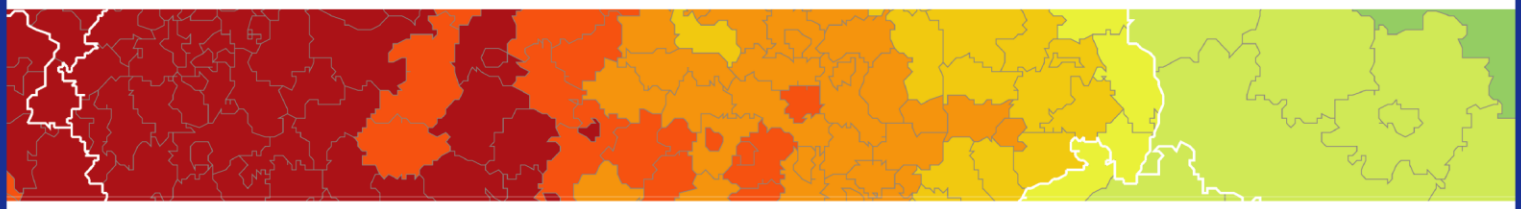

ESPON QoL – Quality of Life Measurements and Methodology

Annex 5 to the Final Report

Case study: Barcelona

Applied Research

Final Report

30th October 2020

Final Report

This applied research activity is conducted within the framework of the ESPON 2020 Cooperation Programme.

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Annex 5 to the Final Report

Case Study 02:

Barcelona

ESPON QoL – Quality of Life Measurements and Methodology

30th October 2020

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Abbreviations

BCN 0-17 observatory	Lives and Rights of Children and Adolescents - Observatory
ECURB	Urban Cohesion Survey
EMCV	Metropolitan Statistics on Living Conditions
FUA	Functional Urban Area
INE	Spanish National Statistics office
IRMB	Barcelona Institute of Regional and Metropolitan Studies (Institut d'Estudis Regionals i Metropolitans de Barcelona)
SIMBA	System of indicators for Barcelona (Sistema d'Indicadors Metropolitans de Barcelona)
SPI	Social Progress Index
TQoL	Territorial Quality of Life

Introduction

This is one of the 10 case studies of the ESPON study “Quality of Life Measurements and Methodology”. The purpose and results of the study, including the definition and application of a territorial quality of life measurement methodology, the synthesis of all case study findings, targeted policy recommendations, ideas for fostering cooperation between ESPON, EUROSTAT, OECD and the UN and recommendations for further research, are illustrated in the Final Report, to which this case study report is annexed.

The purpose of the case studies is twofold:

A) to collect good practices that can be adopted in other European regions, and

B) to make use of the methodology developed and allow for adjustments through testing in case studies.

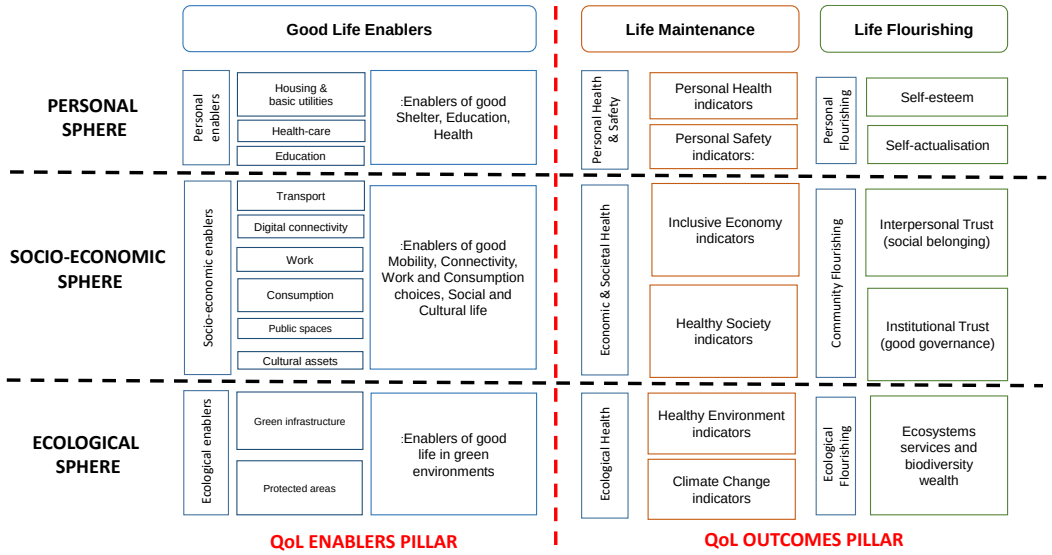
Each case study provides examples of application of the concept of quality of life (QoL) in a specific region. This complements the conceptual model and the research done at European level. The reasons why this region has been chosen forms part of Section 1.

For objective A) the case study report explores the policy context, in which QoL is used and measured in the region (Section 2). It is important to understand for which purpose the concept has been established, in which policy fields it is being used, how different levels of government are involved and which success factors and obstacles can be identified. Section 3 explains the indicators, measurement methods and data that are used for measuring QoL.

Objective B) is covered in Section 4. The study defines and tests a methodology to measure QoL at territorial (sub-national) level and offers guidance to policy makers at different levels – local, regional, national, European – on how to integrate QoL in policy processes and in territorial development strategies. We have applied to the case studies the methodology developed in the main report. This includes the Territorial Quality of Life (TQoL) measurement system and the system for coding indicators.

The TQoL framework defines the system and its main elements (pillars, spheres, sub-domains) to measure QoL facets with reference to territorial entities identified. This is shown in the TQoL framework in figure 1 below.

Figure 1 The TQoL framework



The system for **coding indicators** to represent and monitor adequately the different QoL domains, defined in the TQoL framework, is illustrated in Table 1 below.

Table 1 Coding of the indicator system in the TQoL framework

Dimension	Domain	Sub-domain	Definition
Good Life Enablers	Personal enablers	Housing & basic utilities	
		Health	
		Education	
	Socioeconomic enablers	Transport	
		ICT connectivity	
		Work opportunities	
		Consumption opportunities	
		Public spaces	
		Cultural Assets	
	Ecological enablers	Green infrastructure	
		Protected areas	
Life Maintenance	Personal Health and Safety	Personal health indicators	
		Personal safety indicators	
	Economic and Societal Health	Inclusive economy indicators	
		Healthy Society indicators	
	Ecological Health	Healthy Environment indicators	
		Climate change indicators	
Life Flourishing	Personal Flourishing	Self-esteem	
		Self-actualization	
	Community Flourishing	Interpersonal Trust (Social Belonging)	
		Institutional Trust (good governance)	
	Ecological Flourishing	Ecosystems services and biodiversity wealth	

Both, the TQoL framework and the coding system are applied in all case studies (Sections 4.1 and 4.2).

The methodology developed in this report includes further elements - a dashboard, the latent clustering approach and the citizen-centric approach - that are applied in the case studies, if sufficient data or information have been available. These elements are as follows:

- The indicators coded for local or sub-regional territorial units are presented in a **dashboard** (in an Excel-based tool). In the dashboard different points in time or objective and subjective indicators can be included and compared at territorial unit level. The specific indicators used to monitor the QoL domains are different in each case, as they take into account specific local circumstances that influence the selection of indicators (e.g. availability of data, local priorities and practices).
- In the case studies that cover a large number of territorial units the **Latent Class clustering model** helps to analyse underlying patterns and spatial differences of territorial QoL. However, the number of case studies falling in this category is small.
- A descriptive element of the TQoL approach identified in this applied-research project is the **"citizen-centric" approach**, where citizens are engaged in co-design, implementation and fact-checking activities ("factfulness" tests), to make the measurement of territorial QoL more responsive to the needs and aspirations of citizens to improve their everyday life. This can be promoted, recommended, and applied within the different case study contexts highlighting in particular any existing local practice of citizen engagement that could be adopted as a concrete example of the approach.

These methodological elements are considered in the case studies which were carried out to investigate and compare noteworthy experiences of territorial QoL measurements against the TQoL framework that has been developed with the aim of drawing lessons for further adjusting and fine tuning the methodology, which will eventually allow for its practical and widespread use for measuring QoL across territories in Europe.

1 Description of the region

1.1 Characteristics of the region

Catalonia (ES51) covers an area of 32.000 km² and is made up of four provinces (NUTS3). Barcelona (ES511) province is an urban region, whereas Girona (ES512) and Tarragona (ES514) are intermediate regions, and Lleida (ES513) is classified as a rather rural region close to a city, according to DG Regio typology.

Figure 2. NUTS regions in Catalonia

Code	NUTS 1	NUTS 2	NUTS 3
ES5	ESTE		
ES51		Cataluña	
ES511			Barcelona
ES512			Girona
ES513			Lleida
ES514			Tarragona

The overall region has 7,543,825 inhabitants (Idescat 2018) and 947 LAU2 municipalities, with the central Barcelona Metropolitan Region (RMB) concentrating a population of nearly five million within just 10% of the overall territory. This corresponds to 67% of the total population of Catalonia. The RMB is composed of seven counties and around 800 municipalities, and it includes 18 cities with more than 50.000 inhabitants, seven of them with more than 100.000 inhabitants. The municipality of Barcelona itself has 1.6 million inhabitants.

In 2018, the regional GDP of Catalonia was €242 billion, and GDP per capita was above the EU28 average, around €31.200.

The Catalan economy has an important industrial tradition, concentrated in the largest cities, but it has evolved over the years towards a service economy. The industrial network in Catalonia is essentially composed of a broad network of small and medium-sized family firms in mature sectors, along with a significant number of large multinational firms. Industry represents 21% of Catalan economy, while the service sector accounts for 73%. Tourism is one of the economic sectors enjoying the highest growth rates in Catalonia. Whereas tourism in Catalonia had traditionally focussed on coastal beach destinations, Barcelona became the main destination in the late 1990s. The city is a leading destination on a global level, with a rather diversified tourism sector (leisure, business, education, health), attracting about 12 million visitors/year. Overall, Catalonia hosts more than 22.5 million tourists per year. Although average family income in Catalonia grew in 2017 (0.4%), the poverty rate still increased slightly.

The share of the Catalan population at risk of poverty is 20.0%, above the EU28 average (17.3%) but below the Spanish average (21.6%). The risk of poverty grew in children under 16 and in people aged 65 or more, and it is still especially high in single-parent families (35.3%). The percentage of those “at risk of poverty or social exclusion” (AROPE) is 23.8%, in line with the EU average (23.5%). After the region’s relatively poor performance during the 2008-2014 economic crisis, the Gini index places Catalonia (31.8%) slightly above the Eurozone (30.7%) and the EU28 (30.8%), and below Spain as a whole (34.1%) in terms of economic inequality. Despite the improvements that have been made, inequality is among the consequences of the crisis that have been most difficult to tackle, according to regional government reports.

Catalonia has over 1 million hectares of protected natural land (31% of the total regional surface), part of it also integrated into the Natura2000 network (188 sites of communitarian interest).

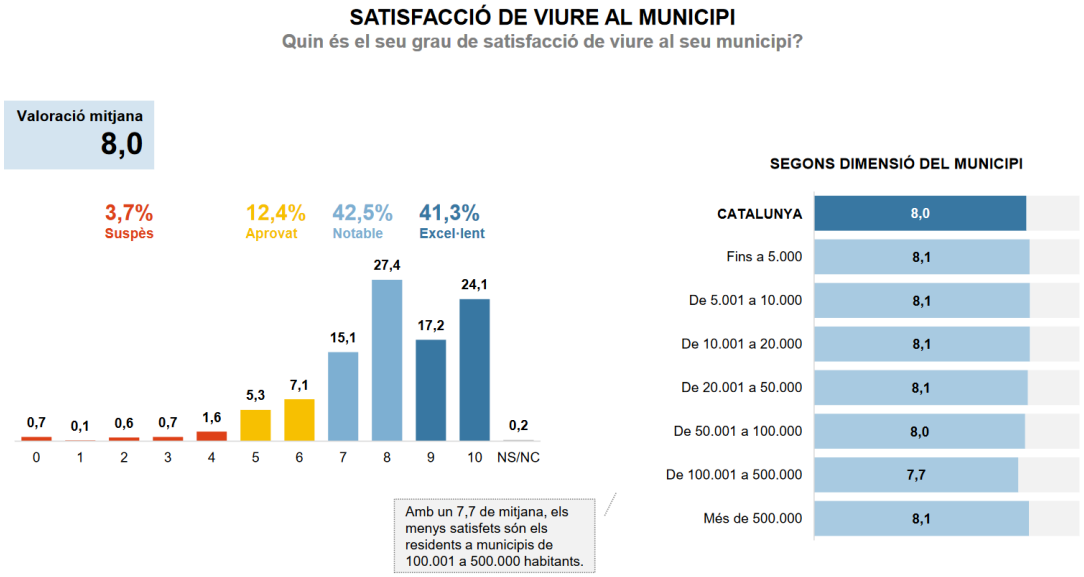
1.2 Rationale for selecting the case study

In Catalonia, there is a high perception of QoL on the part of the population. Meanwhile, around the region, practices of reflection upon QoL and the use of the concept, both as an empirical measuring stick and as a conceptual framework, have taken hold to varying degrees, in some cases very deeply. Various initiatives in this regard are rooted at the local or urban level and serve various territorial and sectorial policies.

Catalans’ overall perception of the quality of life in their region is positive. They tend to be proud of their territory and lifestyle. The average score Catalans give to their general satisfaction with the cities they live in is 8 out of 10, and education, social coexistence, leisure opportunities, sports and health services were among the factors seen as specific positive assets.

A 2019 survey of 850 non-natives who had been living in Barcelona for at least 3 months found that the aspect of Barcelona most valued by foreign residents is the city’s quality of life (43%), followed by climate (25%) and culture (12%). When asked to rate quality of life, practically all the participants (99%) rated Barcelona’s quality of life as satisfactory, good, or excellent. Elsewhere, Mercer rated Barcelona 1st among Spanish cities in terms of quality of life for foreign residents (39th globally out of 230 cities analysed) in its ranking intended to provide information on local conditions for workers and executives sent to work abroad.

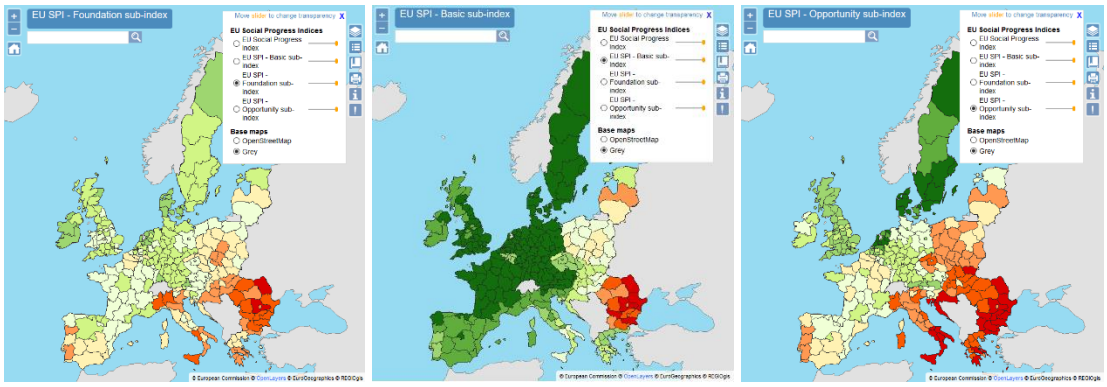
Figure 3.Degree of satisfaction with life in your municipality.



Source: Opendata Barcelona. Ajuntament de Barcelona.

These very positive subjective results contrast with the poor results of the regional EU-SPI for Barcelona/Catalonia (DGRegio 2016). Although Catalonia was the sixty-eighth richest region in Europe in terms of GDP per capita in 2011, in the EU-SPI Catalonia occupied position number 163. The index showed a great deal of contrast between how regions performed if GDP per capita was used as a measure of well-being, and how they performed using the EU-SPI.

Figure 4. EU SPI Foundation sub-index (left), Basic sub-index (middle) and Opportunity sub-index (right).

