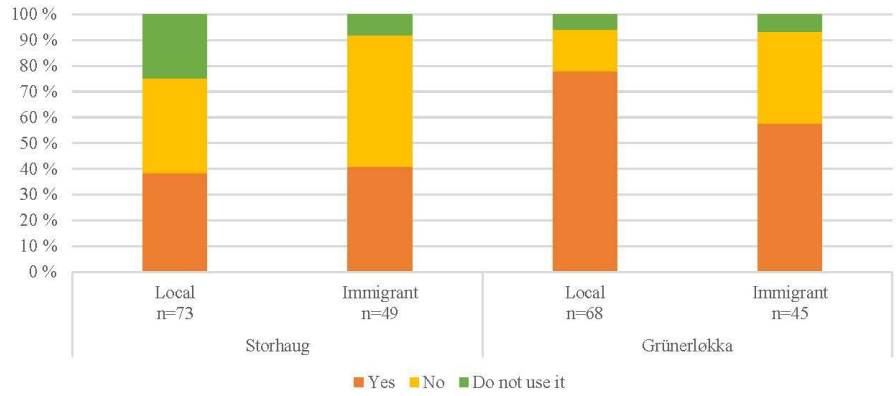


Figure 9: participants according their satisfaction (or use) about public transport.

54% of all the participants are satisfied with public transport; 34% are not, and 12% do not use it (fig.9). 63% of local participants use public transport, compared to 37% of immigrants. The difference between areas is present, since 48% of the participants in Storhaug use public transport, compared to 75% in Grünerløkka. This could be due to the public transport possibilities that Grünerløkka offers.

Once the participants said whether they use public transport or not, they were asked about how they move around their neighbourhood: bus, car, cycling or on foot in Storhaug; and tram, tube and el-cycle besides in Grünerløkka.

The immigrant population in Storhaug uses all the modes of transport equally. As for the local population, the bus is the least used (only 10%) and the car the most (35%). In Grünerløkka public transport is more used than private (car) is. More specifically, tram (26%), bus (22%) and walking (26%).

This fact can be related, first, to the wider public transport possibilities that Grünerløkka offers, and second, to the urban layout. Blocks of apartments are the most representative building layout in Grünerløkka, where 93% of the residencies are apartments. However, in Storhaug we face more variety of residences, e.g. semi-detached, terraced or single-family houses. These typologies allow better arrangement for parking system, and therefore, preferences for private transport (car) in Storhaug may be more considered.

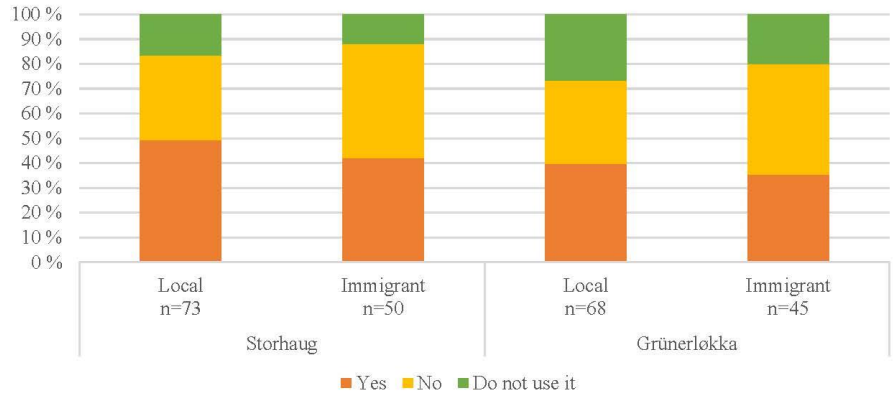


Figure 10: participants according their satisfaction (or use) of parking system in each research area.

Participants were asked about their use and satisfaction with the parking system in the research areas.

