Literature review on superblocks' effects on urban realm

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TuneOurBlock

Transforming urban quarters to human scale environments: applying superblock concepts for different urban structures

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Executive Summary

This deliverable is one of the initial steps towards achieving the TuneOurBlock project objectives. The aim of the document is to provide a foundation for succeeding tasks in the TuneOurBlock project by performing a literature review on Superblocks and similar urban transformational interventions to evaluate their effects on the urban realm.

The document consists of four chapters. After the problem framing in the introduction, which largely draws upon socio-ecological unsustainability of current urban development, the deliverable firstly offers some valuable insight into characteristics, rationale and the evolution of the Superblock concept in Barcelona (chapter 2.1) - from the original theoretical model of Salvador Rueda (2014), integrated in the city vision and planning documents, to the new Superilla Barcelona strategy (2020), based on the lessons learned during the first implementations.

Secondly, the deliverable offers an overview of other selected urban interventions, which were implemented in cities across the globe (chapter 2.2). We found out that most concepts resulted in increased liveability and reduced traffic but they were mostly not able to induce a systemic change. The comparison showed that Superblock is in fact the most ambitious urban transformational intervention as it combines city-wide application, involves a strong climate-change related component, includes citizens' empowerment and it is aiming for a long-term structural change.

The third chapter presents the state-of-the-art on existing Superblock implementations and analyses their impact on urban sustainability, based on the available literature and informant interviews. The description of three Barcelona Superblocks (chapter 3.1) shows flexibility and deviation from the original Rueda's model after the Poblenou experience (2016), which showed some weakness and offered valuable lessons. Somehow less radical Sant Antoni approach (2018), applied in the whole neighborhood, prioritises the extension and continuity of green axes over the creation of isolated ‘pacified pockets’, has later become the model to be reproduced throughout the city. Barcelona cases are followed by the descriptions of other executed and planned attempts to implement Superblocks in other cities.

Impact analysis of existing Superblock implementations from the urban sustainability perspective, following the EEA sustainability framework (chapter 3.2.1), showed strong presence of resilience, health, low-carbon, green and inclusion components (less the circular one) of Superblocks at the theoretical level. From the practical impact point of view, the evidence is scarce due to few Superblocks implementations and absence of a continuous monitoring process, despite the initial ambition to do so by developing numerous indicators. The document also includes a review of effects of mobility interventions of Superblock and other similar concepts on traffic flows (chapter 3.2.2), which showed somehow mixed results. Existing implementation Superblock experiences (chapter 3.2.3) also revealed some key barriers and lessons learned, such as political struggle for authority, discontent over lack of public participation, necessary balance of “tactical urbanism” and “structural urbanism, and need for a quick transition from the functional to the structural implementation, also valuable for other future implementations elsewhere.

The conclusion (chapter 4) summarizes the deliverable findings and reveals main strengths, weaknesses and knowledge gaps related to the Superblock concept. Superblocks’ transformative nature, marrying traffic regulation schemes with the repurposing of public space, combination of top-down and bottom-up action and integration into municipal plans, make the concept a promising a multiple-leverage-point intervention that could act as a catalyst for additional systemic transitions required for a societal transformation to sustainability. The concept is still evolving and has the potential for expanding with other important aspects of urban liveability.

1 Introduction

Human civilization and the Holocene-era biosphere both face existential threats emerging from a crisis of interconnected, unsustainable systems. These systems are entirely anthropogenic in nature, and their lack of sustainability stems from their overshoot of Earth system's biogeochemical flows and the regenerative capacity of the biosphere. Cities and urbanization processes are central to anthropogenic overshoot, as they are integral to the unsustainable macro-trends of industrialization and globalization. At the same time, cities are expected to suffer many of the most extreme impacts of the "unsustainability" crisis, putting a large percentage of the human population at high risk.[1] There are also other concerns of limitations of the hegemonic paradigm of urban planning, such as the lack of attention to unequal power dynamics, leading to the exclusion of non-hegemonic groups from urban space.[2]

In order to move from a state of anthropogenic overshoot to one of functional ecological integration, a strategy based on a combination of decarbonisation (chiefly the cessation of the burning of fossil fuels) and rewilding (the widespread restoration of ecological complexity) is essential. The two are complementary approaches capable of amplifying adaptation as well as mitigation efforts concerning climate change and biodiversity loss and can contribute to moving humanity away from other planetary boundary thresholds. Recent understandings of urban crisis also emphasize its multidimensionality, rooted in unequal socio-ecological relations ("crisis of care"), and call for the gendered right to the city, incorporating feminist perspective and methodologies in planning processes.[3] However, both local and global transitions towards sustainability should take place in the cities, especially in the transformation of current ones as they represent centres of population.[4] [5] As nodes of innovation and knowledge transfer, cities are well-positioned to move from drivers of the unsustainability crisis to drivers of sustainability transformations.