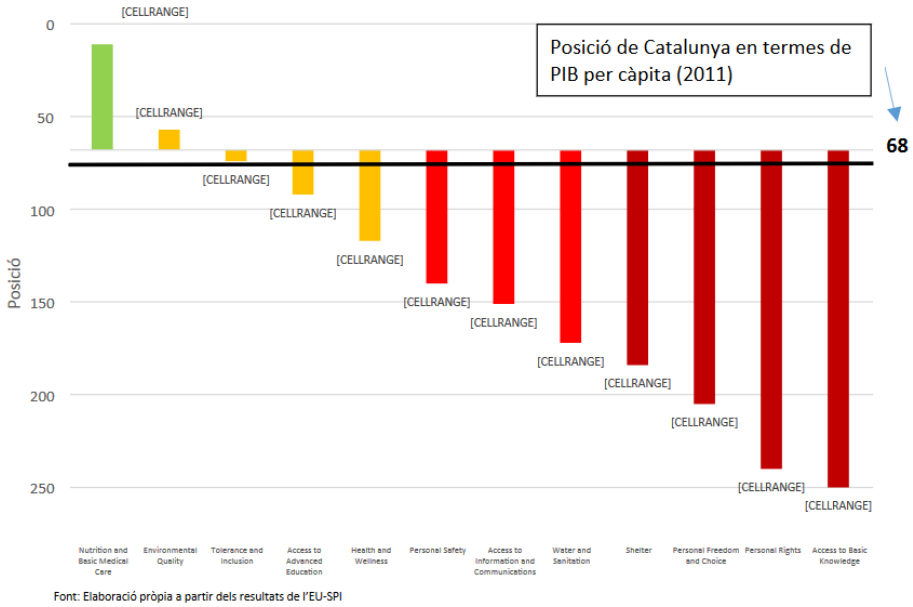


Source: DGRegio EU-SPI (2016).
https://ec.europa.eu/regional_policy/en/information/maps/social_progress

In response to this result, a number of studies in the region have delved into the possible reasons for this divergence. Among them is a report by the Catalunya Europa Foundation, which in 2017 identified the following issues as the potential origins of this great divergence:

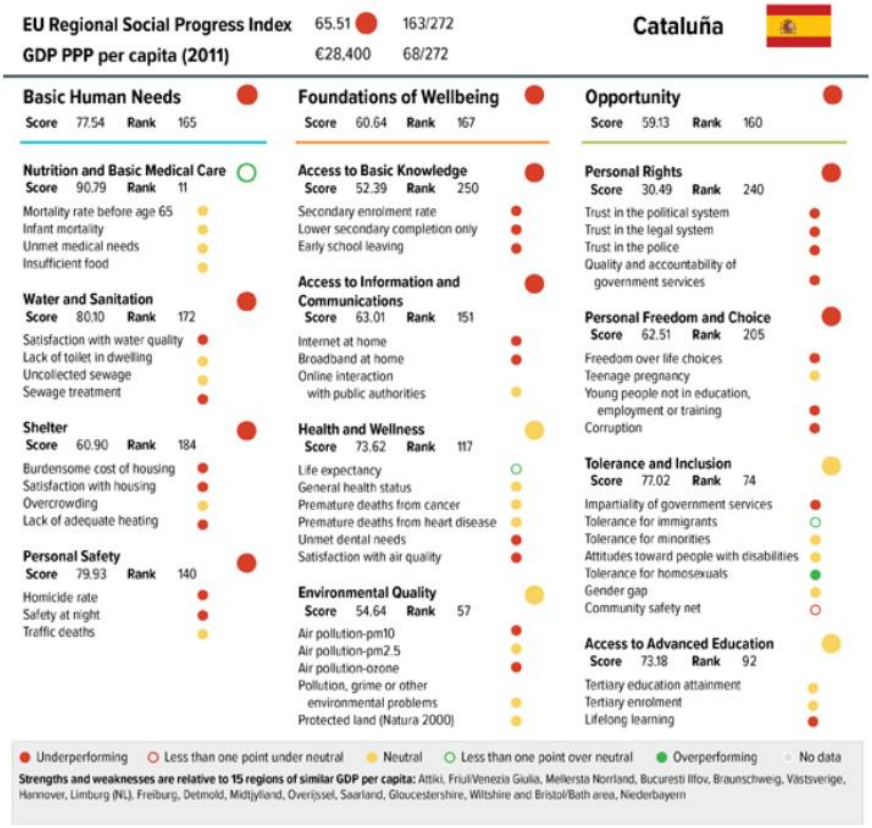
1. Access to basic knowledge, including variables such as the number of people with education beyond secondary school and the share of early school leavers. Catalonia is among the 30 worst regions in Europe.
2. Access to housing, reflecting sharp increases in housing costs in Spain between 2005 and 2015, among the biggest increases in Europe over the same period, together with Ireland.
3. Democratic quality, measured by perceived personal rights, personal freedom and freedom of choice. The citizens of Catalonia seem to have a low degree of confidence in their political and legal system.

Figure 5. Synthesis of Catalonia/Barcelona's relative positions in the rankings of the 12 EU-SPI key components. Source: Catalonia-Europe Foundation, 2017.



Source: Created by the authors from the data provided by DGREgio EU-SPI.

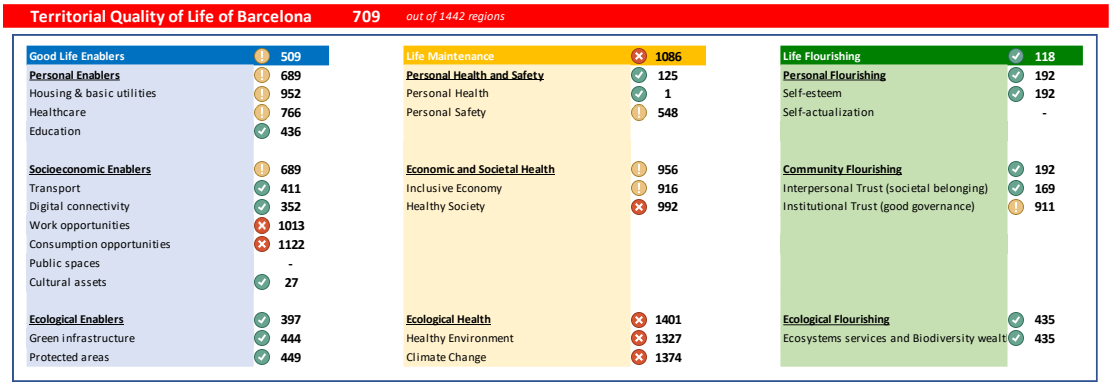
Figure 6. Catalonia's performance in different EU Regional Social Progress Index domains.



Source: DGRegio EU-SPI (2016).
https://ec.europa.eu/regional_policy/en/information/maps/social_progress

If we look at the results of the Territorial Quality of Life Index, we can compare the performance of the Barcelona region (ES511) with that of other European regions (1442 regions). The figure below shows the performance of the Barcelona region represented with the European Dashboard.

Figure 7. Territorial Quality of Life performance of Barcelona (ES511) in Europe.



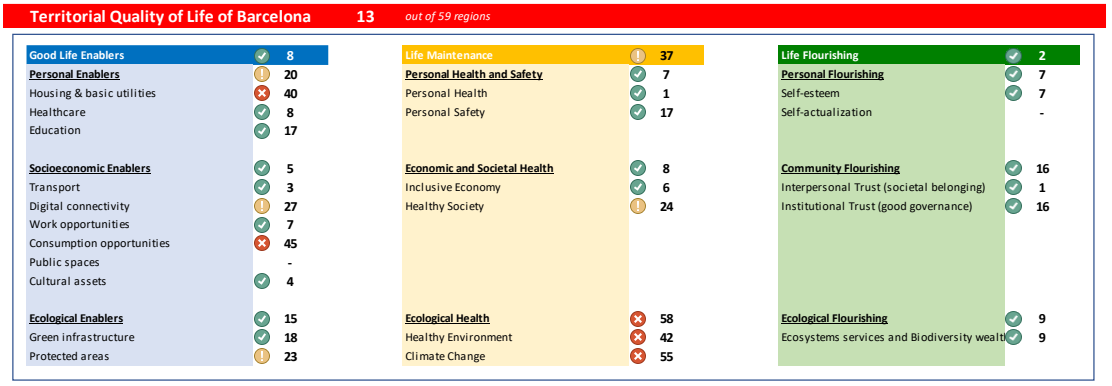
Barcelona occupies the 709th position out of the 1442 NUTS3 regions in Europe. At a dimensional level, Barcelona has an average performance (509th) in the "Good Life Enabler" dimension, driven by its good performance in the Ecological Enablers domain (green infrastructures and protected areas) but hampered by its mediocre performance in the Socio-economic Enablers (work opportunities and consumption opportunities) and Personal Enablers (housing & basic utilities, and health care) domains.

The region's performance is poor (1086th) in the "Life Maintenance" dimension, driven by low performance in Ecological Health domain (healthy environment and climate change) and the mediocre performance in the Economic and Societal health domain (inclusive economy and healthy society).

The "Life Flourishing" domain shows the best performance (118th) of the three dimensions, due to the general high performance of all the 3 domains that compose it, Personal (self-esteem), Community (interpersonal and institutional trust) and Ecological Flourishing (ecosystems and biodiversity).

On the national level of Spain, measured on the sub-domain level, Barcelona shows a comparatively high performance in almost every single sub-domain, with the only exceptions being housing and basic utilities, a healthy environment and climate change, 4 out of the 22 total sub-dimensions. This allows Barcelona to occupy the 13th position out of the 59 regions of Spain.

Figure 8. Territorial Quality of Life performance of Barcelona (ES511) in Spain.



Additionally, a 2014 report conducted by the Credit Suisse research institute showed how an independent Catalonia would improve its score on the United Nation's Human Development Index (HDI) and climb to 20th place in this ranking, while Spain would drop by three places to 26th. The report argued that small countries tend to have a higher standard of living due to a number of factors including more efficient services, a higher chance of benefitting from globalisation and a more homogenous population. It uses these findings to predict the potential HDI scores of territories seeking independence, such as Catalonia, Scotland, Flanders and Quebec.

In this case study we will explore, firstly, the initiatives being brought forth by local authorities in the Catalonia region, and in particular in the Barcelona municipality, to monitor citizens' quality of life. We will also discuss the underlying purposes of these monitoring activities, namely to lend support to social and environmental policies. Finally, we will examine the tools used to accomplish this. In other words, we will look at the indicators and monitoring systems that have been adopted.

Secondly, we will apply experimental TQoL indicators developed in our ESPON QoL project using available local data at the level of neighbourhoods. This will allow us to learn from our methodological research and to better understand the meaning and implications of the choices made to define the TQoL indicators. We will contrast the outcomes of this exercise with ongoing quality of life initiatives already under way in the city.

2 Policy context

2.1 Outline of the QoL concept

2.1.1 Social service law and related initiatives

In recent years, the Catalan government has been striving to understand, evaluate and apply the concept of *quality of life*. It has taken a great deal of interest in creating methodological and conceptual instruments to help plan better strategies to develop social policies.

Research into QoL and the implementation of the concept have been closely related to social issues. This led to the passage of the "**Social Services Law**" (Law12/2007 *Llei de Serveis Socials*). One of the objectives of this legislation is to ensure that social services meet certain quality standards, guaranteeing citizens' quality of life. According to this law, there is a direct link between the quality of social services offered by the Administration and the quality of life of the population.

The law proclaims that "*everyone has the right to a standard of living that will ensure they and their families', health and well-being, especially food, clothing, housing, medical care and the necessary social services"*. It goes on to say that the *"social service system must… [take] as a reference the concept of quality of life and ensure that services and resources are adapted to the social needs and development of the community to achieve high rates of quality of life".*

The Social Services Law was passed before the 2008-2014 financial crisis, but no flagship initiatives emerged from it. The austerity measures implemented during the crisis put pressure on any public budgetary efforts to support social services.

Still, an increasing number of municipalities and counties are using quality of life indicators as a central element for policy guidance. For instance, there has been some recent research into quality of life in the Cerdanya county in the Pyrenees, which is a high income region and tourist destination. There have also been quality of life surveys in metropolitan area municipalities such as Sabadell (200.000 inhabitants), Terrassa (200.000 inh.) and Mataró (150.000 inh.), as well as studies on social use of leisure time in a number of metropolitan municipalities.

The *Barcelona Metropolitan Strategic Plan for 2030* centres its proposal for the Barcelona Functional Urban Area (FUA) around the principles of social and economic progress based on innovation and sustainability, with the aims of reducing social inequality, segregation and spatial injustice. To achieve these ends, the strategy defines three main pillars of action, intended, respectively, to move toward an environmentally-driven "Resilient Metropolis" (air quality, health, food protection, and public space), an affluence-driven "Prosperous Metropolis" (social innovation, reindustrialisation, soft mobility, green infrastructure, digitalisation), and a cohesion-driven "Cohesive Metropolis" (social inclusion, gender balance, open governance).

2.1.2 Urban strategies

In the city of Barcelona, the current city council continues to emphasise the social dimension of public policies via several targeted programs and initiatives, including work on issues such as poverty, housing, education, culture, gender equality, ageing, the environment and public space.

The previous mayoral term witnessed the passage in 2017 of the *Barcelona Social Inclusion Strategy for 2027*, a document defining a city model aimed at making substantial progress to better guarantee citizens' social rights of its citizens, guided by a vision of "*a socially fair city, where difference is respected and valued, a leader in equality, respect, coexistence and solidarity; a habitable and hospitable city that will accommodate all those who work and live in it, revitalise their neighbourhoods and confront the process of expulsion of residents caused by*

financial globalisation. An educating city, opening up a wide range of opportunities to everyone throughout their lives. A feminist city, where gender equity is a reality. And a healthy city that takes care of everyone, where sustainability and environmental justice are indispensable."

The *Municipal Action Plan (PAM) 2020-2023* outlines the political programme to be applied by the current municipal government during this term and defines the following six main objectives:

- to combat the climate emergency
- to reduce social inequalities
- to create a more liveable, healthier, safer and more resilient urban environment and public space
- to achieve economic progress
- to create a more accessible and efficient administration
- to promote education in culture and science.

These objectives are translated into six strategic pillars: i) social rights; ii) climate emergency; iii) economic progress; iv) the right to the city; v) learning and creativity; and vi) governance. Work on each of these areas is being carried out via the implementation of several key actions, with a special focus on concerns such as the quality of housing stock, the proximity to green spaces, air quality and noise pollution rates, all important factors shaping the quality of life in the city's neighbourhoods.

2.1.3 Sectoral plans and strategies targeting quality of life

QoL is at the centre of a number of sectoral strategies that are currently being implemented in the region. They deal with issues such as access to housing, health, social inclusion, environment, public space, ICT and knowledge. The most important among them are briefly described below.

Access to housing

Housing Plan for 2016 – 2025: The objective of the Barcelona Housing Plan for 2016-2025 is to guarantee the social function of housing and the creation of a public housing service. This plan seeks to address issues such as the difficulty of rent payments or the lack of public rental housing stock. The Plan is deploying 59 actions, steps taken with the aims of preventing and attending to the housing emergency, guaranteeing the good use of housing, expanding the number of affordable flats and rehabilitating the existing local housing stock. In addition, this Plan addresses the specificities of each of the districts of Barcelona, identifying the main shortcomings and strengths in relation to housing access in each.

Health

Barcelona Mental Health Plan for 2016 – 2022: This Plan lays the groundwork for improvements in preventive care and treatment for mental health. Improving residents' mental health requires actions in the environments where people's daily lives take place. That is why the actions are territorialised, taking into account the distinct needs of each neighbourhood.

Social Inclusion

Plan for the Promotion the Quality of Youth Employment for 2016 – 2020*:* This plan aims to guarantee equal opportunities regardless of the neighbourhood of residence, gender, education level or social background of young people of Barcelona. The Plan works to encourage educational success, support young people in their introduction to the labour market, promote vocational training, encourage employers to recruit young people and guarantee the quality of labour conditions for younger workers.

The **Barcelona Strategy for Demographic Change and Ageing** is aimed at increasing local resilience in light of the fact that by the year 2030 one in three inhabitants of the city will be 60 years of age or older, and 66% of those over 80 will be women. This strategy was launched to help the city adapt to the democratic challenges associated with an aging population. It seeks to promote comprehensive, community-based care services for older people and to encourage active ageing and intergenerational coexistence.

The city's **Neighbourhood Plans** are part of a municipal initiative in which city government collaborates with local residents on social, economic and urban planning projects aimed at improving the 16 most vulnerable neighbourhoods in the city. The actions are focused on:

- Education: creating comprehensive, transformative education projects, and supporting schools in their complementary socio-educational tasks.
- Health: addressing the main social inequalities that cause health problems, founded upon a comprehensive, preventive and community-based approach.
- Cultural assets: promoting culture as a tool for social transformation, linking it to local facilities, schools, and equal access and participation for all groups.
- Economic activities: promoting local development and the local economy, linked to the needs of people, and fostering job opportunities.
- Urban spaces: addressing urban planning problems such as poor housing quality and lack of facilities.

Environment

Urban Mobility Plan 2013-2018: The Barcelona Urban Mobility Plan is the planning tool that defines the city's lines of action with regard to urban mobility. The strategic goal is to continue to advance towards a collective mobility model that is more sustainable, more efficient, safer, healthier and fairer. The Plan calls for a series of measures aimed at giving a more central role to pedestrians and cyclists ad at promoting the use of collective public transport while reducing the use of private vehicles, all in order to improve the quality of the city's mobility, enhance road safety and boost the efficiency of the mobility system.

Plan for the Improvement of Barcelona's Air Quality for 2015-2018: This Plan includes actions designed to combat air pollution in Barcelona and to move towards to a more efficient society with lower levels of emissions. The idea is to improve the environment and citizens' overall quality of life. The actions carried out are grouped into six basic areas: mobility, energy, port / airport, urban services and communication and information transparency.

Public Space

Superblocks programme: The objective of this programme is to improve and transform public space by addressing the shortage of green spaces in the city, reducing the levels of environmental and noise pollution, decreasing the frequency of traffic accidents and reversing the tendency toward more sedentary lifestyles. The superblocks help strike a better balance the in distribution of public space between private vehicles and people, giving priority to pedestrians and promoting sustainable mobility.

Green and Biodiversity Plan 2012-2020: This document defines the municipal government's challenges, objectives and commitments in relation to the conservation of the city's biological diversity. The document features plans for long-term actions designed to strengthen the city's ecological infrastructure, thus providing the population with a range of environmental and social benefits.

ICT and Knowledge

Barcelona Digital City" Plan 2017–2020: The goal of this Plan is to harness the potential of technological advances to help create a more democratic, sustainable and equitable city. The document highlights the important role of data in transforming the city, as better information allows us to provide better and more accessible public services and to have a more open, agile and efficient local administration. The actions taken under this Plan are already strengthening the capacities of the citizens and the innovative economic fabric necessary for an intelligent city that is at the service of the population.

2.2 Governance levels and the use of QoL in a policy context

At the national level, traditionally the concept of quality of life has been closely related to the welfare state. The indicators used to measure this concept have been mainly economic. Over the years, though, new variables have come to be considered integral to quality of life. These new indicators range from those related to personal and collective wellbeing (health, education, personal relationships, security and wealth), to others that are strictly economic (GDP, employment rates...), to environmental factors (air quality, biodiversity...).

Despite the growing appreciation for the multi-faceted nature of the concept, regional and local administrations frequently must choose specific systems to assess the quality of life in their territories. Local administrations decide on the economic, social or environmental aspects that they are most interested in measuring. Then, they apply the chosen indicators, based on the information they have available or on the information they are able to obtain through their databases, surveys, etc.

In the case of Catalonia, the Generalitat is committed to evaluating welfare and social progress within the Catalan territory based on indicators from the socioeconomic and environmental sphere: living and working conditions, health, education, environmental quality, housing, security, leisure and culture, and social inclusion and civic participation. At the level of Catalonia, there are also sector-specific indicators that analyse key aspects of the wellbeing of the population, for example in the field of health (lifestyles, quality of the health system...). However, sectoral analyses focused on specific fields are not very common at the regional level.