From all the participants, 42% are satisfied with the parking system, 39% are not, and 19% do not use it (fig. 10). 63% of the local participants are satisfied, compared to only 37% of the participants from the immigrant group. Connecting these results with a parallel study (Llopis and Müller-Eie, under review-a), this could be associated with the fact that most of the locals in Storhaug live in residences where the typology allows private parking places, unlike most of the immigrant population who lives in apartments and therefore different parking arrangement.

However, it must be also considered that many participants are not satisfied with the public transport system (34%) nor the parking arrangement (39%) in the research areas. This is a concept worthy of attention since the connectivity and accessibility of an urban area is decisive when pursuing favourable neighbourhood conditions. In Storhaug the reason why participants are not satisfied with the public transport may be to the assiduity of the bus, or the distance between the residences and the bus stops. In Grünerløkka they are less satisfied with the parking arrangement. This could be due to the number of apartments compared to the availability of parking places around them.

The last concept participants were asked about was their physical integration, e.g., if they feel physically connected to the rest of the city. 84% of the local participants feel

physically integrated compared to 70% of the immigrant group. Figure 11 is a representation of native (green) and immigrant (yellow) participants. 78% of the participants feel physically integrated (84% of the local participants feel physically integrated compared to 69% of the immigrant group).

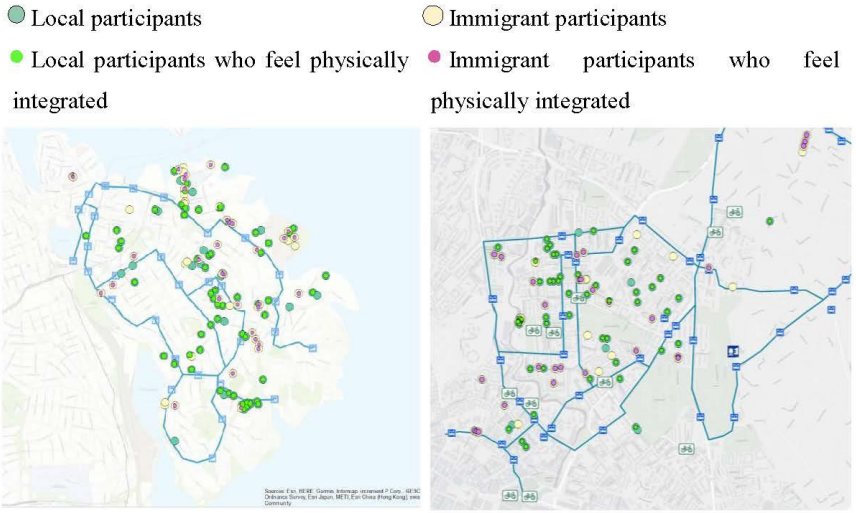


Figure 11: Participants in Storhaug (left) and Grünerløkka (right) according their physical integration.

Figure 11 shows that participants feel physically integrated regardless of their residence location. 51 participants, out of 238, reported to not feel physically integrated. These participants' residences are located near public transport facilities, which indicates that physical integration is a subjective concept, and can be perceived differently from each participant. Some participants may commute more often to other parts of the city, Stavanger/Oslo, and feel more familiar or with more awareness about the transport infrastructure than others. This could be a reason why, despite leaving in the same neighbourhood and under the same public transport possibilities, some participants feel more physically integrated.

4.2 Subjective data: The psychological dimension

The questionnaires conclude asking the participants to rate their QoL.