Among the existing urban interventions, the Superblock concept, originating from Barcelona, Spain, seems especially promising for meeting the challenges of urban transitions toward sustainability. Compared with other similar concepts, it radically re-organises urban space and mobility at a human scale while reclaiming public space. Despite its potential, enthusiastic media attention and increasing interest for application, the concept has only been (partially) implemented in few locations in Spanish cities. To accelerate the applicability of the Superblock concept in Europe, the TuneOurBlock project attempts to validate, internationalize and expand the concept as policy and planning strategy for transformational urban adaptation.

This deliverable is one of the initial steps towards achieving the project objectives. The aim of the document is to provide a foundation for succeeding tasks in the TuneOurBlock project by performing a literature review on Superblocks and similar urban transformational interventions to evaluate their effects on the urban realm.

The deliverable is structured as follows: in chapter 2, a general overview of the Superblock concept is given (what it is, how the concept has evolved and why), along with the comparison

[1] Bulkeley, H. (2013). Cities and Climate Change (Routledge Critical Introductions to Urbanism and the City) (1st ed.). Routledge.

[2] Iturralde Farrus, B. (2021, September). Feminist urbanism for cities that recognise a plurality of voices: a collective assessment of the Sant Antoni superblock (Master's dissertation). https://www.4cities.eu/wp-content/uploads/2021/10/MSCthesis_4CITIES_ITURRALDE_BELEN.pdf

[3] Iturralde Farus, B. (2021). Informal interview.

[4] Nevens, F., Frantzeskaki, N., Gorissen, L., & Loorbach, D. (2013). Urban Transition Labs: co-creating transformative action for sustainable cities. Journal of Cleaner Production, 50, 111–122. https://doi.org/10.1016/j.jclepro.2012.12.001

[5] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), Integrating Human Health into Urban and Transport Planning: A Framework (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

to selected similar traffic calming and transforming public space concepts. In chapter 3, the current evidence on Superblocks implementation is gathered through the exploratory review and impact analysis of implemented cases from the literature with additional focus on effect of Superblocks and other urban interventions on traffic flows. Concluding chapter 4 summarizes the main findings of the document, reveals main knowledge gaps, an estimation of the potential of Superblocks for achieving urban sustainability and stressing out main strengths and weaknesses of the current implementations.

2 Urban intervention concepts

2.1 Superblock

The Superblock concept originates from Barcelona, Spain (pop. 1,600,000), one of the most populous urban areas in Europe. The city's dense construction, increasing traffic burden and lack of available green and public open space, causing urban heat island effect, high air and noise pollution levels and numerous premature deaths, combined with vulnerability of the city to climate change related threats, triggered various actors in the city to develop innovative land use interventions in order to adapt to and mitigate climate change and thus improve quality of life in the area.[6]

A Superblock model was developed according to principles of the ecosystemic urbanism. According to one of the more general definitions, the model is "a *way of organising the city based on reversing the distribution of public space among vehicles and people, giving priority to the citizen, to improve environmental conditions and people's quality of life*".[7] The theoretical model conceptualizes a single superblock unit as an orthogonal cell of around 400 x 400 m, consisting of nine blocks. It is encompassed by perimeter basic roads, where through and connecting traffic circulate at a maximum speed of 50 km/h. Interior roads, where motorized traffic is drastically limited, constitute a local network with limited speed of 10 or 20 km/h, which allows the reconversion of most of the urban space to multiple and shared uses. The traffic regime is organized in a way that a superblock cannot be crossed by individual motorized traffic.[8]

The dimensions of a superblock are based on the average urban car speed of 20 km/h, which means that cars spend a similar amount of time to go around the superblock as a person walking around the block at about 4 km/h. As main crossings are present every 400 m, the traffic lights synchronization is much more efficient and avoids disruption of the main flux since two out of three turns are avoided. With the average number of people in a superblock in Barcelona being around 6,000 inhabitants, every superblock emerges as a little city with a wide range of different social, economic and environmental functions. This is achieved through mixed land use, e.g. green spaces, public spaces, housing, retail, social care services[9], thereby reducing the need for auto-mobility for residents.

The theoretical superblocks model for Barcelona reduces the total length of through traffic roads by 61% and gives 45% of road area a chance to be redesigned.[10] This opens up the possibility of public spaces being put to other uses and that people reclaim their citizen status (today relegated to the function of pedestrians) and to encourage local residents to re-

[6] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona Superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

[7] Ajuntament de Barcelona. (2016, May). Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

[8] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), Integrating Human Health into Urban and Transport Planning: A Framework (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

[9] Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020b). Changing the urban design of cities for health: The Superblock model. Environment International, 134. https://doi.org/10.1016/j.envint.2019.105132

[10] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), Integrating Human Health into Urban and Transport Planning: A Framework (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

appropriate public spaces, by improving their habitability and the presence of greenery in streets.[11]