Meanwhile, there is also a set of indicators to evaluate the quality of life of the population of the Barcelona Metropolitan Region. The Barcelona Institute of Regional and Metropolitan Studies, together with the Barcelona Metropolitan Area, monitor data for indicators on demography, social and urban cohesion, housing, coexistence and security, the economy, mobility and sustainability in the 36 metropolitan municipalities in the Barcelona area. The information can be displayed in aggregate for the entire Metropolitan Area. Some of the information is also provided for the city of Barcelona individually. The indicators are intended to represent an overview of living conditions in the Barcelona Metropolitan Region.

The Barcelona City Council also measures the living conditions of its citizens at the district and neighbourhood levels. Several indicators are used for this analysis. The local administration has developed a system of indicators to evaluate Barcelona's sustainability. Improving sustainability is one of the main goals of the current government, which has expressed a commitment to achieving environmental, economic and social sustainability as a way to contribute to people's wellbeing. That is why the city's sustainability indicators go further than others and encompass not only environmental factors, but also economic (employment rates…) and social factors (educational level, income distribution...), embracing a broad definition of sustainable development.

In recent years, the local administration has placed a great deal of emphasis on assessing the situation of children and adolescents in the city. The Barcelona Social Observatory has been

carrying out an exhaustive analysis of the personal, economic, social and relational status of children and adolescents of Barcelona. These sectoral analyses have yielded results in the form of a set of highly detailed indicators. Other institutions work along similar lines. The Barcelona Public Health Agency collects data on a set of indicators to assess the state of health of the population in order to analyse inequalities between neighbourhoods and districts in the city. Individual and collective health is closely related to citizens' quality of life. That is why the Barcelona Public Health Agency also collects data on the physical and socioeconomic characteristics of each neighbourhood as part of its analyses.

In all cases, from the Catalan government to the Barcelona City Council, government officials use these indicators to monitor the evolution of economic, social and environmental conditions in society as a whole and in different age groups, in order to find out whether these conditions have improved or worsened over the years.

The following table shows the scope of study that each administration uses to assess quality of life. The table makes clear that although supra-municipal levels of government tend to cover practically all areas, their level of detail is lower, while local organisations in charge of sector-specific analyses often focus their attention on a specific area but tend to collect much more detailed information.

Table 2 Barcelona institutions addressing the ESPON QoL domains

		Catalan Government	Barcelona Metropolitan Region	City Council	Sectorial		
					Health Agency	Social Observatory	Housing Observatory
Quality of Life Enablers	*Personal sphere*	■	■	■	■	■	■
	Socioeconomic sphere	■	■	■			
	Ecological sphere			■	■		
Life Maintenance	*Personal health and safety*	■	■		■	■	
	Economic and social health	■	■	■	■	■	■
	Ecological health	■	■	■	■		
Life Flourishing	*Personal Flourishing*			■		■	
	Community Flourishing		■	■		■	
	Ecological Flourishing		■				

2.3 Success factors and obstacles

In 2010, the Open Data BCN project was created. It serves as an innovative model of how to gather, process and share data of general interest to the public sector, companies, administrations, organisations and social groups in Barcelona.

The Open Data BCN portal includes more than 450 data sets. They are regularly updated, available in various formats and can be downloaded. The data is classified into five blocks:

- Administration: information on the public sector, contracting, legislation and justice, human resources.

- City and services: data on transport, culture and leisure, the environment, security, sports, tourism, citizen participation, and public opinion.
- Economy and business: data on trade, employment, science and technology.
- Population: demographic, social, welfare and education data.
- Territory: data on housing, urban planning and infrastructure.

In addition, several initiatives are being carried out by other public institutions in the city to obtain and publish data of different types, at different scales, and for different sectors within the city. The Public Health Agency, the Social Observatory, the Housing Observatory and others collect data to monitor activities in their respective fields, areas such as health, social conditions and access to housing. This increases the amount of data available on the city of Barcelona.

The ability to refer to this information facilitates demographic, urban planning, climate, air quality, mobility, citizen opinion, traffic accident, housing and infrastructure analyses. A large number of these indicators are available both at the city-wide level and for each neighbourhood.

This easy access to a wealth and variety of data makes it possible to obtain a range of basic city indicators, many of which are directly or indirectly connected to the evolution of quality of life in the city. Thus, some of the currently available indicators could be aggregated to calculate a quality of life indicator.

However, an integrated framework for the analysis of the quality of life in the city has not yet been developed based on the data provided by the various indicators analysed to date. As of today, there is no single indicator, or set of indicators, that represent the overall calculation of quality of life in Barcelona.

2.4 Achievements and further plans

The implementation of the “Barcelona Ciutat Digital” city strategy has led to the collection, management and dissemination of new data dealing with different elements of the city: mobility, infrastructure, health, education, green areas, etc. The city council plans to analyse these data to generate the kind of knowledge it needs to fully evaluate the current situation in the city in institutional, territorial, economic and social terms. This knowledge will then inform changes in local public policies.

The implementation of this strategy has involved the creation of new data gathering systems. The city now collects information on a wider range of areas, including a number of social, economic, cultural indicators that are regularly published in city reports.

Within the framework of this strategy, Barcelona has created a Municipal Data Office, in charge of the city's data processing activities. One of the main objectives of this office is to promote and coordinate the efficient management of Barcelona’s data. The service’s responsibilities include data collection and storage, analyses and predictions in areas of interest connected to the management of the city (demography, traffic, cultural habits, waste, air quality, public opinion...), and communication and dissemination of the results of its studies.

Although in recent years the City Council has deepened its commitment to obtaining and processing data to improve the management of municipal services, there is no initiative or policy in the public sphere that collects information in the short- or medium-term as an integrated framework for calculating an indicator of quality of life in Barcelona.

3 Measuring Quality of Life

3.1 Indicators and measurement in Barcelona

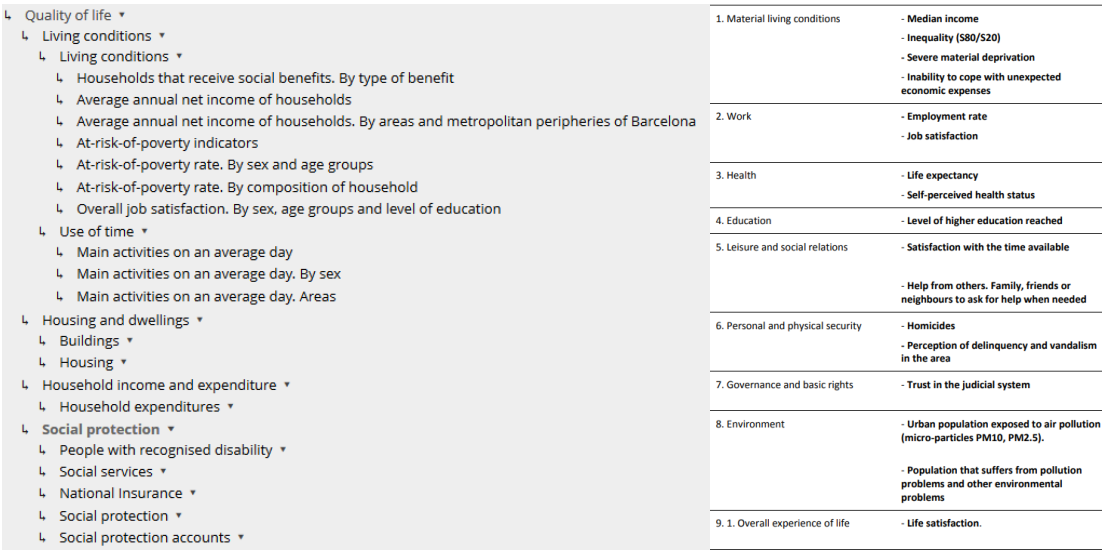
3.1.1 Catalonia's quality of life indicators

Official data related to quality of life, gathered by the Catalan statistics office Idescat or the Spanish National Statistics office (INE), are displayed below. These data are based on the *Life Conditions Survey* carried out by INE, within the framework of the EU-SILC. It offers data on poverty and people at risk, housing stock conditions, public services, the welfare state, and leisure habits.

Most of this information is usually delivered in aggregate form for the Catalonia region as a whole (ES51). As such, comparisons with Spain's average or other neighbouring regions are possible. Data related to housing and dwellings and to social services are also delivered at the provincial level (NUTS3) and even at the county level in some cases (LAU1).

A list of the key indicators gathered locally is presented below.

Figure 9. Data related to quality of life provided by the Catalan statistics office (left) and the Spanish statistics office (right)



- Quality of life
  - Living conditions
    - Living conditions
      - Households that receive social benefits. By type of benefit
      - Average annual net income of households
      - Average annual net income of households. By areas and metropolitan peripheries of Barcelona
      - At-risk-of-poverty indicators
      - At-risk-of-poverty rate. By sex and age groups
      - At-risk-of-poverty rate. By composition of household
      - Overall job satisfaction. By sex, age groups and level of education
    - Use of time
      - Main activities on an average day
      - Main activities on an average day. By sex
      - Main activities on an average day. Areas
  - Housing and dwellings
    - Buildings
    - Housing
  - Household income and expenditure
    - Household expenditures
  - **Social protection**
    - People with recognised disability
    - Social services
    - National Insurance
    - Social protection
    - Social protection accounts

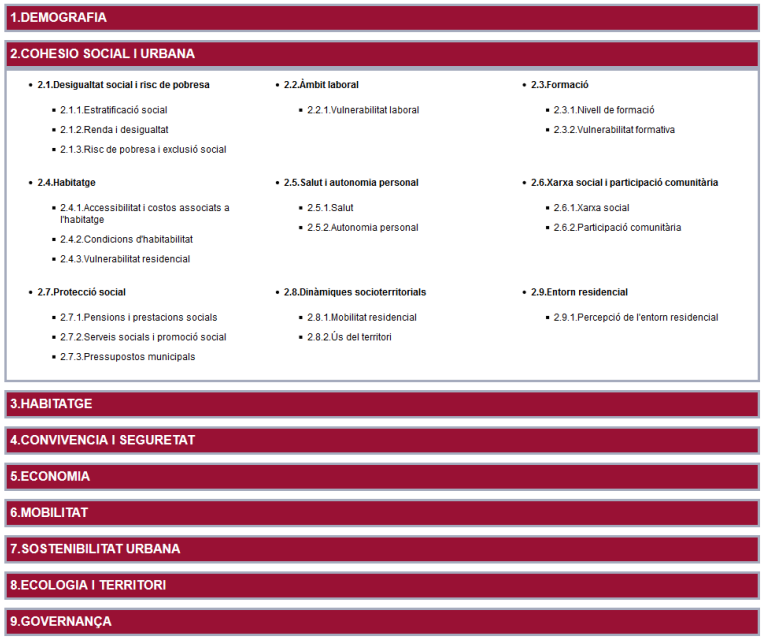
1. Material living conditions	- **Median income** - **Inequality (S80/S20)** - **Severe material deprivation** - **Inability to cope with unexpected economic expenses**
2. Work	- **Employment rate** - **Job satisfaction**
3. Health	- **Life expectancy** - **Self-perceived health status**
4. Education	- **Level of higher education reached**
5. Leisure and social relations	- **Satisfaction with the time available** - **Help from others. Family, friends or neighbours to ask for help when needed**
6. Personal and physical security	- **Homicides** - **Perception of delinquency and vandalism in the area**
7. Governance and basic rights	- **Trust in the judicial system**
8. Environment	- **Urban population exposed to air pollution (micro-particles PM10, PM2.5).** - **Population that suffers from pollution problems and other environmental problems**
9. 1. Overall experience of life	- **Life satisfaction**.

Source: INE (2019). Life Conditions Survey. https://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736176807&menu=ultiDatos&idp=1254735976608

3.1.2 QoL in the Barcelona Metropolitan Region FUA

In the case of Barcelona, local data is available on a number of variables. In particular, data is available from the IRMB via the system *Metropolitan Statistics on Living Conditions* (EMCV). The survey is taken annually and collects information related to income, material deprivation, housing, the labour market, job training and education, and health. Furthermore, the *Urban Cohesion Survey* (ECURB) is conducted every three years to collect information regarding residential mobility, territorial uses and the social perception of quality of the residential environment. Data are usually provided in aggregate for the city of Barcelona as a whole and for its Metropolitan Region. Survey data are available for 2011 and for 2016-2017 (SIMBA).

Figure 10. SIMBA system of data at the municipal level for the city of Barcelona and at the level of the Metropolitan Region.



Source: AMB (2019). System of data at municipal level for the City of Barcelona. https://iermbdb.uab.cat/

3.1.3 Barcelona's Sustainability indicators

Barcelona city council issues an annual *Sustainability Indicators* report. The document consists of a dashboard of indicators that does not focus exclusively on environmental issues. Instead, it is intended as an overarching monitoring system of social sustainability in the city, neatly aligning with quality of life concerns of this report.

The indicators included in the *Sustainability Indicators* report respond to the variables set out in a document entitled "Citizen Commitment to Sustainability for 2012-2022". They are meant to provide a picture of the current socioeconomic and environmental situation in Barcelona. Each area is evaluated via the indicators detailed in the table below.

Table 3 Data from the Sustainability Indicators Report

OBJECTIU	INDICADOR		OBJECTIU	VALOR 2016	GRAU D'ASSOLIMENT	VALOR MÍNIM	VALOR MÀXIM
1. Biodiversitat	1.1 Superfície verda	Superfície verda per habitant	18,5	17,6	31,2%	17,2	18,5
2. Espai públic i mobilitat	2.1 Ecomobilitat	Pes de l'ecomobilitat en els desplaçaments realitzats	85,1%	73,9%	86,4%	0	85,1%
	2.2 Seguretat viària	Nombre de víctimes en accidents de trànsit	220	282	73,9%	220	454
3. Qualitat ambiental i salut	3.1 Qualitat de l'aire	Concentració mitjana de NO_2	40	39	100,0%	40	58
		Concentració mitjana de PM_{10}	40	25	100,0%	40	37
		Concentració mitjana de $PM_{2,5}$	25	14,7	100,0%	26	19,6
	3.3 Qualitat de l'aigua de consum humà	Grau de compliment de la qualitat microbiològica	99%	100%	100,0%	0	99%
		Grau de compliment de la qualitat físico-química	99,7%	100%	100,0%	0	100%
		Grau de compliment de la desinfecció	95%	99,4%	100,0%	0	95%
		Grau de compliment de la concentració THM	100%	100%	100,0%	0	100%
4. Ciutat eficient, productiva i d'emissions zero	4.2 Consum d'aigua	Proporció d'aigua consumida pels serveis municipals d'origen freàtic (Índex sostenibilitat)	63,5%	17,8%	31,5%	0	63,5%
5. Ús racional dels recursos	5.2 Generació de residus municipal	Residus municipals generats	1,38	1,26	100,0%	1,38	1,54
	5.3 Recollida selectiva de residus	Proporció de residus municipals recollits selectivament	60,0%	35,9%	60,3%	0	60%
	5.4 Destí dels residus municipals	Proporció RM valorats materialment	55,0%	35,1%	64,6%	0	55%
		Proporció RM amb destí a dipòsit controlat	0,0%	2,7%	27,3%	0	5,5%

Table 3 Data from the Sustainability Indicators Report

6. Bon govern i responsabilitat social	6.2 Endeutament del Govern municipal	Proporció que suposa el deute sobre els ingressos corrents	60,0%	32,9%	100,0%	60	62,6%
7. Benestar de les persones	7.2 Accessibilitat a l'habitatge	Esforç econòmic d'accés a l'habitatge	40,0%	34,0%	100,0%	40	79,9%
10. Resiliència i responsabilitat planetària	10.1 Canvi climàtic	Volum emès de CO_2 eq per habitant	2,53	2,21	100,0%	2,53	3,44
	10.2 Autosuficiència energètica	Proporció d'energia consumida generada localment	100%	2,29%	79,6%	0	100%

Source: Ajuntament de Barcelona (2016). https://media-edg.barcelona.cat/wp-content/uploads/2018/05/17095539/Indicadors-de-Sostenibilitat-de-Barcelona.-Informe-2016.pdf

Table 4 Sustainability Indicators. Set used by the city of Barcelona to assess progress on quality of life

Area	Indicator	Time scale	Territorial level
Biodiversity	Green areas	Annual	Municipal District
	Biodiversity of birds	Annual	Municipal
Public space and mobility	Road traffic safety	Monthly	Municipal
	Eco-mobility	Annual	Municipal
Environmental quality and health	Air quality	Annual	District
	Acoustic quality	Five-year	Municipal
	Water quality	Annual	Municipal
Efficient, productive and zero-emission city	Housing stock quality	Annual	Municipal
	Water consumption	Annual	Municipal
	ICT deployment in households	Annual	Municipal
Rational use of resources	Responsible consumption	Annual	Municipal
	Waste generation	Annual	Municipal
	Waste management	Annual	Municipal
Good governance and social responsibility	Municipal expenditure in the environmental and social areas	Annual	Municipal
	Municipal government debt	Annual	Municipal
	Sustainability certifications	Annual	Municipal
People's well-being	Life expectancy at birth	Annual	District
	Accessibility to housing	Annual	District
	Employment rate	Annual	Municipal
	Income distribution	Annual	District
	Access to the cultural offer	Annual	Municipal
	Citizen satisfaction	Annual	District
Economic progress and development	Innovation rate	Annual	Municipal
Education and citizen action	Levels of education	Annual	Municipal
Global resilience and responsibility	Energy self-sufficiency	Annual	Municipal
	Climate change	Annual	Municipal

3.1.4 URBAN HEART monitoring system of the Public Health Agency of Barcelona

The Barcelona Public Health Agency has created a monitoring system on the health and quality of life of Barcelona's citizens, working both at the scale of districts (InfoDistrictes) and neighbourhoods (InfoBarris).

InfoBarris and InfoDistrictes are intended as tools to support the analysis of health and its determinants in the neighbourhoods of the city of Barcelona. The programme's calculations yield a set of indicators that are available at the neighbourhood level. These neighbourhood data can always be compared to the figures of the larger district to which a neighbourhood belongs and to the city as a whole. InfoBarris seeks to discover the determinants of health and inequalities in health in smaller urban areas. It also offers socioeconomic data on the population and information on sexual and reproductive health, health behaviours, safety, drug habits, major diseases, mortality and sanitary services.