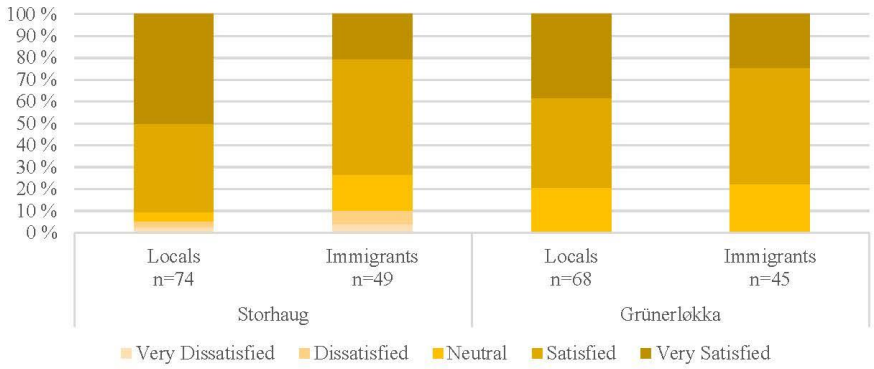


Figure 12: degree of satisfaction of the participants with their QoL.

Figure 12 shows that the local population has a greater satisfaction with QoL than the immigrant population does. 85% of the local participants are either satisfied or very satisfied with their QoL, compared to a 75% of the immigrant population. The levels of satisfaction are slightly higher in Storhaug than in Grünerløkka. 83% of all the participants are either satisfied or very satisfied in Storhaug, compared to 78% in Grünerløkka. The highest difference is observed when comparing local and immigrant population in Storhaug at the highest degree of satisfaction, since 50% of the local participants are very satisfied, compared to 20 % of the immigrants.

5. Relationship between neighbourhood conditions and satisfaction with QoL

This study has considered certain indicators that represent the physical, environmental and mobility dimensions. These indicators are connected to the concept of QoL to identify in which degree participants are influenced by their neighbourhood conditions in terms of life-satisfaction.

Table 1 shows the direct effect of neighbourhood conditions on satisfaction with QoL. Considering QoL a wide concept that includes other dimensions than the studied in this research, i.e., financial situation and housing conditions, social aspects, economic and

physical safety, health, education, employment and basic rights, the goodness of it for this model is quite adequate.

Table 1: Regression results on Satisfaction with QoL.

QoL	Odds Ratio	Robust Std. Err.	z	p-value	Confidence interval	0
Storhaug	1.27	0.31	0.98	0.329	0.79	2.06
Local population	2.37	0.6	3.41	0.001	1.44	3.88
Visits educational services	2.8	0.84	3.44	0.001	1.56	5.02
Works in the neighbourhood	1.29	0.38	0.88	0.382	0.73	2.29
Visits daily shop. services	2.25	0.81	2.25	0.025	1.11	4.56
Visits green/public areas	5.26	2.13	4.1	0.000	2.38	11.63
Carries out other activities	1.34	0.41	0.94	0.350	0.73	2.45
Number of carried out activities	1.95	0.27	4.76	0.000	1.48	2.56
Number of visited green areas	1.15	0.06	2.88	0.004	1.05	1.27
Satisfaction with public transport	1.61	0.43	1.78	0.075	0.95	2.73
Satisfaction with parking system	2.05	0.57	2.58	0.010	1.19	3.55
Satisfaction green/public areas	0.88	0.97	-0.12	0.906	0.1	7.64
Satisfaction maintenance	2.37	0.92	2.23	0.026	1.11	5.06
Physical Integration	0.21	0.07	-4.68	0.000	0.11	0.41
Note: Pseudo-R^2: 0.33						
Note: p <.05 statistical significance						

In this study, participants who have the highest degree of satisfaction with QoL are those who visit the daily shopping services and green spaces in their residential areas, being the most frequented activities. As mentioned, well-designed urban layouts can influence the

livelihood, the use of space and thus the QoL of an individual by combining the presence of primary basic needs, as daily shopping, or more recreational areas as green areas or public spaces.

From all the participants, only 9% do not visit green areas in their neighbourhoods. From the 91% who does, 85% are either satisfied or very satisfied with their QoL. This reflects the importance in the urban environment of presence and accessibility of green areas and how this impact on individuals' QoL.