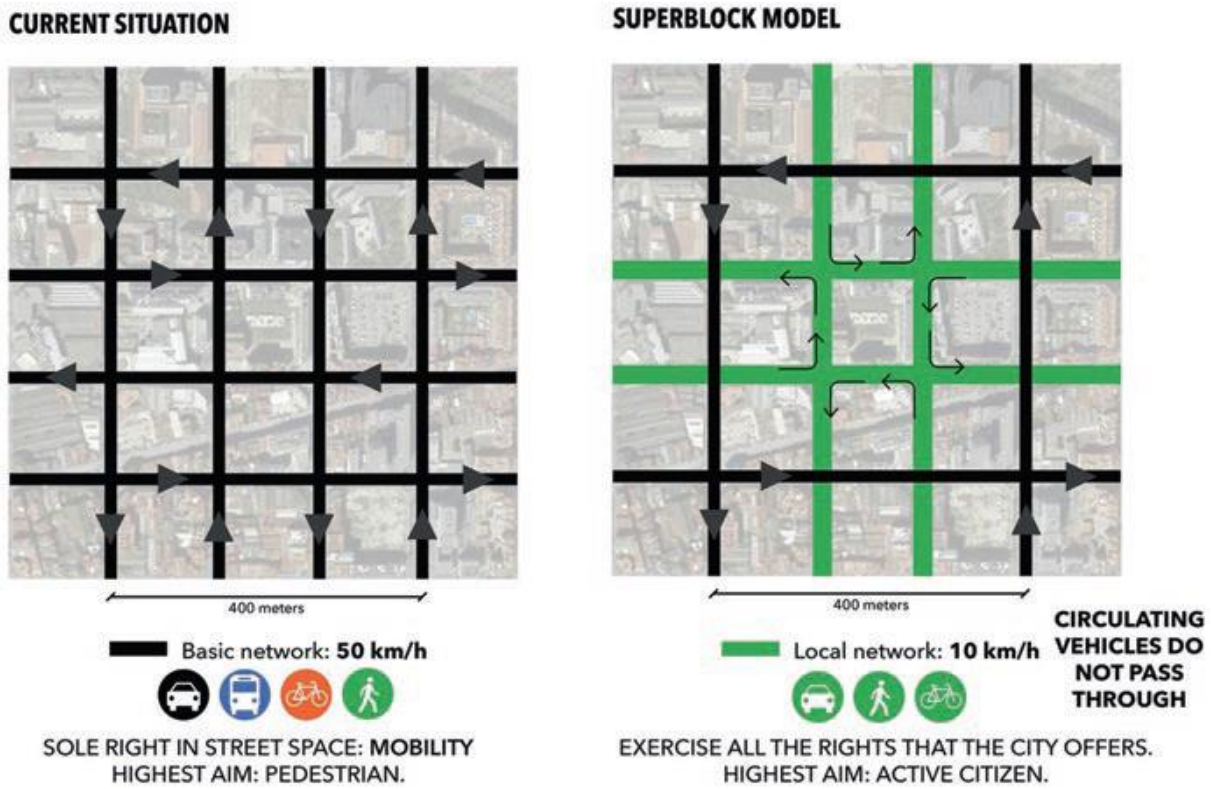

Figure 1: Current and proposed road network scheme in the Superblock model.[12]

The important impetus to design the Superblocks model was related to the realisation that the current urbanism does not accommodate the challenges of the beginning of the 21th century, related to the "anthropogenic overshoot". Therefore, the Superblocks model was integrated in the vision of the city of Barcelona and found its place in the planning practice. To mitigate and to adapt to the climate crisis, the municipal government decided to follow a cross-scale interconnected action strategy for the whole metropolitan area under the umbrella of the city climate plan (2018–2030). One of its important elements was the Superblock programme,[13] proposed and developed by the Urban Ecology Agency (BCNEcología), a public consortium integrated into the city council. The programme was integrated into the Sustainable Urban Mobility Plan 2013–2018, a key element of Barcelona's climate strategy, formally approved by the Barcelona City Council in March 2015. The concept was thus anchored in different

[11] Commission for Ecology, Urban Planning and Mobility. (2016, May). Let's fill streets with life. Establishing Superblocks in Barcelona. Ajuntament de Barcelona. https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/en_gb_MESURA%20GOVERN%20SUPERILLES.pdf

[12] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), Integrating Human Health into Urban and Transport Planning: A Framework (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

[13] Commission for Ecology, Urban Planning and Mobility. (2016, May). Let's fill streets with life. Establishing Superblocks in Barcelona. Ajuntament de Barcelona. https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/en_gb_MESURA%20GOVERN%20SUPERILLES.pdf

municipal sectorial plans and commitments and strategically embedded in a larger vision of the city.[14]

The first Superblock programme had **four strategic goals**:

- improving the habitability of public spaces,
- moving towards more sustainable mobility,
- increasing and improving urban greenery and biodiversity,
- promoting public participation and joint responsibility.

The programme followed **general guidelines**:

- public participation process in all the stages (diagnoses, proposals and implementation);
- prioritising functional over physical changes;
- deployment throughout the city, giving priority to the Cerdà area (districts of Eixample, Gràcia and Sant Martí);
- ensuring maximum consideration of cross-sectoral issues and integrating all views;
- implementing at several speeds: ensuring flexibility according to the stage and complexity of the programme for each area in each district;
- two intervening scales: initiatives with a city-wide and local impact;
- establishment of measurable indicators to monitor the development of the change;
- start of a continuous improvement process for public spaces. The programme is not an isolated event but rather the start of a process of change.