Both systems make it possible to monitor key indicators over time and to compare geographic areas, and they are presented as user-friendly dashboards for external users. They display results in infographics and allow for full database downloading in standard formats (Excel).

Figure 11. InfoBarris performance table of indicators, by neighbourhood.

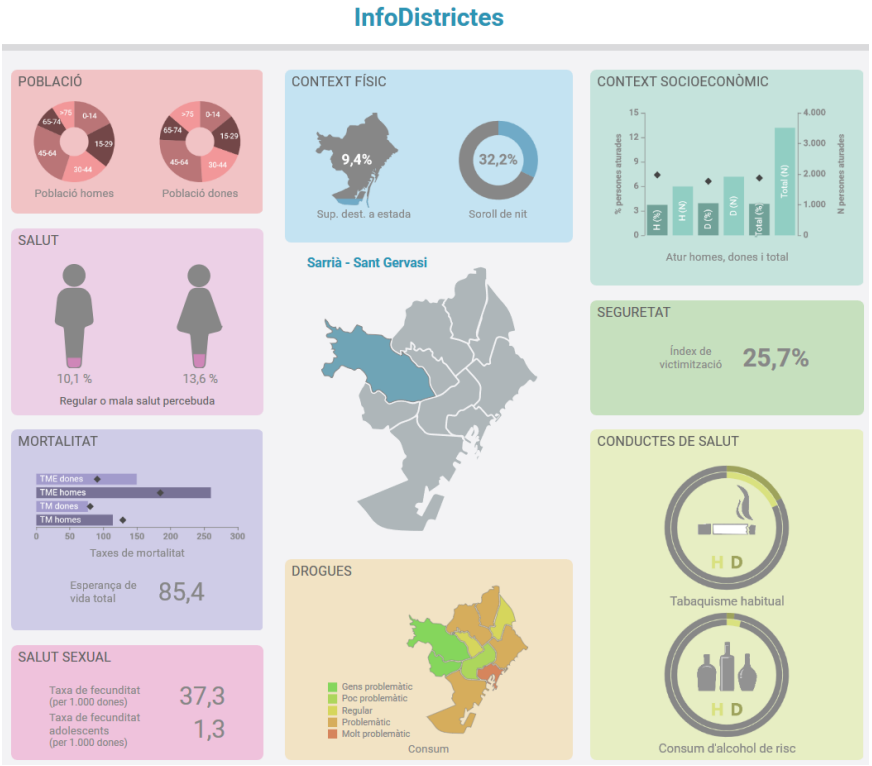
Urban Heart

Any Informe: 2017

			Taxa mortalitat prematura	Taxa de tu berculosis	Taxa de go nocòccia	Taxa de fecunditat adolescent	Índex de Co nsum Probl emàtic..	Àrea del barri destinada..	Índex de vegetació	Km recorr eguts pels vehicles..	Raó del % d' habitatge..	Taxa de persones ateses pe..	Taxa de persones menors d..	Persones de 16 a 29 anys amb..	Índex de Renda Familiar Di..	Atur registrat entre per..	Abstenció a les darreres ..
Ciutat Vella	1	El Raval	362,3	93,6	121,8	19,3	2,33	0,4	0,107	89,7	0,270	87,7	56,5	34,6	65,9	11,0	54,9
	2	El Barri Gòtic	240,7	48,4	103,1	5,1	1,71	0,2	0,094	76,5	0,091	69,6	28,1	15,4	98,5	9,0	50,1
	3	La Barceloneta	434,9	52,4	50,2	6,6	3,01	3,2	0,092	123,6	0,145	77,2	58,3	20,0	84,5	11,3	52,9
	4	Sant Pere, Santa Caterina i la Ri..	371,6	25,1	82,6	16,2	1,28	7,3	0,173	35,5	0,099	69,4	26,7	21,8	92,5	10,0	49,6
Eixample	5	El Fort Pienc	210,7	10,5	33,6	3,6	-0,98	2,8	0,139	81,7	0,078	29,6	6,7	17,4	104,5	7,0	36,0
	6	La Sagrada Família	222,8	11,0	27,8	6,3	-0,71	0,9	0,134	77,6	0,100	34,0	9,0	16,0	92,4	7,2	38,0
	7	La Dreta de l'Eixample	218,7	9,2	44,4	1,3	-0,84	0,5	0,129	227,2	0,065	26,1	3,8	14,5	165,3	5,8	35,0
	8	L'Antiga Esquerra de l'Eixample	224,1	6,4	80,5	2,9	-0,95	0,6	0,121	130,1	0,073	29,1	5,4	13,5	127,8	6,6	36,8
	9	la Nova Esquerra de l'Eixample	228,5	8,1	46,7	4,8	-0,75	1,5	0,136	80,8	0,079	32,1	7,8	15,2	109,1	7,0	36,7
	10	Sant Antoni	252,3	12,2	67,0	6,1	-0,76	0,2	0,142	71,9	0,083	43,2	16,7	19,3	97,8	7,6	38,6
Sants-Montjuïc	11	El Poblesec	306,0	38,5	48,4	13,9	0,53	16,5	0,202	115,9	0,165	63,5	20,0	28,7	66,3	9,9	46,6
	12	La Marina del Prat Vermell	306,0	38,5	48,4	13,9	14,39	15,2	0,073	359,9	0,162	94,3	38,7	50,8	39,4	19,3	64,8
	13	La Marina del Port	277,3	18,7	26,4	9,3	-0,10	3,5	0,156	38,9	0,113	55,6	14,2	33,1	72,0	10,5	44,5
	14	La Font de la Guatlla	206,3	6,4	35,4	5,5	-0,34	2,2	0,164	16,1	0,089	29,0	7,1	19,1	77,6	10,2	41,7
	15	Hostafrancs	257,1	25,2	31,5	9,1	-0,27	0,0	0,108	30,1	0,110	50,5	12,7	23,8	76,8	7,8	41,2
	16	La Bordeta	272,0	10,9	16,3	9,6	-0,77	1,5	0,112	65,3	0,086	32,3	18,8	20,8	76,0	8,3	38,9
	17	Sants-Badal	243,9	23,4	30,3	21,2	-0,91	0,2	0,098	19,6	0,105	39,0	10,0	21,7	79,6	7,0	41,2
	18	Sants	225,6	19,5	30,9	9,0	-0,62	1,2	0,108	65,6	0,096	38,8	20,7	19,7	85,8	7,7	37,1
Les Corts	19	Les Corts	176,1	14,4	18,8	2,8	-1,02	1,8	0,150	137,5	0,077	24,3	5,4	15,4	125,4	7,5	33,8
	20	La Maternitat i Sant Ramón	178,0	7,0	15,4	7,6	-1,16	4,4	0,157	116,8	0,074	34,2	9,3	15,0	112,6	7,5	35,4
	21	Pedralbes	242,6	0,0	5,7	1,5	-1,06	19,0	0,230	234,0	0,089	10,6	0,9	20,3	251,7	3,6	35,7
Sarrià-Sant Gervasi	22	Vallvidrera, el Tibidabo i les Plan..	279,8	0,0	21,8	4,5	-0,84	0,0	0,341	54,2	0,144	40,8	14,5	24,3	162,8	3,6	36,8
	23	Sarrià	220,2	9,5	12,2	5,5	-1,05	9,1	0,226	197,0	0,108	17,5	7,3	20,5	195,2	3,7	33,3
	24	Les Tres Torres	193,5	6,1	4,1	0,0	-0,30	1,2	0,172	53,7	0,120	7,5	0,8	16,9	217,8	4,2	31,7
	25	Sant Gervasi-La Bonanova	200,9	7,9	7,9	0,0	-1,00	2,2	0,201	155,3	0,090	15,2	2,0	17,0	191,8	4,4	35,4
	26	Sant Gervasi-Galvany	209,7	10,0	12,1	1,7	-1,06	2,4	0,132	97,1	0,087	14,4	2,2	17,1	192,1	4,4	33,3
	27	El Putxet i el Farró	222,7	9,2	11,5	2,2	-0,63	3,7	0,144	42,1	0,072	21,9	5,0	16,0	140,2	6,4	34,0
Gràcia	28	Vallcarca i els Penitents	265,6	15,1	10,8	3,5	-0,08	0,3	0,192	104,9	0,078	31,4	3,8	17,3	101,6	7,8	35,6
	29	El Coll	277,0	4,6	27,5	0,0	-0,55	4,9	0,187	7,3	0,072	62,5	15,7	19,8	81,6	6,7	42,3
	30	La Salut	323,6	22,7	7,6	0,0	-0,52	11,5	0,177	27,3	0,076	28,3	20,1	18,7	107,3	7,5	37,0
	31	La Vila de Gràcia	241,2	15,8	33,6	15,3	-0,71	0,4	0,108	46,7	0,064	40,5	6,0	14,5	118,1	7,2	36,7
	32	El Camp d'en Grassot i Gràcia N..	216,7	10,7	31,2	4,1	-0,79	0,1	0,124	36,2	0,058	34,8	7,0	15,1	103,7	7,4	32,9
Horta-Guinardó	33	El Baix Guinardó	260,5	14,3	24,8	9,1	-1,02	2,1	0,142	41,0	0,073	41,9	10,4	16,7	86,6	7,7	39,2
	34	Can Baró	195,1	15,0	7,5	5,8	-0,01	0,9	0,165	18,0	0,088	50,2	27,9	22,7	77,4	7,7	41,1

Source: https://www.aspb.cat/docs/infobarris/

Figure 12. InfoDistricts dashboard of key indicators, by district



Source: https://www.aspb.cat/docs/infodistrictes/

3.1.5 Barcelona Social Observatory – A system monitoring the living conditions of Barcelona residents

The Barcelona Social Observatory is an instrument that allows us to understand the social reality of the citizens of Barcelona. Its main objectives are to assess the situation and evolution of the living conditions of the population and to examine the social processes that affect people's quality of life and social cohesion in the city.

The Observatory collects data on indicators in a range of areas: the economy, labour conditions, employment, education, health and housing. The results are broken down by age and social group: children and adolescents, young people, women, elderly people. It also includes territorial indicators at the neighbourhood and district level that can be consulted using interactive maps.

The list of indicators analysed by Barcelona Social Observatory are:

- Large population groups
- Population by age groups, 0-18 years of age
- Young population of 15-34 years of age
- Demographic dependency index
- Aging and over-aging index
- Loneliness of the elderly aged 65 and over
- Place of birth of the population
- Nationality of the population
- Level of education of the population aged 16 and over
- Income level of the population
- Non-contributory social security pensions
- Population with a certificate of disability

- Population with disabilities, by type of disability.

3.1.6 BCN Observatory 0-17: monitoring the lifestyles of children and adolescences in Barcelona

This tool is used by Barcelona city council to consult, analyse and monitor data relating to children and adolescents in the city. The data here focus special attention on those in the most socially vulnerable situations in order to help officials determine the reality of these groups in the city and to shape policies that contribute to equal opportunities and social cohesion.

Data are displayed through a system of district indicators and annual key data reports. There is a total of 130 indicators, divided into the following dimensions:

Table 5 Sample of indicators in BCN Observatory 0-17. Set of data used by the city of Barcelona to assess the progress of children and adolescents living in Barcelona

Dimension	Sub-dimension	Indicators
Socio-demographic context	Population	Youth dependency index
		Index of the working age population replacement
		Projection of population of children and adolescents (0-17)
	Socio-demographic profiles	Children and adolescents by nationality (0-17)
		Homes with children and adolescents (0-17)
		Child and adolescent population by average family income
Education	Education (0-2)	Rate of schooling
		School children aged 0-2, by family income
		% of children enrolled in schools by type of school
	Primary and secondary school	Absenteeism rate
		% of students with low achievement of school results
		Secondary school students rate
	Post-compulsory education	Degree of satisfaction with student life
		Perceived safety in the school environment
		Fear of being abused in school
Health	Physical health conditions	Children with sleeping difficulties
		Hospitalization rate for children and adolescents
		Childhood obesity rate
	Mental health conditions	Children with mental health problems (4-14)
		Adolescents who suffer from depression or anxiety (15-17)
		Suicide attempts of children and adolescents (8-17)
	Healthy habits	Children and adolescents who eat breakfast daily (3-17)
		Children and adolescents who get enough sleep
		Children and adolescents who exercise regularly (6-16)
	Risky habits	Fertility rate in adolescent girls (15-19)
		Adolescents initiated in the habit of drinking alcohol (13-17)
		Adolescents initiated in the habit of smoking tobacco (13-17)
Poverty, exclusion and inequality	Poverty and social exclusion	Children and adolescents at risk of poverty and / or social exclusion
	Income inequalities	Income inequality of children and adolescents, according to the Gini Index
		Children and adolescents living below the poverty line
		Children and adolescents living in households where adults are unemployed
	Material deprivation, food and housing	Children and adolescents living in a home with humidity problems, lack of light or environmental pollution
		Children and adolescents living in households where they are not able to eat meat or fish

Dimension	Sub-dimension	Indicators
Relationships & leisure time	Activities in the free time	Children and adolescents doing extracurricular activities (6-16)
		Adolescents with physical inactivity or sedentary lifestyles (13-17)
		Children who are not satisfied with the use of their free time (10-12)
	Relationships	Teenagers who say they have no friends
		Teenagers who think that their relationships with their families are not good
		Children who do not see their friends very often (10-12)
	Citizenship	Children who are not satisfied with the neighbourhood where they live (10-12)
		Children who are not satisfied with how adults talk to them (10-12)
Violence, social risk and protection	Violence	Children who report suffering from physical or verbal violence at school
		Children (10-12) who do not feel safe their daily life environments (home, school and neighbourhood)
		Adolescents who report suffering from bullying
	Socially at-risk	Children and adolescents whose social risk situation has been assessed at the request of the judicial system (0-17)
	Child protection	% children and adolescents under a tutelary regime

3.1.7 Barcelona Housing Indicators

Barcelona's Municipal Housing Indicators are produced by the Local Housing Observatory of the Barcelona Provincial Council. An open viewer makes it possible to compare data from Barcelona with those of other municipalities in the Barcelona region.

The 80 indicators here are organised into four domains: population, housing conditions, housing market, and housing policies.

Table 6. Barcelona Housing Indicators sample. Set of data used by the Barcelona province administration to assess the housing sector

Domains	Subdomains	Indicators
People	Demography factors	Population growth rate
		Migratory balance
		Aging index
	Socio-economic factors	Low level of education
		Family income
		Unemployment rate
Housing	Housing stock	Multifamily buildings
		Small homes
		Large homes
	Housing quality	Homes over 45 years old
		Buildings with houses in poor condition
		People living in dilapidated buildings
Housing market	Purchase and sale processes	Homes in property pending payment
		Purchase and sale of used homes
	Renting	Percentage of salary spent on rent
		Number of leases
	Homebuilding	Average built area of housing
		Housing built per inhabitant
	Supply and demand	Average rental price

Domains	Subdomains	Indicators
		Purchase price per m2
Housing policies	Sheltered housing and affordable housing	Applications for subsidised housing
		Contracts for public or rent-controlled housing
	Grants	Emergency rental aid
		Refurbishment grants

3.2 Data sources and tools for measuring QoL

A number of data sources and tools have been created to provide information related to quality of life (dashboards and observatories, reports). They are presented below.

3.2.1 Data sources

Data sources include statistical data bases generated by statistical institutions, data collected by other organisations, surveys and big data.

Statistical Databases

- IDESCAT – Idescat is the Catalan Government's statistical institution, charged with collecting data on Catalonia. The results can be viewed by municipality.
- SIMBA – An online platform that provides indicators for the Barcelona Metropolitan Region regarding demographics, social and urban cohesion, housing, coexistence and security, the economy, mobility and sustainability.
- Barcelona Opendata – A platform that provides statistical information about the local administration, local resources and services, the economy and industry, population and sustainability in Barcelona.
- Barcelona Observatory – A joint project of the Barcelona Chamber of Commerce and the Barcelona city council. The data collected for Barcelona can be compared with that of other major European and world cities. The indicators address business, knowledge, tourism, sustainability and quality of life, as well as the labour market and education and job training.

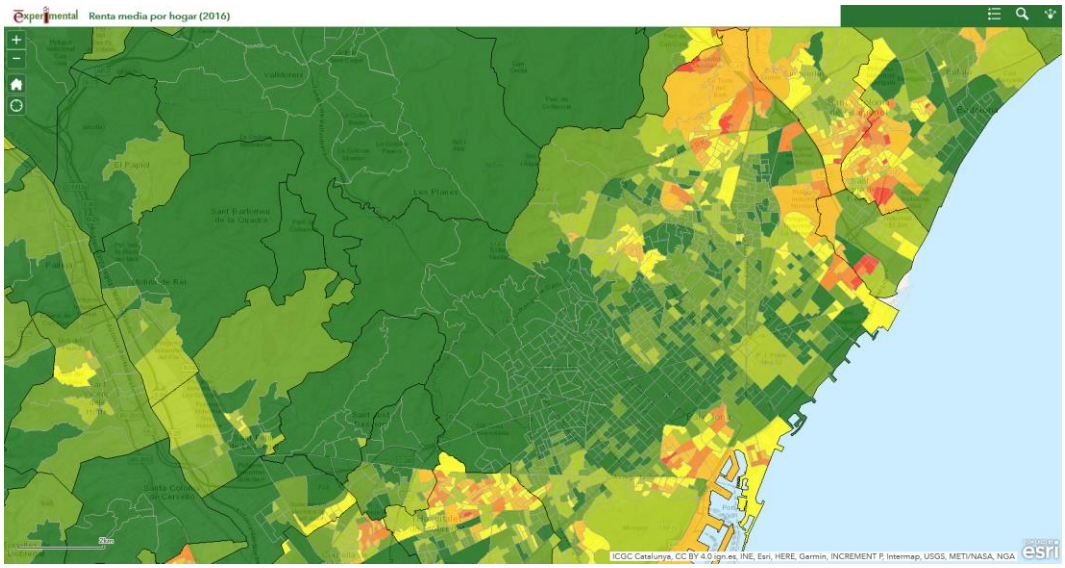
Other data sources featuring sub-municipal divisions

A number of indicators are available with data at a higher resolution than the municipal level.