When relating the satisfaction of the maintenance of the research areas with the participants' QoL, it can be observed that those who are satisfied or very satisfied with the maintenance of their residential areas are the ones representing the highest degree of satisfaction with their QoL. This fact can be related to the number of green spaces used in each research area. Results showed that in Grünerløkka participants visit a higher number of green areas in comparison to Storhaug and the satisfaction with the maintenance of these areas may be the reason. Participants may be attracted to visit different places due to better maintenance, healthier environment or more desirable visual aesthetics.

According to the mobility dimensions, participants who are the most satisfied with their QoL in Storhaug are those who use private transportation, more specifically, the local population (31%). On the contrary, in Grünerløkka the highest degree of satisfaction is from participants who use public transport, especially bus (23%) or tram (23%). Grünerløkka offers more public transport possibilities and a more spread transport network in the neighbourhood. These facts, together with the housing structure in each neighbourhood may be the reason why private transport seems to be more favourable in Storhaug and public transport in Grünerløkka.

When relating the concepts of physical integration and QoL, participants who said that they are physically integrated are the ones with their greater degree of satisfaction with their QoL. It seems that physical integration in neighbourhood environments has a positive impact on perceived QoL.

In order words, to create neighbourhoods that contribute to positive living conditions they need to be well integrated in terms of distances, transport connectivity and accessibility. Besides of a favourable distribution of services and green areas in a well-maintained condition.

6. Results

This study has analysed the distribution and use of services, the satisfaction with green areas and maintenance of the neighbourhood as well as indicators related to the transport infrastructure in Storhaug and Grünerløkka. These aspects have been connected with the concept of satisfaction with QoL, and thus, it can be confirmed that that certain neighbourhood conditions can contribute to improve or decrease individuals' perceived QoL.

A well-designed urban space with a variety of services and activities, which contribute to a balance between daily primary needs and leisure, can contribute to higher satisfaction of an individual's QoL.

This study demonstrates that participants who visit more services or carry out more activities report higher perceived QoL. Storhaug and Grünerløkka offer services related to education, social and administration, daily amenities and accessibility to recreational activities and green areas. In the current study, a well-designed urban layout is considered as favourable for QoL, since the participants carrying out more activities are the ones perceiving greater QoL.

The use of green spaces as well as participant's satisfaction with these areas have been the neighbourhood conditions that strongly predict satisfaction with QoL.

Besides these physical aspects, the transport infrastructure of an urban area must also be considered when referring to a well-design urban space. The connection between the different activities or services of an urban space is a concept that can interfere on an individual satisfaction with his/her QoL.

This study compares two population groups, local and immigrant. The local group has a higher degree of satisfaction with most of the analysed concepts, as well as with their QoL. Local population carries out more activities and visits more services than the immigrant population. The number of visited green spaces is also higher for locals than immigrants. The local group is more satisfied with the maintenance of the studied areas. They are more satisfied with public transport and parking system and use a wider variety of modes of transports than the immigrant population. Referring to the physical integration, a higher percentage of local population confirmed they feel more physically integrated in compared to the immigrant population. It is therefore expected that when

asking about their satisfaction with QoL, locals are more satisfied than immigrants, especially when referring to the highest degree of satisfaction.

Obtaining different results when asking participants about the same residential area makes us consider personal factors as the reason why the immigrant group differs from the local group despite living under the same physical conditions. These personal factors may refer to social, labour, economic, migration or personal aspects as the reason why immigrant population uses, perceives and is differently satisfied with their neighbourhood conditions.

Besides comparing the two population groups, this research allows comparing results in the two studied areas. Storhaug and Grünerløkka have been selected due to high percentage of the immigrant population. Despite this similarity, Storhaug and Grünerløkka differ on physical, demographic and environmental characteristics. When asking participants about their QoL, percentages are very similar in Storhaug and Grünerløkka, i.e., 83% of the participants in Storhaug are either satisfied or very satisfied with their QoL, and 78% in Grünerløkka.