The programme proposed to extend the superblocks throughout the city, dividing it into 503 superblocks, but across three types of territorial areas of action: Cerdà Area (central part of the city), areas already started (where the proposals gathered in the participatory process will be taken up again and their feasibility studied) and new territorial areas (also placed in the outskirts).

The programme was also designed to be flexible regarding the level of change. Three levels of change with respective levels of measures/initiatives were planned:

- **Basic** with a change in mobility only, focused on methods of traffic prioritisation.
- **Tactical**: a halfway level with tactical (low budget, temporary and reversible) measures, oriented towards the habitability of the public space.
- **Structuring**: with finalised urban redevelopment projects that consolidate the functional change, habitability and establishment of greenery and biodiversity in the public spaces of the whole area.

The process for defining the initiatives consists of five successive work stages, divided into two phases, with first phase was planned to be implemented in 2016, while the second from 2016 to 2019. The programme had also its budget around 11 million euros to provide an impetus to the first initiatives.

[14] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

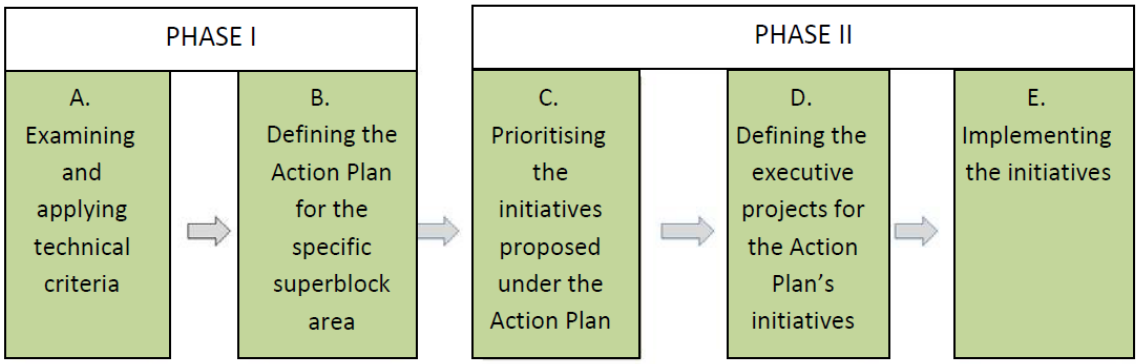

Figure 2: Work stages of defining the initiatives.

With the expected impact of turning car-occupied streets into public green spaces at a large scale, the programme is an example of a "hybrid climate intervention" as it combines mitigation and adaptation efforts – it seeks to mitigate emissions by adapting the city to climate change threats, while seeking to reduce vulnerability and increase resilience.[15] Another important element of the concept is returning public space to citizens, what is actually the essence of an urban life.[16] The concrete implementations with the main results are presented in the chapter 3.

In 2020, the city authorities took another step and rather modified approach towards Superblocks implementation (*Superilla Barcelona*). The divergence away from the 'ideal' superblock (i.e., the model which had been implemented in the Poblenou neighbourhood) towards the *Superilla Barcelona* strategy is the result of a learning process. A process that, on the one hand, is guided by an evaluation of what worked from the previous Superblock implementations and, on the other, reflects an intense collaboration process between planners and members of the community. Barcelona City Council planners came to the realisation that Rueda's model needed to be adapted in order to take into account 1) psychosocial aspects, as the changes must be adjusted to the pace of assimilation of the different users and groups; 2) functional reasons, it is important that the planned transformation do not destabilise the current functioning of the city, such as access to the city or to work; and 3) the economic context, where budgets are limited, structural changes require large investments, and the problems of the city are numerous and complex.[17] [18]

[15] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

[16] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), Integrating Human Health into Urban and Transport Planning: A Framework (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

[17] Grup Impulsor. (2021, September 28). *Superilla Barcelona* [Group meeting]. 1st meeting with the Impulsor Group, Barcelona, Spain. https://ajuntament.barcelona.cat/superilles/sites/default/files/20210910_Presentacio_Diagnosi_GI_1.pdf

[18] Rosa Lopez (2021). Informal interview.