- On the one hand, **census data at the level of an individual census sector** is available, offering indicators such as population (by age, sex, birth place, nationality, civil status, level of education), housing stock (number of houses by type of use: 1st home, 2nd home, vacant…, by property regime, by surface area, by number of rooms) or households (total, and by size). Census sectors within Barcelona are usually just a few blocks in size.
- Since 2019, the National Institute of Statistics has been providing **experimental economic data at the level of census sectors,** including information on income per person (2016), income per household and income origin (salary, pension, unemployment…).

- **Survey data and big data**. We can also find data on the QoL of Barcelona on diverse internet pages surveying QoL-related items. These websites often average different values and compare them with those of other cities around the world. Several examples exist, focussing on local residents, tourists, foreign residents or even businesses.

Figure 13. Economic distribution by census sector (experimental data). Source. INE 2016.



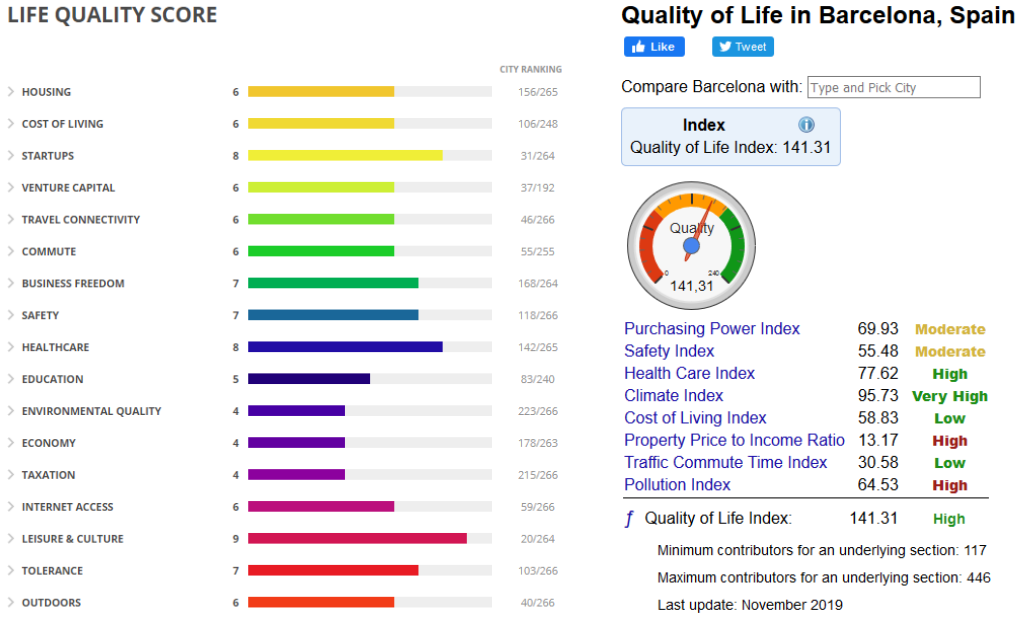
Source: https://www.ine.es/experimental/experimental.htm

Using subjective surveys to analyse quality of life

Several surveys are regularly conducted to monitor citizens' satisfaction with their lives in Barcelona, touching on a range of social and economic aspects of the city, including:

- **Barcelona health survey** – Provides subjective indicators of the health quality of the population based on people's own perception. The state of health is viewed as a key indicator of the QoL of citizens.
- **Municipal services survey** – Intended to gather citizens' perceptions of the city and the neighbourhoods where they live (degree of satisfaction, problems, demands…), and opinions about the municipal management of services. The results are presented at the neighbourhood level.
- **Socio-demographic survey of Barcelona** Describes the socio-demographic characteristics of the citizens, asking about a) housing; b) composition and characteristics of households; c) level of income, poverty risk and social exclusion; d) health status.
- **Barcelona Victimization Survey** – Reveals the perception of Barcelona residents of the level of security in the city and in their own neighbourhoods. Also addresses aspects of citizen coexistence within the neighbourhood. The results are broken down by neighbourhood and district.
- **Barcelona Barometer** – Sheds light on citizens' opinions on the social and economic evolution of Barcelona and the actions of the local administration. Also reveals their perceptions of the city's image, the state of the local economy, each respondent's own economic situation at home and their views of the labour market.
- **Qualitative study of Barcelona** – Based on discussion group sessions with citizens living in Barcelona. The results show how Barcelonans live in their city, Barcelona's territorial identities, and their perceptions of the city's evolution.
- **Social Values Survey** – Gathers citizens' opinions on ideological, ethical and attitudinal issues.

Figure 14. Data from other surveys or big data exploitation.



Source https://www.numbeo.com/quality-of-life/in/Barcelona, Source: https://teleport.org/cities/barcelona/

3.2.2 Tools for presenting QoL measurements

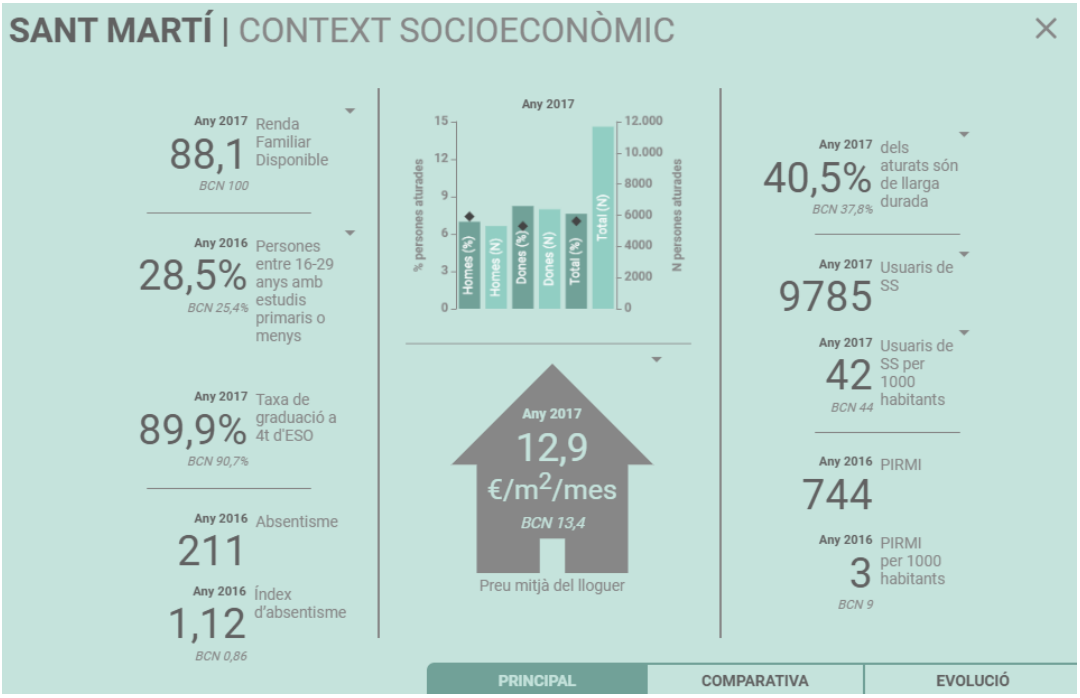
A number of informational tools that have been developed for various purposes are useful in presenting information on QoL. A discussion of the available tools follows below.

Dashboards

InfoBarris & InfoDistricts (online)

InfoDistrictes & InfoBarris is a tool for visualizing a set of health data on indicators collected by Public Health Agency of Barcelona. The data are presented at the district and neighbourhood level. There is also a selection of indicators that allow for comparison between districts and neighbourhoods and make it possible to assess the evolution of the data over time. Data can be downloaded.

Figure 15. InfoDistricts dashboard of key indicators, per district.

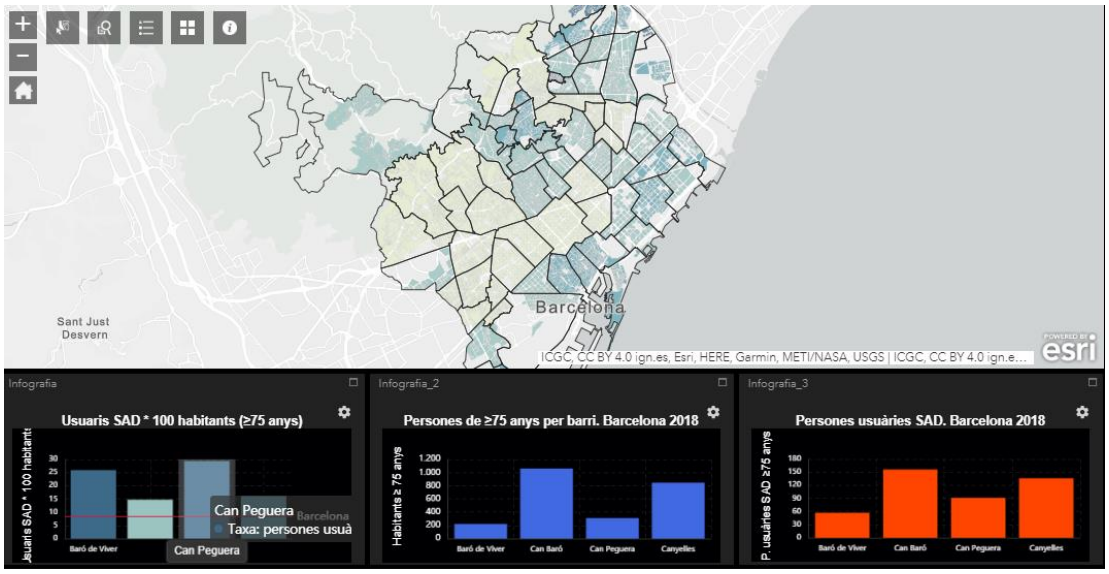


Source: Department of Green Spaces and Biodiversity Assessment. https://www.aspb.cat/docs/infodistrictes/

Social Observatory of Barcelona (online)

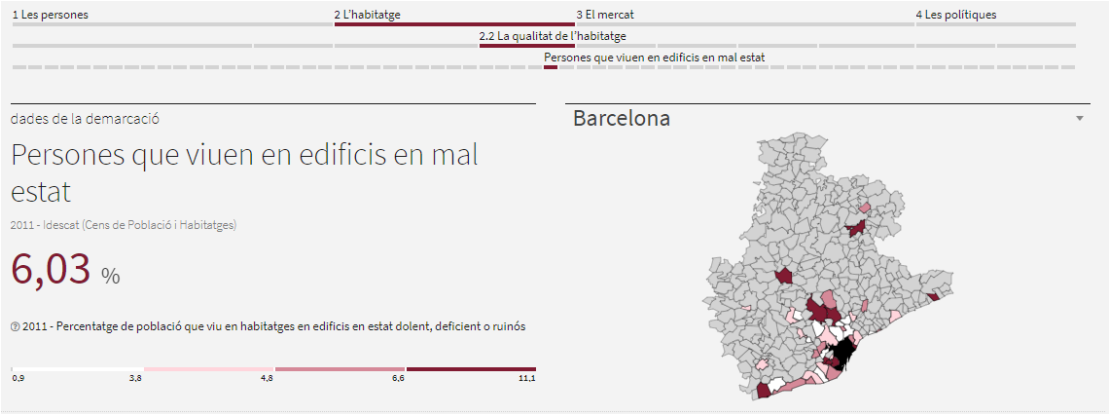
The results of the Barcelona Social Observatory are presented via an interactive dashboard that provides information on a set of key indicators related to social issues, neighbourhood by neighbourhood.

Figure 16. Barcelona Social Observatory dashboard of key indicators, by neighbourhood. https://ajuntament.barcelona.cat/dretssocials/ca/indicadors/informacio-territorial



Source: https://teleport.org/cities/barcelona/ This online tool presents a set of indicators related to housing using graphs and maps of all the municipalities of the Barcelona region. It can generate reports for each of the municipalities, offer synthetic visualizations of the statistics and facilitate the download of data on each indicator.

Figure 17. Barcelona Housing Observatory dashboard, by municipality



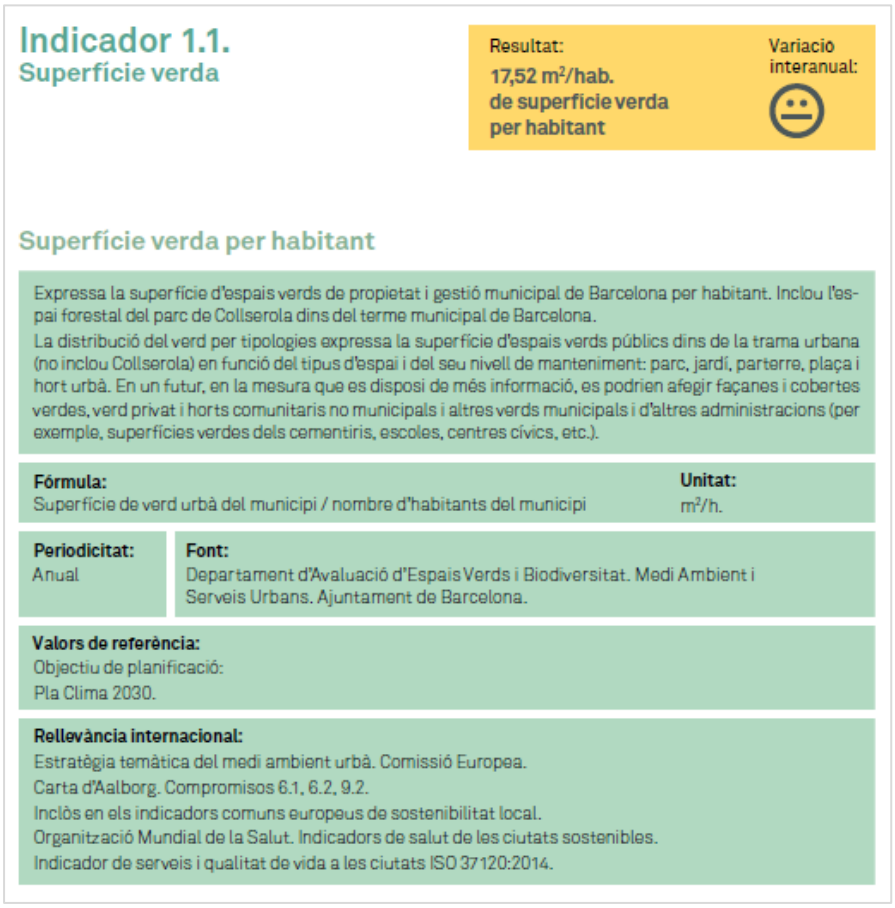
Source: https://media.diba.cat/diba/indicadors-habitatge/index.html

Reports

Barcelona Sustainability Indicators (report)

Barcelona's sustainability indicators are presented in an annual report. This report summarises and evaluates the city's evolution in relation to the objectives of the Citizen Commitment for Sustainability. The indicators address the areas of urban biodiversity, environmental quality, well-being, local resources and civic transparency.

Figure 18. Presentation of the results of each individual indicator in the Sustainability Indicators Report of Barcelona City Council (2018).



Source: Department of Green Spaces and Biodiversity Assessment. City Hall of Barcelona. https://www.barcelona.cat/barcelonasostenible/sites/default/files/Indicadors/web2015_ind1_1.pdf

Barcelona's current situation (report)

This annual report is used by Barcelona City Council as a tool to monitor the city's progress in terms of population, economic activity, social rights, sustainability and citizen participation. Each year's report contains a chapter that analyses the conditions of quality of life, including health, income, environment, job training and education, and service provision by the local administration.

Annual statistical report on Barcelona

This annual report collects statistical data on Barcelona. Broken into chapters, the report reflects the economic, social and environmental progress of Barcelona, offering data on indicators in the fields of the climate and the environment, demographics and population, health care and health policy, social well-being, economic activities, housing and mobility.

4 Analysing and testing the methodology used in the case study as compared to our TQoL approach

4.1 Comparing the QoL approach in the case study with our conceptual model

There are some similarities between the indicators collected by the Barcelona City Council and those gathered by other researchers using European methodologies.

All of Barcelona's monitoring initiatives are intended to the social and economic health of the local population. These initiatives analyse employment rates, the state of local economic activities, income distribution and education levels…, much like the analyses called for by the ESPON TQoL methodology.

Barcelona and a number of other cities strive to evaluate access to housing and the quality of the environment and public space, issues that are also addressed by the ESPON TQoL. Most of Barcelona's monitoring initiatives look at the domains of housing and environment. It is clear that these initiatives are based on the view that the quality of the urban environment plays a key role in guaranteeing the quality of life in the city.

However, certain other indicators that are not included in Barcelona's initiatives are collected by the ESPON TQoL. The European methodology gathers a set of indicators pertaining to the socioeconomic sphere, including access to transport system, access to commercial and cultural services, and ICT connectivity, considering all of these to be enabling factors that contribute to quality of life. Along these lines, Barcelona's initiatives analyse only ICT presence in households. Education and health data are not analysed in any great depth by local initiatives either.