These results confirm the importance of the individual perception on the satisfaction with residential areas. Personal circumstances, employment status, economic situation or simple preferences can influence individuals' life-satisfaction. This may be the reason why, despite living under different residential scenarios, participants may coincide on the degree of perceived QoL.

7. Conclusion and implications

This paper is part of a study where the purpose is to find the impact of the residential conditions, i.e., housing and neighbourhood conditions, on the local and the immigrant population's QoL in Storhaug and Grünerløkka.

Most wellbeing studies in the area of geography and urban planning refer to the national or regional level (Kahn and Juster, 2002; Campbell, 1976; Cummins, 2000a). Few empirical studies have contemplated the impact of minor settings such as neighbourhood units. Furthermore, limited studies attempt to investigate the influence of the neighbourhood conditions on QoL among the immigrant population in these mentioned minor settings.

The present study presents several findings on the effects of neighbourhood environments on QoL. These findings confirm that specific neighbourhood conditions influence individuals' QoL in Norwegian minor settings. In support with other studies (Westaway, 2009; Rogerson, 1999; Ambrey and Fleming, 2014), this study confirms that the built environment, the concept of connectivity and distribution of services have a repercussion on residents' QoL. Many factors influence QoL, and there is a growing consensus among urban and regional policymakers that the character of the built environment is one of them.

Among the presented neighbourhood conditions, number of carried out activities and visited green areas as well as satisfaction with outdoor areas or maintenance of the neighbourhood are directly related to the dependent variable. The neighbourhood conditions that strongly predicted satisfaction with QoL are the ones related to the built environment or environmental amenities, i.e., visited services or green spaces. Previous studies mentioned it (Ambrey and Fleming, 2014; Burton and Matson, 1996; Elariane, 2012; Sirgy and Cornwell, 2002), and this current study does not appear to be different.

Subjective assessment from the participants has been included in this study to complement the objective analysis of each dimension. This aspect enforces the importance of subjective analysis when studying the neighbourhood conditions. Storhaug and Grünerløkka differ in physical, demographic and environmental characteristics. However, percentages of perceived QoL are similar in Storhaug and Grünerløkka despite these differences. The subjective dimension is therefore necessary to include for understanding why participants living in different urban scenarios perceive similar QoL.

Referring to practical implications, there are two aspects worthy of consideration. *First*, the fact that the local population is more satisfied with QoL in comparison to the immigrant population makes us consider that personal factors may be the reason for these results. Therefore, this study suggests being complemented with another study focused on the social aspects, where the social dimension will be present, with indicators such as social environment, social integration or reason of migration.

Secondly, the contribution of this paper is to enhance the importance of green spaces, the maintenance of the neighbourhood and the existence of well-connected services in urban areas of this scale.

Urban green spaces provide a range of benefits in various forms and offer a variety of opportunities for individuals. These spaces can contribute positively to both the QoL and the competitiveness of the urban setting. It is crucial to pay more attention to initiatives designed to foster sustainable development and to improve the QoL in urban areas by 'greening' environments, through the implementation of parks, playgrounds, greenways and other open spaces. Green areas gather recreational, aesthetic, cultural, historical and social interaction value.

Concerning the maintenance of an urban area, proper management of public spaces contributes to the creation of sustainable habitats, enabling social interrelation and physical distribution of services. Similarly, the existence in minor settings, as neighbourhoods, of local facilities, services and recreational areas reduce travel distances by encouraging the use of these local amenities being easily reachable. Equivalently, the proximity to public transport networks may influence travel behaviour and contributes to reducing environmental impact.

Initiatives related to green spaces, maintenance and transport structure set sight on enhancing no only individual's QoL, but the quality of urban life.

Because this study is limited to specific neighbourhoods, the sample is not highly representative of the entire immigrant population residing in Norway and consequently not generalizable. Future research may be encouraged to replicate the present study in other Norwegian neighbourhoods to confirm the results of this study.

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