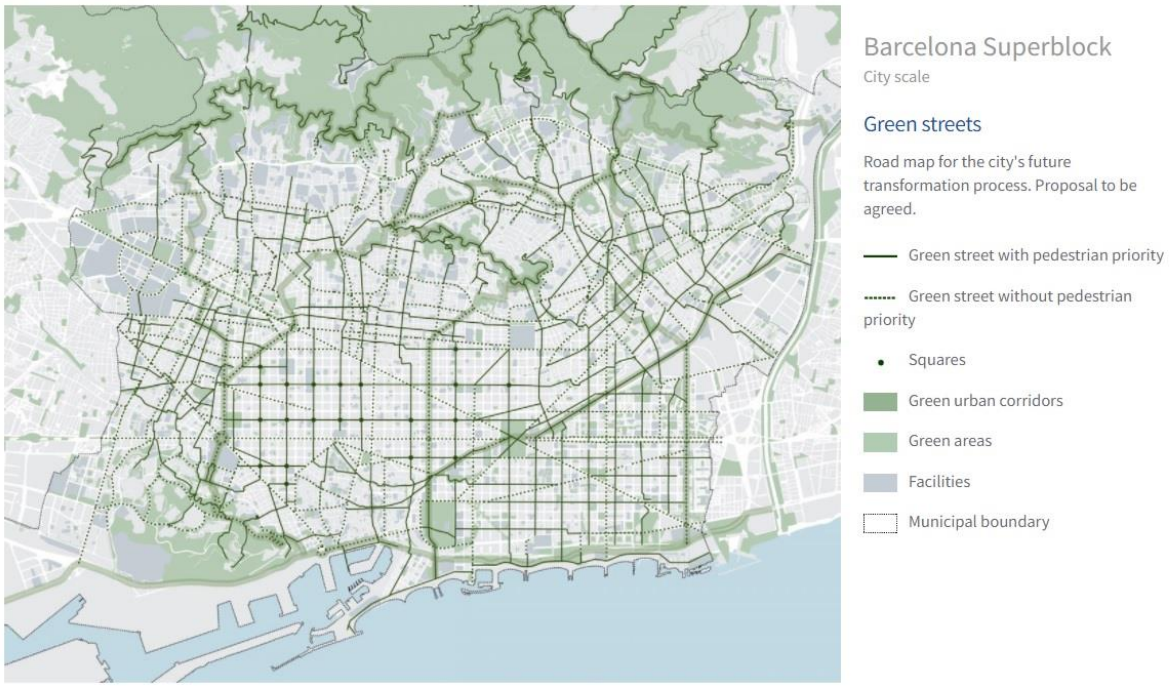

Figure 3: *A map of Superilla Barcelona.*[19]

Hence, while superblocks planners previously took action at a local level, in delimited areas, now they want to broaden the vision and seek structural changes through the "vision of green streets" over the larger area and finally over the whole city. The focus in the first phase is on the Eixample, the central section of the city, which suffers the greatest pressure from motorised transport and has the lowest number of green areas. The aim is to provide the Eixample residents a square or a green street within 200 metres from their homes. According to the plan, 21 green streets with traffic-calming measures, places to relax and more vegetation will be created (with a total of 33 km), while 21 junctions will be turned to squares, providing a total of 3.9 hectares of new public spaces. Therefore, the City Council held two design competitions to transform four streets into green axes (Consell de Cent, Rocafort, Borrell, and Girona) and create four superplazas (located at the junctions between two green hubs) to find a new type of public space that would put people first and integrate natural processes, greenery and biodiversity, optimising resources, with simple and rational solutions. The plan is to have the first eight projects ready by February 2022, with the goal of commencing the works in June 2022 and completing them in the first quarter of 2023.

The result of the competition is the design of the "21st-century street model" which will be implemented in every green hub. This new street concept is based on three cornerstones: 1) promoting street life, 2) designing a new environmental infrastructure and 3) stimulating local commerce. The fulfilment of these cornerstones translates into a series of basic features linked to uses, mobility, greenery, furniture and lighting. All together, they make up a green hub that will encourage people to reclaim the streets, with more family life and local commerce and less pollution and noise.

An important gain of the concept is to increase the public space for pedestrians – around 1,500m^2 of public space in each street section (one block), which means doubling the current

[19] Eixample. (n.d.). Ajuntament de Barcelona. Retrieved November 18, 2021, from https://ajuntament.barcelona.cat/superilles/en/superilla/eixample

space, and around 1,300 m^2 in the squares at the junctions, tripling the current figure. Another gain is at least 10% of the overall surface area devoted for greenery.

Streets in the Eixample area will not be closed to traffic. All vehicles will be able to circulate, but with heavily reduced speed limits and priority given to pedestrians and cyclists. There will also be no restrictions on access. On green axes, speed will be limited to 10 km/h to ensure proper coexistence with pedestrians and cyclists (without curbs). The current traffic direction in streets will remain, except at the junctions/squares, where traffic (except for the bikes) will be obliged to turn left or right. Pedestrians will be able to walk everywhere with priority over other modes of transport. Bicycles and hand-scooters will be able to circulate in both directions up to maximum speed of 10 km/h and respecting pedestrian priority at all times. The loading and unloading activities of hauliers and couriers will be allowed in green streets during a time range in the morning, but only for half an hour (controlled by an application), without indication where the loading zones are. On other roads, the speed limit will be 30 km/h or 50 km/h, depending on the road category.