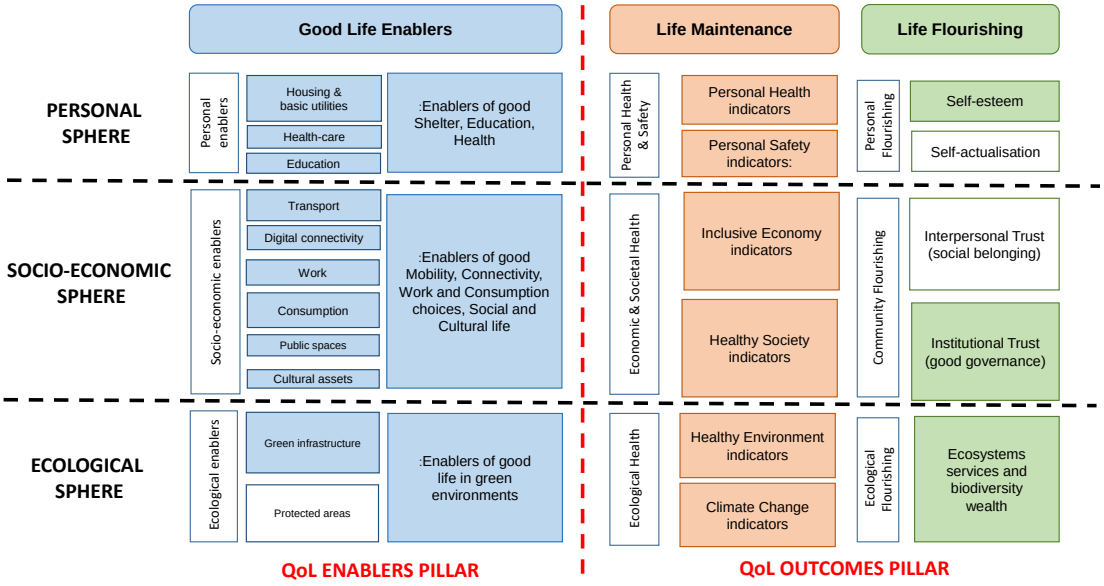
In the case of Barcelona, there is a specific study that attempts to calculate QoL as part of an effort to assess the degree of wellbeing of people in each district of the city. This indicator is collected via the *Sustainable Indicators of Barcelona Initiative*. It includes data on the evolution of life expectancy at birth over the years. Life expectancy is considered to be an important indicator of the health status of the population. The figure represents a forecast of the average number of years that people born at a given time will live, conditioned by the pattern of mortality at the time it is calculated. It is a synthetic indicator that incorporates, in a single figure, the experience of mortality of the whole population of all ages.

When we tried to match the indicators collected with the coding system, a total of 20 subdomains were covered. Some subdomains like health, education, transport, work opportunities, self-actualization and interpersonal trust were not covered by Barcelona's monitoring initiatives, or they were only covered in the form of more qualitative data. The sub-domain under the title "Protected Areas" does not apply at this local level and has not been considered in the elaboration of the composite index.

To overcome this issue, we collected quality of life related indicators from the Barcelona Statistics Department, the Metropolitan Transport Authority (ATM) and other relevant organisations with open databases. All the indicators gathered at the various local spatial levels (census tract, neighbourhood and district) are presented in the Annex section under the heading "Indicators".

When considering the "territorial quality of life measurement system" utilised in this project, the subdomains addressed by Barcelona at the neighbourhood level are mapped out in the following figure in accordance with our conceptual model. The allocation of each indicator to its assigned domain and sub-domain is shown in further detail in section 4.3.1, entitled Application of the dashboard.

Figure 19. The TQoL framework



4.2 Coding the indicators

The aim of this section is to analyse the applicability of the methodology developed for the European TQoL composite index to the local context of Barcelona, based on the selection of indicators employed by local authorities.

The TQoL measurement system is represented in the figure below as a framework of indicators made up of 9 domains and 22 subdomains.

In the following figure, the indicators collected via Barcelona's range of monitoring initiatives are placed within the nesting system developed as part of the conceptual framework of this study.

Table 7 Coding of Barcelona's monitoring initiatives and correspondence with ESPON TQoL, a cross-comparative table

Dimension	Domain	Sub-domain	Sustainability Indicators of Barcelona	Urban Heart Indicators	Social Observatory Indicators	Observatory 0-17 Indicators	Housing Observatory Indicators	Database sources (Statistic Department, ATM…)
Quality of Life Enablers	Personal Enablers	Housing & basic utilities	Housing stock quality Sustainability certifications Access to housing			Children/adolescents living in houses with humidity problems, lack of light or environmental pollution	Average built area of housing People living in dilapidated buildings Homes over 45 years old Buildings with houses in poor condition	
		Health						Area of the neighbourhood devoted to health services (%)
		Education						Area of the neighbourhood devoted to education services (%)
	Socioeconomic Enablers	Transport						Population with a good Public Transport Accessibility Index (PTAI)
		ICT connectivity	ICT deployment in households					
		Work opportunities						Area of the neighbourhood devoted to offices and tourism (%)
		Consumption opportunities	Responsible consumption					
		Public spaces		% of green areas per neighbourhood				
		Cultural Assets	Access to cultural activities					
	Ecological Enablers	Green infrastructure	Green areas	Urban vegetation index				
		Protected areas						
Life Maintenance	Personal Health and Safety	Personal health indicators	Life expectancy at birth	Premature mortality rate Gonococcal rate Adolescent fertility rate Drug consumption index Tuberculosis rate	Population with a certificate of disability Population with disabilities by type of disability	Youth dependency index Children with sleeping difficulties Hospitalization rate for children and adolescents Childhood obesity rate Adolescents who suffer from depression or anxiety Children and adolescents who exercise regularly Children with mental health problems	Ageing index	
		Personal safety indicators	Road traffic safety			Perceived safety in the school environment Fear of being abused in school Children who do not feel safe in their daily life environment (home, school or neighbourhood)		
	Economic and Societal Health	Inclusive economy indicators	Employment rate Income distribution	Employment rate Household income index	Income level of the population aged 60 and over Non-contributory social security pensions	Children and adolescents living in households where adults are unemployed	Family income Unemployment rate Applications for subsidized housing Average rental price	

Dimension	Domain	Sub-domain	Sustainability Indicators of Barcelona	Urban Heart Indicators	Social Observatory Indicators	Observatory 0-17 Indicators	Housing Observatory Indicators	Database sources (Statistic Department, ATM…)
							Homes in property pending payment	
		Healthy Society Indicators	Innovation rate Levels of education	Rate of people attended by social services % of children attended by social services People between 16-29 years of age with basic education	Aging and over-aging index Loneliness of the elderly aged 65 and over Level of education of the population Demographic dependency index	Rate of schooling Absenteeism rate % of students with low school achievement Children/ adolescents at risk of poverty	Low level of education Population growth rate Migratory balance Emergency rental aid Public housing and rent control contracts Percentage of salary devoted to rent	
	Ecological Health	Healthy Environment indicators	Air quality Water quality Water consumption Waste management Waste generation Energy self-sufficiency Acoustic quality					
		Climate Change indicators	Climate change					
Life Flourishing	Personal Flourishing	Self-esteem	Citizen satisfaction			Suicide attempts of children and adolescents Adolescents initiated into the habit of smoking tobacco Adolescents initiated into the habit of drinking alcohol Children who are not satisfied with the neighbourhood where they live Children who are not satisfied with the use of their free time Adolescents who report suffering from bullying Adolescents claiming to no have friends		
		Self-actualization				Teenagers who think that their relationships with their families are not good		
	Community Flourishing	Interpersonal Trust (Social Belonging)						
		Institutional Trust (good governance)		% lack of electoral participation				
	Ecological Flourishing	Ecosystems services and biodiversity wealth	Biodiversity of birds					Number of nesting bird species Number of plant and tree species

4.3 Application of the methodology to the case study context

4.3.1 Application of the dashboard

Based on the general framework and methodology developed by the ESPON TQoL composite indicator, we have selected indicators which are available locally to inform each of the dimensions and subdimensions of the indicator, and we have mapped quality of life at the local level (neighbourhoods) in the city of Barcelona.

The following table displays the indicators we believe correspond to each of the dimensions and subdimensions of the TQoL Composite Index for Barcelona's neighbourhoods.

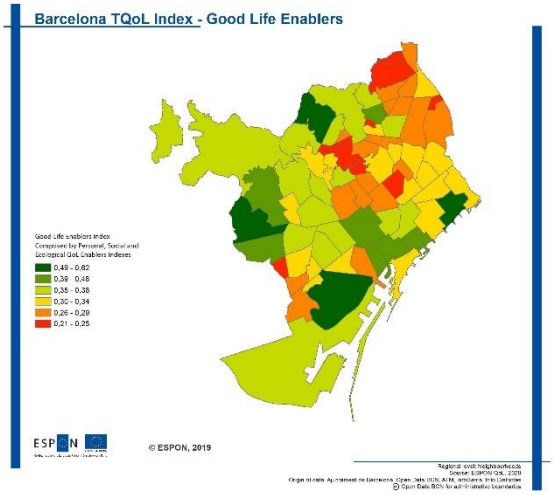
Table 8 Coding system for measuring TQoL in Barcelona's neighbourhoods

Dim.	Domain	Sub-domain (code)	Indicator	Data Source
Good Life Enablers	Personal Enablers	Housing & basic utilities (b11	Households lacking adequate heating	Main homes without heating
			Households without elevators	Dwelling without elevator (%)
		Healthcare (b12)	Availability of health services	Area of the neighbourhood intended for health services (%)
		Education (b13)	Availability of education services	Area of the neighbourhood devoted to education services (%)
	Socio-economic Enablers	Transport (b21)	Accessibility to public transport	% Population with an above average public transport accessibility index (PTAI)
		Digital connectivity (b22)	Households without telephone or internet service	Main homes by facilities III: telephone and internet
		Work opportunities (b23)	Availability of jobs (offices and tourism)	Area of the neighbourhood devoted to offices and tourism (%)
		Consumption opportunities (b24)	Availability of businesses	Percentage of storefront spaces registered as businesses
		Public spaces (b25)	Availability of public space for pedestrians	% Public space for pedestrians
		Cultural assets (b26)	Availability of cultural activities (shows and religion)	Area of the neighbourhood devoted to shows and religion (%)
	Ecological Enablers	Green infrastructure (b31)	Availability of green spaces	Area of the neighbourhood devoted to urban green spaces (%)
		Protected areas (b32)	No data available	No data available
Life Maintenance	Personal Health and Safety	Personal Health (m11)	Life expectancy at birth	Life expectancy
			Health status	Low weight at birth
				Tuberculosis rate
				Gonococcal rate
				Standardised HIV rate
			Drug abuse	Drug abuse Index
		Personal Safety (m12)	Safety on the street	Needles on the street (%)
			Criminality	Victimisation rate
			Traffic safety	Number of people injured or killed by traffic collision per vehicle-km
	Economic and Societal Health	Inclusive Economy (m21)	Unemployment	Total unemployment (%)
				Long-term unemployment (%)
		Healthy Society (m22)	Under 18 population served by Child and Adolescent Care Teams	Rate of people under 18 served by the Child and Adolescent Care Teams
			Population with primary education or less	People 16-29 years of age with primary education or less (%)
			Income distribution	Territorial income distribution in the city of Barcelona
			Elderly population living alone	Population >75 years that live alone (%)
	Ecological Health	Healthy Environment (m31)	Noise exposure	Noise
			Air Quality	NO2 concentration
		Climate Change (m32)	Distance travelled by motorized vehicles	Km travelled by motorised vehicles
Life Flourishing	Personal Flourishing	Self-esteem(f11)	Citizens suffering from depression	Risk of poor mental health
		Self-actualization(f12)	No data available	No data available
	Community Flourishing	Interpersonal Trust (societal belonging)(f21)	No data available	No data available
		Institutional Trust (good governance)(f22)	Participation in municipal elections	Lack of participation in the last municipal elections (%)
	Ecological Flourishing	Ecosystems services and Biodiversity wealth(f31)	Diversity of animal & plant species	Number of nesting bird species
				Number of plant and tree species

4.3.2 Mapping the Composite TQoL indicator

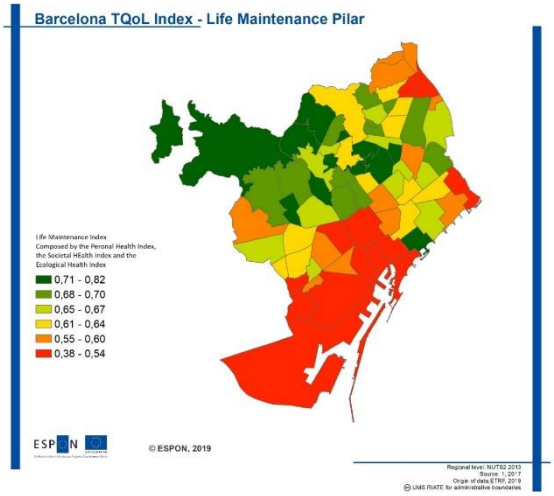
The following maps show the results produced using the TQoL composite index methodology at a local level (neighbourhoods). The first map shows the aggregate TQoL composite index (all three dimensions combined), and the subsequent maps separately depict each dimension: QoL enablers, life maintenance and life flourishing.

Figure 20 TQoL Index - Territorial Functioning Pillar



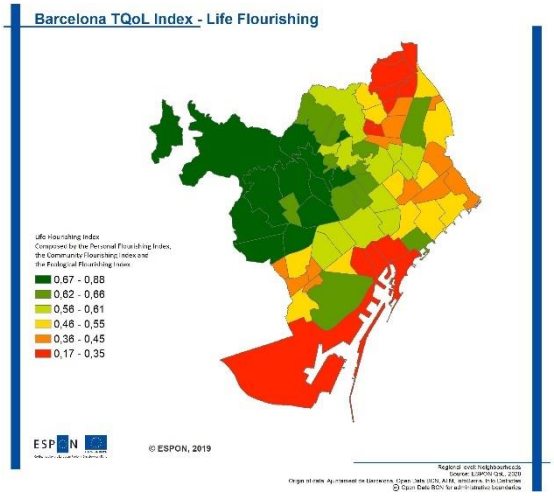
The Quality of Life Enablers dimension broadly follows the pattern of differences between neighbourhoods in terms of accessibility or remoteness. The suburbs in the northeast and the neighbourhoods with serious transportation deficits (neighbourhoods located in relatively high hills), tend to perform worse.

Figure 21 TQoL Index - Life Maintenance Pillar



This seems to be the most imbalanced dimension we have examined thus far, with the southern and north-eastern neighbourhoods scoring below average. Low "Personal Health and Safety" and "Economic and Societal" scores were found in the southern neighbourhoods, indicating low levels of economic health (unemployment, health status and criminality) and social wellbeing (education attainment, income distribution and elderly population living alone).

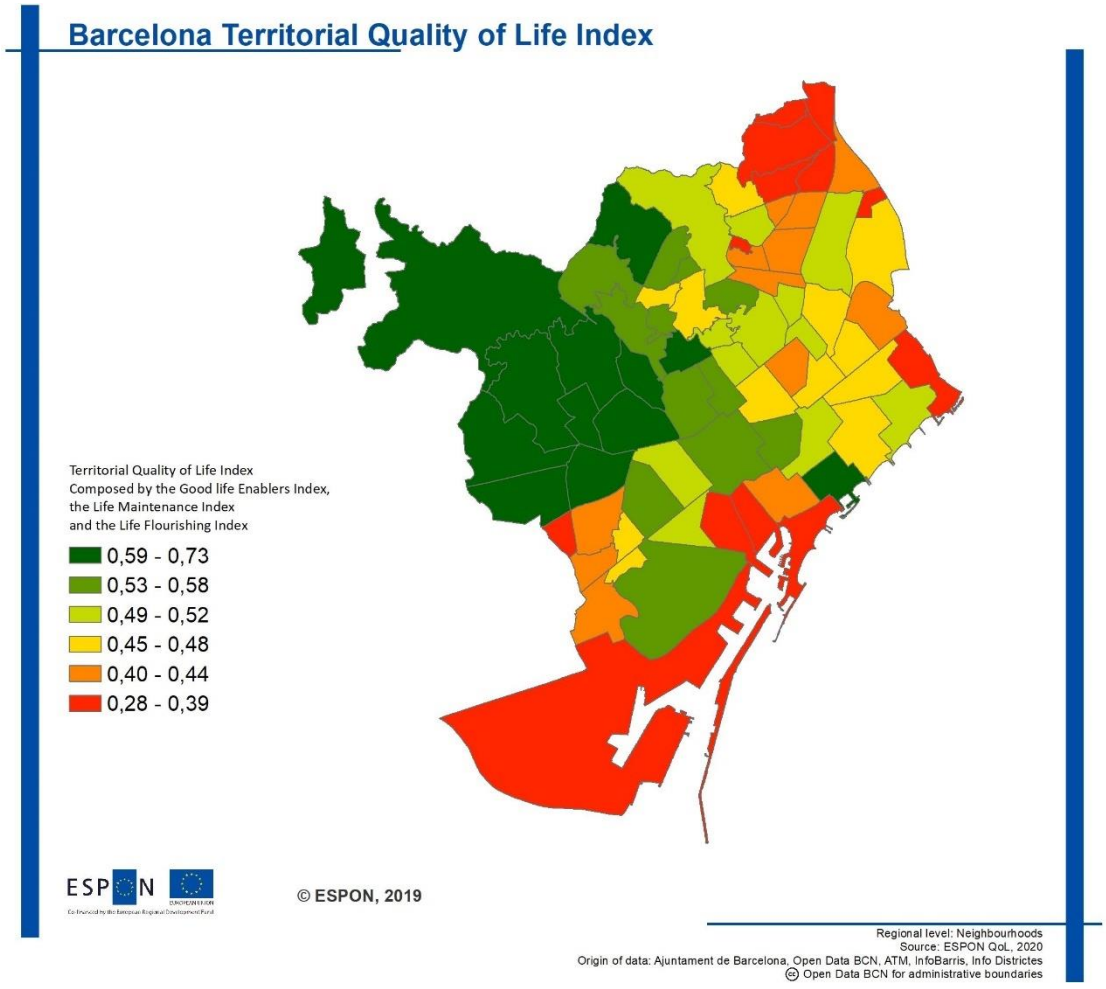
Figure 22 TQoL Index – Life Flourishing Pillar



Low scores for "Personal Flourishing" were again found in the neighbourhoods in the south and northeast of the city, driven by low performance on the measurement of self-esteem (represented here by the risk of poor mental health). The scores for "Community Flourishing" were also relatively low in the south and northeast, indicating low levels of trust in the public institutions (represented by participation in city elections). High levels of "Ecological Flourishing" were identified in the suburbs and in some isolated neighbourhoods, matching with the ones with extensive parkland.

The following map represents the results of the Territorial Quality of Life Index for Barcelona's neighbourhoods.