The plan is going to be implemented through dialogue and with the participation of all stakeholders including the general public in all the stages. To this end, a central project office and an advisory board are planned. The City Council proposal and the results of the competitions will be further elaborated with local residents and organisations, plus economic stakeholders and professional associations, at a city and neighbourhood level.[20] However, the streets that will be transformed in green axes had undergone tactical transformations a year before the participation process started (in Spring 2020) without any public consultation with the justification that these changes were needed to adapt to a post-covid city. In addition, the purpose of the participation process is only to incorporate the views of the locals, not to ask them whether they want to implement the project or not.[21]

Figure 4: The new Superblock scheme in the Eixample district. [22]

[20] Superilles. (n.d.). Ajuntament de Barcelona. Retrieved November 18, 2021, from https://ajuntament.barcelona.cat/superilles/en#

[21] Iturralde Farrus, B. (2021). Informal interview.

[22] Superilles. (n.d.). Ajuntament de Barcelona. Retrieved November 18, 2021, from https://ajuntament.barcelona.cat/superilles/en#

To evaluate the model's usefulness and any potential improvements to be introduced during its implementation, the first Superblocks Programme also provided a system to monitor and evaluate the impact on the main public health and urban environment elements over 4 lines, 7 areas and 42 indicators.[23] Over the past years, the Barcelona City Council has changed the system as the theoretical model and indicators were developed in an academic context and were hardly applied to practice due to their complexity and data unavailability. In the same way the Superblocks theoretical project had to adjust the reality of Barcelona's districts, the indicators to measure the impact of Superblocks also changed with the evolution and territorialisation of the urban strategy. Nowadays, the aim is to collect basic data, which could be subsequently related to each other in order to create more complex indicators.[24] A comprehensive document with collection of the indicators to monitor and evaluate the impact of the Superilla Barcelona urban strategy is under preparation and will be ready by the beginning of 2022. Superblocks planners' goal is to gather data on the following aspects:

- **Mobility**: data on the mobility of pedestrians, bicycles, and motor vehicles. They will be measured with traffic counters and cameras without compromising the privacy of users.
- **Environment**: data on the quality of air (NO2 and PMs) and environmental noise. Measuring stations are scattered across the Eixample district.
- **Habitability**: data on green areas per m^2, benches per m^2, spaces of stay per m^2, number of fountains per m^2, play areas per m^2, number of trees per m^2.
- **Socio-economic**: to understand the impact of gentrification, the evolution of rent prices is tracked both in relation to private housing as well as the rent of shops. Moreover, data is gathered to understand the usage of credit cards in the area. A higher use of credit cards indicates a greater commercial vitality.
- **Health**: qualitative surveys are being developed to monitor the evolution of neighbours' healthy behaviours in public space (see the report 'Salut als Carrers').[25]

2.2 Other concepts for calming traffic and transforming public space

Many other similar concepts for calming and banning traffic and transforming public space evolved in the last decades across the globe. They aim to accelerate the sustainability transitions and improve the liveability for urban residents, and demonstrating at the same time that a localized approach is a promising path forward for urban transformation. In order to extract some valuable lessons from them and compare them to Superblock model, six similar concepts/programmes were studied and described – Woonerf, Circulation Plan, Mini Hollands, Low-traffic Neighbourhoods (LTN), Open Streets and Paris Respire.

As the "mother" of the described concepts, Woonerf needs to be pointed out as it largely inspired and paved the way to implementation of newer concepts. The concept, developed and implemented in Delft, Netherlands in the late 1960s, is known as one the most successful grassroots efforts to free residential streets from the old auto-centric paradigm by introducing traffic calming measures, eliminating the separation between pedestrian and vehicular traffic, and preventing through traffic. It gained extreme popularity and was adopted in several places

[23] Ajuntament de Barcelona. (2016, May). Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

[24] Rosa Lopez (2021). Informal interview.

[25] Iturralde Farrus, B. (2021). Informal interview

around the world, often with different names and in different variants. Among the described concepts, it directly inspired the Mini-Hollands programme in London.

These concepts are very similar in the way that:

- they all prioritize sustainable transport modes while disrupting motorized traffic at the same time,
- they transform and redistribute public space and return it to people,
- they aim to improve liveability of urban environment, and
- they aim to improve public health through reducing air pollution and noise and promoting active mobility.

On the other hand, there are also some dissimilarities between concepts in regards to:

- **Temporal aspect**: some are being established for a certain period only (Open Streets, Paris Respire), orientated to demonstrate a vision and raise awareness of the recent distribution of space.
- **Spatial scale**: some are basically applied at a street level (Woonerf), some at the neighbourhood (LTN), while the others were applied over larger areas, such as districts (Mini-Hollands) or the whole inner city (Circulation Plan), or the combination of the above (Open Streets, Paris Respire).
- **Strictness of traffic banning regime**; in the "temporal" cases, areas are completely closed for motorized traffic (Open Streets) or are only accessible to residents (Paris Respire).
- **The importance of public space redistribution**; concepts, such as Circulation Plan and LTN are more traffic regulation approaches, focusing on preventing through traffic (by introducing modal filters and one-way streets), putting public space redistribution into the background.

If we compare these concepts to Superblock model, we can see that Superblock is in fact the most radical of all approaches from numerous perspectives:

- It is basically the only concept applied city-wide (although first attempts were being implemented locally, e.g. certain streets or neighbourhoods).
- Its evolution is also "climate change induced" both in terms of adaptation and mitigation.
- Its rationale also includes citizens' empowerment.
- Despite its gradual approach with tactical urbanism, it has a permanent character, aiming for a long-term structural change.

Woonerf

A Woonerf, a Dutch term for "living yard", is a traffic-calming measure that gives pedestrians priority over other (motorised) traffic. Woonerfs are residential areas (neighbourhoods) that primarily serve as residential areas, meeting places, playgrounds and pedestrian zones and have the additional function of accommodating traffic while having no function for through traffic.

Figure 5: Woonerf.[26]

Circulation Plan

Circulation Plan is a traffic regulation scheme with the goal to take transit traffic out of the city centre. It was applied in Ghent, Belgium in 2017.

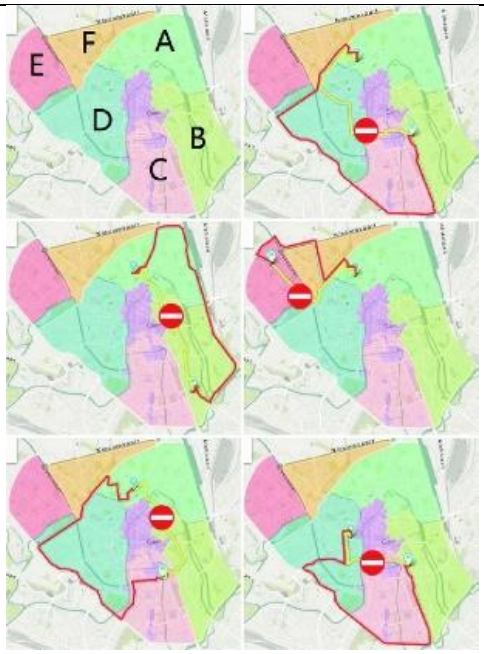

Figure 6: Ghent's Circulation Plan.[27]

[26] Vazquez, L., & Dillmann, E. (n.d.). Introduction. NEU DIALOGUE DELFT 2017. Retrieved November 18, 2021, from https://web.northeastern.edu/holland2017sustrans/?page_id=527

[27] Rezende Amaral, R., Šemanjski, I., Gautama, S., & Aghezzaf, E. H. (2018). Urban Mobility and City Logistics – Trends and Case Study. Promet – Traffic & Transportation, 30(5), 613–622. https://doi.org/10.7307/ptt.v30i5.2825

Mini Hollands

Mini-Hollands is a holistic approach to improve public spaces in residential neighbourhoods and to change the mobility behaviour of the London population by improving the walking and cycling infrastructure according to the Dutch example.

Figure 7: Mini Holland, Waltham Forest.[28]

Low-traffic Neighbourhoods

A Low-traffic Neighbourhood (LTN) is an area where motorised through traffic is discouraged or impeded to ensure safe walking and cycling, improving air quality and road safety.

Figure 8: Low-traffic Neighbourhood.[29]

[28] Walthamstow Village, Mini-Holland, Waltham Forest | Civic Trust Awards. (2017). Civic Trust Awards. Retrieved November 18, 2021, from https://www.civictrustawards.org.uk/benet/schemes/mini-holland-walthamstow-village

[29] Sheridan, E. (2020, October 27). Residents and councillors discuss impact of Hackney Downs low traffic scheme. Hackney Citizen. Retrieved November 18, 2021, from https://www.hackneycitizen.co.uk/2020/10/27/residents-councillors-discuss-impact-hackney-downs-low-traffic-scheme/

Open Streets

The concept of Open Streets (also known as Ciclovías in Latin America or Car-Free-Days) stands for temporary closures of entire streets to motorised traffic in order to use them as public spaces. Often, the opening of the streets as public space goes along with a programme or organised activities.

Figure 9: Open street on State Street, Chicago, IL.[30]

Paris Respire

Paris Respire (Paris Breathes) is the name of a car-free initiative begun in May 2016 in Paris, France, where certain districts are closed to motorized through traffic and traffic-calmed for a different interval, mostly on Sundays and public holidays between 10am and 6pm.

Figure 10: Paris Respire[31]

All six concepts are described in more detailed way in the **Table 1**, together with results and lessons learned, which are discussed in the third chapter.

[30] Street Plans & Alliance for Biking & Walking. (2012, February). The Open Streets Guide (Volume 1). https://nacto.org/docs/usdg/smaller_open_streets_guide_final_print_alliance_biking_walking.pdf

[31] Azeredo, L. (2017, October 1). Paris - Dia sem carro [Photograph]. Flickr. https://www.flickr.com/photos/wricidades/37442473322/

Table 1: Comparison of the selected concepts.