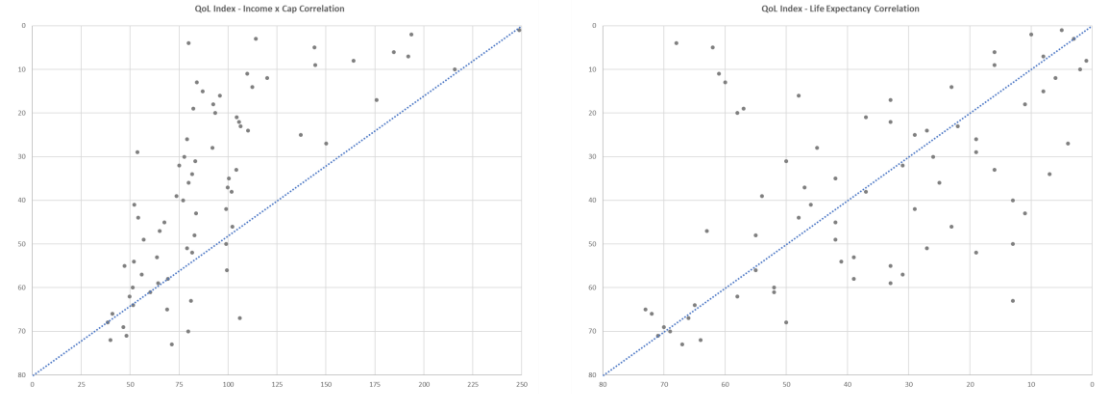
Figure 23 Territorial Quality of Life Index



This map confirms our expectations based on the TQoL Index maps of the three separate dimensions, as it shows a similar pattern. The poorest patterns are in the southern and north-

eastern neighbourhoods. For validation purposes, the composite TQoL index results have been compared to the per capita income and life expectancy figures. We investigated the correlations between the results of our TQoL composite index and where each Barcelona neighbourhood ranked in terms of per capita income and life expectancy. If the TQoL index was mostly wealth-driven, then it would stand to reason that neighbourhoods would tend to occupy similar ranks for both the TQoL index and for per capita income. This would mean, however, that our index would be a no more effective measure of quality of life than a mere per capita income ranking. The same can be said of life expectancy at birth. The following figures show the results of this analysis:

Figure 24 Correlation plot of the TQoL Index and mean per capita income (left) and life expectancy (right)



The correlation between the TQoL Index and income per capita does exist, but there are some deviations, and the same holds true for the correlation with life expectancy at birth, as shown by the relatively large dispersion of values around the regression lines.

4.3.3 Application of LC-clustering to test the indicator framework

LC-clustering analysis makes it possible to investigate different territorial quality of life patterns by comparing the behaviours of objective and subjective indicators as well as those of input/output and outcome indicators.[1]

The application of the cluster approach to the case of Barcelona has allowed us to take advantage of all benefits of the Latent Class cluster approach discussed above. Instead of using dimensions (composed of multiple indicators) as indicators of the latent class model, observed variables are directly used as indicators for clustering. More specifically, we used a set of “Good Life Enablers” as indicators for this model, while outcome QoL indicators related to life maintenance and life flourishing were treated as covariates. This means that the clusters should reveal certain QoL “input configurations” (factors that to a certain extent are under the control of the city of Barcelona). Based on these varied configurations, we can subsequently assess how these different inputs are associated with different outcome indicators.

To answer these empirical questions, we specified a latent class cluster model, in which we used the proportions of the surface area dedicated to various land uses as indicators. In total, 11 different land uses were identified: housing, parking, commerce, industry, offices, education, health, tourism and hospitality, sport, religion, and theatre/cinema. These indicators essentially

[1] See Annex 5 for more details on the distinction we drew between input (availability, accessibility, affordability) and output (quality of functionings) indicators on the one hand (classified within the “territorial functionings” dimension) and outcome (objective and subjective) indicators on the other hand (classified within the “life maintenance” and “life flourishing” dimensions).

capture the first layer of our Territorial Quality of Life framework, namely the kind of *territorial functioning*, operationalised here as access to various services. In addition, 26 covariates are included in the model to reflect the dimensions of TQoL related to "life maintenance" and (to a lesser extent) to "life flourishing". [2]

The model was calculated using data from all 73 neighbourhoods in Barcelona. We tried out the model with different numbers of latent classes and found that the optimal model in terms of fit and parsimony was a 4-class model. Table 9 presents the profile output of this model, and Figure 25 maps the class membership of each neighbourhood.

The four classes reveal clear and distinct profiles with respect to the input indicators. In the first class, (42.1% of the neighbourhoods) most of the surface area is dedicated to housing (71.6%). The second class (27.3% of the sample) consists of neighbourhoods with relatively large shares of space dedicated to parking (11.7%), commerce (8.4%), industry (14.7%) and offices (6.6%), hence with a generally high access to jobs. The third class (16.6%) is unique in the relatively large shares of space dedicated to education (6.8%), health (6.1%) and religious uses (1.3%). Lastly, the fourth class (14.0%) has the largest share of use for tourism and hospitality (6.7%), but also has relatively high shares dedicated to offices (4.6%), education (4.6%), sport (5.3%) and religion (1.1%).

These results already lend themselves to several interesting observations. Initially, the results indeed reveal a cluster of neighbourhoods with a high concentration of tourism services (the fourth class). However, there is no evidence that this strongly crowds out other land uses, with the notable and important exception of health services. Secondly, while the existence of the first cluster ("residential" neighbourhoods) and the second cluster ("business" neighbourhoods) could have been predicted beforehand, the existence of the third cluster with a large concentration of health and education services is rather surprising. Hence, not only are tourism services concentrated in particular neighbourhoods, but the same also goes for these health and education services.

So how do these QoL configurations of territorial functioning relate to the relevant outcome indicators? The first cluster performs poorest on the indicators related to the economy and education; it has the highest level of unemployment (7.7%), the lowest income (69.9) and the lowest level of education (21.3% in tertiary education). The lack of education services, offices and industry in these neighbourhoods may contribute to these outcomes, but the effect likely also runs the other way around, with poorer/less educated residents "choosing" to live in these neighbourhoods (because housing is likely more affordable). In terms of health indicators, the first cluster also performs relatively poorly, for example, with a high premature mortality rate (294.9/100,000) and the highest percentage of people with psychological problems (2.0%). This may be related both to the lack of health services in these neighbourhoods (only 0.9%), and to the low socioeconomic position of the residents. In terms of social belonging and trust, the first cluster also performs poorly, with a high abstention rate in elections (43.0%) and many people requiring the attention of social services (61.0%).

[2] The pilot application is meant to provide insights about the performance of the clustering technique – its capacity to detect relevant quality of life patterns. Of course, the results for Barcelona are not immediately transferable to other contexts, and we should refrain here from making undue generalisations. For instance, this approach may work in the case of Barcelona because of its size, but it may be questionable in the case of a smaller city / municipality. In smaller cities or municipalities, QoL does not necessarily suffer if neighbourhoods with work opportunities are separated from residential neighbourhoods. Because the city / municipality is small, all services are still close together.

The second cluster, with high share of commerce, industry and offices, performs much better economically, with less unemployment (6.6%) and a higher average income level (97.6) than the first cluster. In terms of the health indicators, the cluster also performs well, with a relatively high life expectancy (83.9 years). The cluster has the highest number of kilometres travelled by car (93.9 km), which can be interpreted negatively from an environmental perspective, but positively from an economic (accessibility) perspective.

The third cluster, with the highest shares of education and health services, performs "best" on almost all output indicators. Regarding health, it has the longest life expectancy (84 years) and the lowest tuberculosis rate (12.7%) and gonococcal rate (14.6%). The cluster also has consistently good economic, social and environmental scores, with the lowest unemployment rate (5.2%), the highest income (131.9), the highest level of education (38.1% with tertiary education), the lowest abstention rate in the last elections (37.8%) and the highest vegetation index (0.21). Again, the high performance of this cluster can partly be explained by the specific input configuration (with high levels of health and education services), but it is also likely that more affluent citizens self-select into these neighbourhoods. In addition, it is interesting to note that it is possible in practice to develop all these dimensions (the economy, social aspects, health and the environment) simultaneously, even though conventional wisdom suggests that trade-offs exist between these dimensions.

Finally, the fourth cluster (with the highest share of tourism and hospitality) reveals a particularly interesting pattern with respect to the output indicators. In terms of the economic indicators, the performance is in line with the average of the whole sample (with an unemployment rate of 7.3% and an income level of 96.0), with the neighbourhoods in this cluster thus performing better than the first "housing-only" cluster. This above-average performance may be associated with the high share of tourism services, which generate income and employment. In terms of the health indicators, however, the fourth cluster performs the poorest overall, with the lowest life expectancy (82.8 years), highest premature mortality rate (284.5), highest tuberculosis and gonococcal rates (32.9% and 44.8% respectively) and highest level of crowding (12.8%). In addition, socially the cluster performs poorly, with the highest electoral abstention rate (44.5%). Hence, it seems that, while tourism offers some economic benefits, these are offset by "costs" in terms of health and social dimensions, which actually aligns well with the problem analysis of the city of Barcelona (as discussed above).

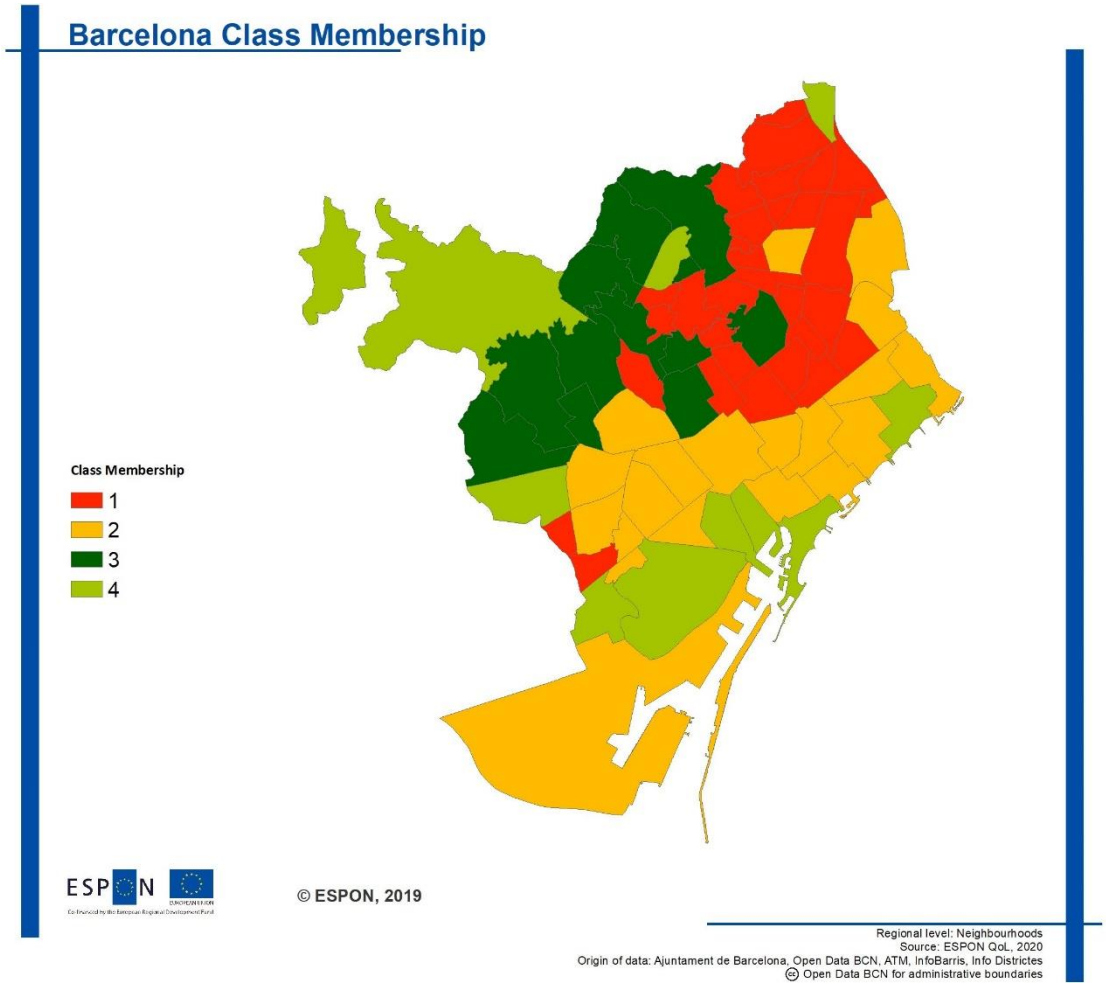
Table 9 Neighbourhood quality of life profiles in Barcelona (N=73)

Domains and subdomains	**Cluster**	**1**	**2**	**3**	**4**	**Sample**
	Cluster Size (%)	42.1	27.3	16.6	14.0	100.0
	Indicators:					
Good Life Enablers						
Access to services	Surface area: housing (%)	71.6	51.2	59.8	49.6	61.0
	Surface area: car parking (%)	9.7	11.7	10.6	11.2	10.6
	Surface area: commerce (%)	6.4	8.4	4.6	6.5	6.7
	Surface area: industry (%)	5.1	14.7	5.4	4.7	7.7
	Surface area: offices (%)	1.4	6.6	2.2	5.9	3.6
	Surface area: education (%)	2.9	2.2	6.8	4.6	3.6
	Surface area: health (%)	0.9	1.1	6.1	1.7	1.9
	Surface area: tourism and hospitality (%)	0.4	2.3	0.6	6.7	1.8
	Surface area: sport (%)	1.0	0.9	2.1	5.3	1.8
	Surface area: religious (%)	0.3	0.3	1.3	1.1	0.6
	Surface area: theatre/cinema (%)	0.0	0.3	0.1	2.0	0.4
	Covariates:					

Domains and subdomains	Cluster	1	2	3	4	Sample
	Cluster Size (%)	42.1	27.3	16.6	14.0	100.0
	Indicators:					
Housing and basic utilities	Homes without heating (%)	11.7	11.3	9.2	13.4	11.5
Digital connectivity	Homes without internet (%)	39.7	33.5	32.7	37.7	36.5
Ecological Enablers	Area of the neighbourhood intended for urban green spaces (%)	2.5	3.4	5.9	6.3	3.8
	Vegetation index	0.15	0.14	0.21	0.16	0.16
Life maintenance and life flourishing						
Personal Health and Safety	Life expectancy (years)	83.8	83.9	84.0	82.8	83.7
	Premature mortality rate (deaths per 100,000)	264.9	241.3	242.0	284.5	257.4
	Tuberculosis rate (%)	17.6	16.5	12.7	32.9	18.6
	Gonococcal rate (%)	22.5	36.5	14.6	44.8	28.1
	Teenage fertility rate (%)	14.3	8.5	3.9	10.5	10.5
	Problematic Consumption Index of Drugs (standardized measure)	-0.1	0.2	-0.6	0.5	0.0
	Population with legally recognized disability: psychological problems (%)	2.0	1.7	1.5	1.9	1.8
	Crowding: homes with > 4 residents by average surface of the house (%)	11.0	9.5	8.7	12.8	10.4
Inclusive Economy	Registered unemployment among people aged 16 to 64 (%)	7.7	6.6	5.2	7.3	6.9
Healthy Society	Persons under 18 served by the Child and Adolescent Care Teams (%)	22.8	14.3	18.8	26.0	20.3
	No education (%)	3.6	2.5	2.4	2.7	3.0
	Primary education (%)	22.8	17.6	12.7	20.7	19.4
	Secondary education - level 1 (%)	27.1	21.5	18.5	22.6	23.5
	Secondary education - level 2 (%)	23.5	24.2	26.6	22.7	24.1
	Family Income Index Disposable (Barcelona = 100)	69.9	97.6	131.9	96.0	91.3
Ecological Health	Kilometres travelled by motorized vehicles (weekly)	47.6	93.8	89.2	88.0	72.7
Interpersonal Trust	Abstention in the last municipal elections (%)	43.0	40.5	37.8	44.5	41.7
Population size	Population between 16 and 64 years of age	12873	18699	12295	14011	14525
	Population (all ages)	20340	28931	19717	20529	22608

Figure 8 maps the class membership of the 73 neighbourhoods. The neighbourhoods belonging to cluster 1 (the “housing” cluster) are located mostly in the northern part of the city. The neighbourhoods in the second cluster, focused on commerce, industry and office space, are located near the coastline, surrounding the inner-city parts of Barcelona. These neighbourhoods cover more territory than those of cluster 1. The most affluent neighbourhoods (with the most education and health services) are located in the western part of the city, whereas the “tourism” neighbourhoods (cluster 4) are also mostly located near the coastline, with a couple of notable exceptions. Overall, it can be concluded that the neighbourhoods clearly cluster together, not only in terms of their scores on the considered indicators, but also geographically.

Figure 25 Barcelona Class Membership



Methodological insights from the Barcelona pilot test

In this section we reflect on how the case of Barcelona illustrates the benefits of the cluster approach (vis-à-vis the composite index approach), but also point out some of its limitations.

Initially, the main benefit of the cluster approach is that it provides a holistic and contextualised understanding of quality of life by revealing comprehensive quality of life profiles (see Table 9). This allows an understanding of the particular challenges and achievements of regions in obtaining a high quality of life. More specifically, in the case of Barcelona, the approach has been able to reveal the configurations of kinds of territorial functioning that produce desirable outcomes in relevant outcome dimensions (life maintenance and life flourishing). In addition, the approach is able to reveal disparities and inequalities between regions. In this regard, the results for Barcelona clearly support policies aimed at providing a fairer and more equitable distribution of relevant services.

The second benefit in relation to the composite index approach is that there is no need for normalisation (or standardisation) of indicators. Indeed, the cluster approach can simultaneously handle indicators of mixed scale types and units. In the Barcelona application, most of the indicators were measured as percentages, which can be handled jointly with, for example, life expectancy data, which is measured in years. Moreover, because information on the scores on the original scales is retained, the results of the analysis can be more meaningfully interpreted than would have been the case in the composite index approach. For example, the results from Barcelona show that the life expectancy in cluster 4 is lower than in clusters 1-3. However, the difference is only one year, and in an absolute sense the life

expectancy in cluster 4 (82.8) remains quite high. The absolute scores (and differences) would have been obscured using the composite index approach.

Thirdly, in the cluster approach no assumption has to be made with respect to the relationship between the score on a given indicator and the related value judgment in terms of QoL. Several of the indicators used in the Barcelona case also illustrate this point. Some examples would be the fertility rate and the number of kilometres travelled by car (which can be considered either desirable or undesirable, depending on the assumed perspective). Indeed, it would be difficult to handle such indicators in the composite index approach.

Finally, the cluster approach allows for the separate identification of indicators and covariates, which, in turn can be related to types of territorial functioning and outcome indicators and/or objective & subjective QoL indicators. In the Barcelona case, we used kinds of territorial functioning as indicators and outcome QoL indicators as covariates. As such, we were able to reveal how certain configurations of territorial functioning lead to particular outcomes. Discriminating between these different types of variables would not have been possible in the composite index approach.

Although the cluster approach comes with certain methodological benefits, the method also has limitations in comparison with the composite index approach. Firstly, while there is no constraint on the number of covariates in the cluster approach, the number of indicators that can be used to actually cluster the data is limited. In this regard, there is no fixed threshold (it also depends on the number of observations), but with more than 10 indicators the method becomes infeasible in practice. This means that there must be a good conceptual motivation to select a particular set of QoL indicators for this model. In the case of Barcelona, this is based on the layers of our territorial quality of life framework, in which the distinct kinds of functioning reflect differing levels of access to various services. In other cases, though, such motivations may be more difficult to develop. The composite index approach, on the other hand, is not bound by any limitations regarding the number of indicators that are used.

A second drawback is there are no clear statistical criteria to judge how much heterogeneity remains within each of the clusters, or, formulated the other way around, how much of the heterogeneity is actually explained by the clusters. Related to this, the results of the cluster analysis show high-level patterns that may be used to improve QoL at a high level of aggregation (e.g. by providing a more equitable distribution of services across the whole of Barcelona), but they may not be particularly informative with respect to what particular areas (neighbourhoods in Barcelona) can do to improve QoL. It bears highlighting, though, that the composite index approach is also unable to provide such specific recommendations.

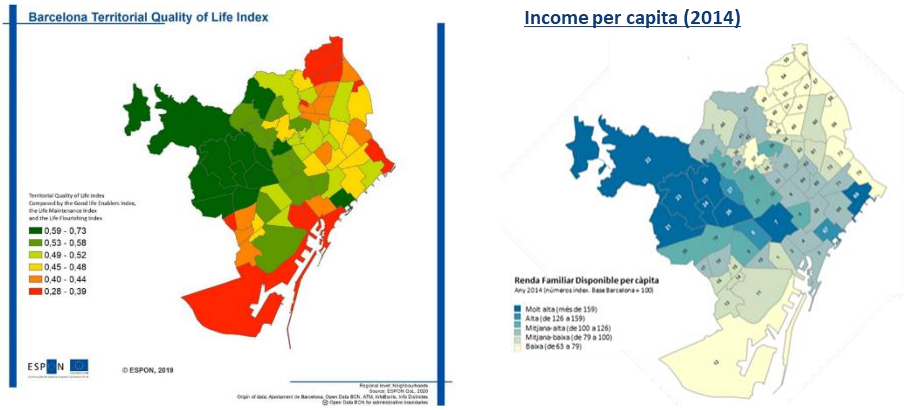
To conclude, the cluster approach can open up and address some of the problematic assumptions of the composite index approach, but it also has several limitations of its own. Nevertheless, given that it is not widely known or applied in the field of composite index measurement and QoL measurement in particular, we believe it constitutes a relevant complementary approach to study and better understand quality of life and how to improve it.

5 Synthesis and conclusions

- In Barcelona, neither public administrations nor private entities explicitly elaborate a comprehensive quality of life index at the local level. Some entities focus on specific domains such as health (Public Health Agency), digital access (Barcelona Digital City Plan) or the environment (Green and Biodiversity Plan), but they do not bring together data to provide a full picture of the general performance at a local level (e.g. neighbourhoods or district).
- There are some sector plans and strategies[3] targeting quality of life that effectively cover the various subdomains established in the framework of the Territorial Quality of Life Index for Europe. However, these plans tend to provide qualitative information in a report format, and only a few indicators could be gathered to inform the Composite Index.
- Because there are several official statistical sources with available open databases, we were able select and harmonise a list of quality-of-life-related indicators that complemented the indicators gathered from the plans.
- Of the 22 subdomains established in the Quality of Life framework, we were able to cover 19. The “Protected Areas” sub-domain did not apply at the local level of Barcelona, and there was no data available for the subdomains “Self-actualization” and “Interpersonal Trust”. In total, we used 34 different indicators, classified in 19 subdomains; only 5 out of the 34 had a time series available, so it was not possible to elaborate a reliable analysis of the evolution of the Territorial Quality of Life Index over time.
- We calculated and mapped the Territorial Quality of Life Index at a neighbourhood level using the most up-to-date data available for each indicator. Most of the data were collected at least as recently as 2015, except for the data on “Main homes without heating”, which were from 2011. We can conclude that the resulting indicator is up to date.
- The resulting maps showed that the lowest patterns are in the southern and north-eastern neighbourhoods, coinciding with least accessible neighbourhoods and, in broad terms, with the lowest incomes per household.
- We compared the composite TQoL index to the neighbourhoods’ ranks in per capita income and life expectancy. The correlation between the TQoL Index and per capita income exists, but there are some deviations, and the same holds true for the correlation with life expectancy at birth, as shown by the relatively large dispersion of values around the regression lines.

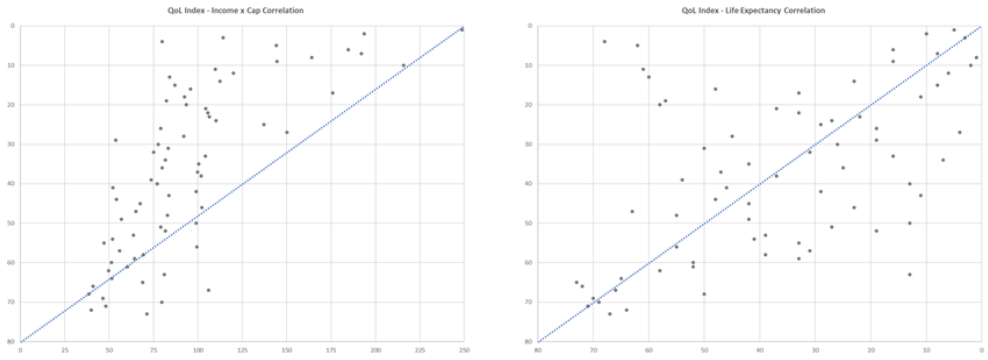
[3] Housing Plan 2016 – 2025, Barcelona Mental Health Plan 2016 – 2022, Plan for the Promotion the Quality of Youth Employment 2016 – 2020, The Barcelona Strategy for Demographic Change and Ageing, Neighbourhood Plans, Urban Mobility Plan 2013-2018, Plan for the Improvement of Barcelona Air Quality 2015-2018, Superblocks programme, Green and Biodiversity Plan 2012-2020 and Barcelona Digital City” Plan 2017–2020.

Figure 26 Maps of Territorial Quality of Life Index of Barcelona (left) and the average income per capita (right)



Source: Territorial Distribution of Family Income Available per Capita in Barcelona, Ajuntament de Barcelona (2018).

Figure 27 Correlation plot of the TQoL Index against mean per capita income (left) and life expectancy (right)



Source: Territorial Distribution of Family Income Available per Capita in Barcelona and OpenData Barcelona, Ajuntament de Barcelona (2018).

6 Recommendations

6.1 How the QoL concept and indicators could be further developed in the region

In particular, the case of Barcelona could benefit from bringing together all the quality-of-life-related indicators that can be found in the numerous open databases maintained by different official sources. They could be united in a harmonised Quality of Life Database that would gather all the indicators defined in this report and also include other specially-designed indicators that are better able to represent the different sub-domains of the Territorial Quality of Life index.

The subdomains in the “Good Life Enablers” and “Life Flourishing” dimensions would benefit the most from adding more indicators. Most of the “Good Life Enablers” sub-domains were only covered by one indicator for each sub-domain, with the exception of “housing and basic utilities”, which was represented by two. It is important to underline that even though it was not possible in this study to find more fitting existing indicators to complement the index at this local level (neighbourhoods), there is a wealth of available geospatial data that could be used to elaborate more fitting indicators, including the number of libraries (cultural assets) or number of hospital beds (healthcare).

There was a dearth of data for the “Life Flourishing” dimension, where the sub-domains “Self-esteem” and “Self-actualization” could not be covered by any of the available indicators. This dimension would benefit from adding more subjective indicators. This could also benefit the “Life Maintenance” dimension, as even though this dimension was well covered by several indicators, there was a lack of subjective ones. This would help the QoL scheme to go beyond its traditional focus on attributes mainly related to quality of place.

6.2 How the QoL concept of this ESPON project can be improved and enriched

Barcelona is a clear example of how the open data policy that the different administrations have been following offers an opportunity to work with a large pool of available data to define a more complete Territorial Quality of Life Index. However, because there is not a specific quality of life programme, the data available is not always ideally suitable for the framework defined, especially because the data used here were gathered with a range of different goals in mind (census, health programme, environment programme…).

A similar situation can be observed for the ESPON domain at the regional scale, where even though there is a more defined framework for quality of life, it was limited by the degree of availability of the existing data, gathered as it was in the framework of other projects with different goals. ESPON should mobilise more resources to develop a database with specific indicators specially designed to represent the different aspects of quality of life, thus allowing for the creation of more complete composite index.

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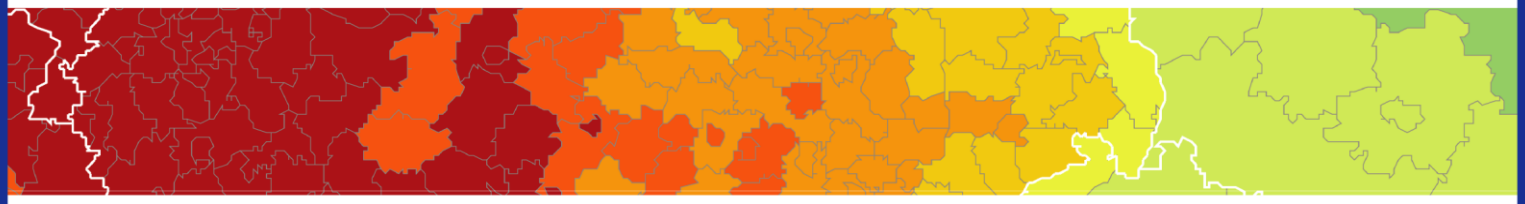
8 Annex – Indicators

Table 10 List of Indicators gathered at different spatial local levels (census, neighbourhood and district)

Indicator	Source	District level	Neighbourhood level	Census level	Year covered	Domain	Used TQoL Index
Percentage of buildings with a commercial space on the ground floor	AjuntBCN		x		2016	Inclusive Economy	no
Main homes without heating	AjuntBCN		x		2011	Housing & basic utilities	yes
Main homes according to facilities II: running water, WC	AjuntBCN		x		2011	Housing & basic utilities	no
Main homes without internet	AjuntBCN		x		2011	Work opportunities	no
Premature mortality rate	InfoBarris		x		2012-2014	Personal Health	yes
Tuberculosis rate	InfoBarris		x		2013-2015	Personal Health	no
Gonococcal rate	InfoBarris		x		2013-2015	Personal Health	no
Teenage fertility rate	InfoBarris		x		2012-2014	Self-actualization	yes
Problematic Consumption Index of Drugs	InfoBarris		x		2015	Personal Health	no
Area of the neighbourhood devoted to urban green spaces (%)	InfoBarris		x		2015	Green infrastructure	yes
Vegetation index	InfoBarris		x		2015	Green infrastructure	no
Km travelled by motorized vehicles	InfoBarris		x		2015	Climate Change	yes
% of homes with> 4 residents by average surface of the house	InfoBarris		x		2015	Housing & basic utilities	yes
Rate of people under 18 served by the Child and Adolescent Care Teams	InfoBarris		x		2015	Healthy Society	yes
People 16-29 years of age with primary education or less (%)	InfoBarris		x		2015	Healthy Society	no
Family Income Index Available	InfoBarris		x		2014	Healthy Society	no
Registered unemployment among people aged 16 to 64 (%)	InfoBarris		x		2015	Healthy Society	yes
Abstention in the last municipal elections (%)	InfoBarris		x		2015	Interpersonal Trust (societal belonging)	no
Registered unemployment classified by duration	OpenDataBCN		x		2013-2019	Healthy Society	no
Weight of the registered unemployment in the population from 16 to 64 years of age of the city of Barcelona	OpenDataBCN		x		2012-2019	Healthy Society	no
Registered unemployment	OpenDataBCN		x		2011-2019	Healthy Society	no
Average age of the housing premises in the city of Barcelona	OpenDataBCN			x	2018-2019	Inclusive Economy	no
Area size of the cadastral premises according to the main use	OpenDataBCN		x		2009-2017	Healthy Environment	no
Absolute results of the elections for the Parliament de Catalunya in the city of Barcelona	OpenDataBCN			x	2010-2017	Interpersonal Trust (societal belonging)	no
Absolute results of the European Parliament elections in the city of Barcelona	OpenDataBCN			x	2009-2014	Interpersonal Trust (societal belonging)	no
Absolute results of the General Elections in the city of Barcelona	OpenDataBCN			x	2011-2019	Interpersonal Trust (societal belonging)	no
Absolute results of the local elections in the city of Barcelona	OpenDataBCN			x	2011-2019	Interpersonal Trust (societal belonging)	no
Reading registers of inhabitants' academic level of the population classified by sex of the city of Barcelona	OpenDataBCN		x		2009-2019	Healthy Society	no
Reading registers of inhabitants' average occupation of the population of the city of Barcelona	OpenDataBCN		x		2007-2019	Healthy Society	no

Indicator	Source	District level	Neighbourhood level	Census level	Year covered	Domain	Used TQoL Index
Reading registers of inhabitants' population that lives alone classified by five years gap and sex in the city of Barcelona	OpenDataBCN		x		2007-2019	Healthy Society	yes
Territorial income distribution in the city of Barcelona	OpenDataBCN		x		2007-2017	Healthy Society	no
People with recognised legal disability in the city of Barcelona grouped by level of disability	OpenDataBCN		x		2013-2016	Personal Health	no
People with recognised legal disability in the city of Barcelona grouped by type of disability	OpenDataBCN		x		2013-2016	Personal Health	no
Antiquity of the vehicle park by less than a year of antiquity and by neighbourhood in the city of Barcelona	OpenDataBCN		x		2016-2017	Inclusive Economy	no
Antiquity of the vehicle park, motorcycles by neighbourhood of the city of Barcelona	OpenDataBCN		x		2007-2017	Inclusive Economy	no
Antiquity of the vehicle park, cars by neighbourhood of the city of Barcelona	OpenDataBCN		x		2007-2017	Inclusive Economy	no
Life expectancy in the city of Barcelona (five-year-old). 2006-2013	OpenDataBCN		x		2010-2014	Personal Health	yes
Victimisation rate	InfoDistrictes	x			2017	Personal Safety	yes
Population >75 years that live alone (%)	InfoDistrictes		x		2017	Healthy Society	yes
NO2 concentration	InfoDistrictes		x		2017	Healthy Environment	yes
PM10 concentration	InfoDistrictes		x		2017	Healthy Environment	yes
Noise	InfoDistrictes		x		2017	Healthy Environment	yes
Vegetation index	InfoDistrictes		x		2017	Green infrastructure	yes
% Public space for pedestrians	InfoDistrictes		x		2016	Public spaces	no
Dwelling without elevator (%)	InfoDistrictes		x		2016	Housing & basic utilities	yes
Available Household Income	InfoDistrictes		x		2017	Healthy Society	yes
Unemployment Total (%)	InfoDistrictes		x		2017	Inclusive Economy	no
Long-term unemployment (%)	InfoDistrictes		x		2017	Inclusive Economy	yes
% population 16-29 years of age with primary school level or less	InfoDistrictes		x		2016	Healthy Society	yes
Drug abuse Index	InfoDistrictes		x		2018	Personal Health	no
Needles on the street (%)	InfoDistrictes		x		2018	Personal Safety	yes
Teenage fertility rate (15-19 years)	InfoDistrictes		x		Average 2014-2018	Self-actualization	yes
Low weight at birth	InfoDistrictes		x		Average 2014-2018	Personal Health	no
Life expectancy	InfoDistrictes		x		Average 2013-2017	Personal Health	yes
Mortality rate relation over the neighbourhood average	InfoDistrictes		x		Average 2014-2018	Personal Health	yes
Area of the neighbourhood devoted to health services (%)	OpenDataBCN		x		2009-2017	Healthcare	no
Area of the neighbourhood devoted to education services (%)	OpenDataBCN		x		2009-2017	Education	yes
Area of the neighbourhood devoted to offices and tourism (%)	OpenDataBCN		x		2009-2017	Work opportunities	yes
Area of the neighbourhood devoted to shops (%)	OpenDataBCN		x		2009-2017	Consumption opportunities	yes
Area of the neighbourhood devoted to shows and religion (%)	OpenDataBCN		x		2009-2017	Cultural assets	no
Antiquity of the utility vehicle float (> 10 years)	OpenDataBCN		x		2007-2018	Inclusive Economy	no

Indicator	Source	District level	Neighbourhood level	Census level	Year covered	Domain	Used TQoL Index
Risk of poor mental health	InfoDistrictes	x			2016	Self-esteem	no
Number of nesting bird species	AjuntBCN		x		2020	Ecosystems services and Biodiversity wealth	yes
Number of plant and tree species	AjuntBCN		x		2020	Ecosystems services and Biodiversity wealth	yes
Percentage of storefront spaces registered as businesses	AjuntBCN		x		2019	Consumption opportunities	yes
% Population with a public transport accessibility index (PTAI) over the average	ATM		x		2019	Healthy Society	yes
Standardized HIV rate	InfoDistrictes	x			2017	Personal Health	yes
Number of people injured or killed by traffic collision per vehicle-km	InfoDistrictes	x			2018	Healthy Society	yes



ESPON 2020 – More information

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