	Woonerf	**Circulation Plan**	**Mini Hollands**
Rationale	The original idea behind Woonerfs was to create a safe space for communities, especially children, to gather and/or play. Today, the implementation of the Woonerf concept in neighbourhoods has a broader mission. Woonerfs not only promote community cohesion by freeing residential streets from the old auto-centric paradigm, but they also promote healthier lifestyles by encouraging non-motorised transportation and improving the quality of life in neighbourhoods. Woonerfs radically reduce traffic speeds, which increases traffic safety, provides more opportunities for social interaction and activity, and improves the aesthetic quality of the street. In the U.S., for example, woonerfs are now also being developed as measures to promote physical activity among children and families and to address the growing problem of obesity.	The Circulation Plan ("Het Circulatieplan") is part of a larger mobility plan in Ghent devised in 2012 in response to the rising amount of car traffic in the inner city, causing mass street parking and congestions on the roads entering the inner city, and growing concerns over negative impacts of noise and air pollution. The city set out targets to change the modal split by 2030 (reducing car usage and increasing cycling, public transport and walking). The Circulation Plan was proposed and implemented with a goal to disable through traffic in the city centre. It was inspired by the traffic circulation plan from Groningen, the Netherlands in 1977, where the centre of the town was divided in four sectors. Cars were prohibited to cross sectors (they had to take the ring-road around the inner city). Cyclists could move freely about on new cycle paths constructed. Groningen's success was established on the political power, neglecting the opposing views. Expert involvement (bureaucracy) and citizen participation were reduced to a minimum.	The Mini-Holland concept focuses specifically at Outer London boroughs, where residents are still more dependent on cars. The goal is to improve pedestrian and bicycle infrastructure, thereby reducing traffic and car dependency, renewing community space, and expanding public health and quality of life for children and adults. One of the important things for the concept was to break down people's barriers that keep them from riding a bike and to redesign parts of the areas so that they offer more quality of life for the residents. Mini-Hollands also became part of London's "Healthy Streets" approach, which aims to counter the physical inactivity of London's population with bike- and pedestrian-friendly living spaces.
How it works	It aims to eliminate the separation between pedestrian and vehicular traffic, such as continuous curb between sidewalks and traffic lanes. It also introduces traffic calming measures. Woonerfs are limited to one street with adjacent residential area, designed with clearly marked accesses to and exit from the neighbourhood. Each woonerf should provide parking for residents' cars, keeping the neighbourhood accessible to vehicles, but prevent the through traffic. Speed limit is reduced, street lighting provided, various areas are marked by the colouring of the street and protected (road marking for parking - P, playgrounds, etc.).	To prevent cars from needlessly crossing the city centre, the Circulation Plan divides the city into six separate districts, including one large car-free/pedestrian zone. If cars would like to move from one sector to another, they need to make use of the inner city ring road as part of the plan. Some streets changed direction or were cut for cars, causing direct journeys between the areas are not allowed.	The Mini-Holland concept follows the basic idea of Dutch "Woonerfs". In order to retrofit the key principles for a traffic-calmed and mixed-used residential neighbourhood, public street space is redesigned and redistributed. Key features include Low-traffic Neighbourhood schemes, more space for cycling and walking as well as more green spaces and safer junctions.

Table 1: Comparison of the selected concepts, continued.

Low-traffic Neighbourhoods	**Open Streets**	**Paris Respire**
Low-traffic Neighbourhoods (also active or filtered neighbourhoods) can help reduce air pollution, decrease traffic accidents, and increase community activity. Combined with the much quieter and safer streets due to the elimination of through traffic, it allows residents to switch to healthier modes of transportation, especially for short trips. In addition to that, more walking and cycling-friendly neighbourhoods are good for local business and can help local high streets thrive too. Therefore, they are often an integral part of a holistic approach for improving neighbourhoods.	Despite the fact that the idea of opening a street temporarily for public use is older, the first application of the Open Street concept is dated back to 1974 in Bogotá, Colombia. Through the absence of motorised vehicles, the rationale behind Open Streets are manifold: Primarily, local residents are encouraged to experience and appropriate 'their' streets and use the free space for other purposes, like socialising or strolling. Being active generally contributes to healthy living. The improvement of the air quality is another positive side effect that can be observed in the field of health. Creating an attractive environment for active travel, even when only temporary, encourages residents to walk and bike and to give more consideration to it when making mode choices. Furthermore, Open Streets can strengthen the sense of community in a neighbourhood and usually have positive, though short-term, economic impact through an increase of sales of businesses along the route.	Paris is one of the most polluted cities in Europe, mainly due to road traffic, which also occupies most of the public space in the city. In 2016, the Council of Paris adopted a vast project to redevelop Paris's emblematic squares with the aim of prioritizing pedestrians and cyclists. This initiative sets out to decongest the squares, ease access to public transport and intermodality, create welcoming green spaces for socialising, promote the architectural and historical heritage of the squares, facilitate cultural and sporting activities and simplify the journeys of cyclists and pedestrians. To increase the number of continuous footpaths and simplify pedestrian access to the road system while facilitating access to public transport and improving the conditions for walking, the Paris Pedestrian Strategy *(Stratégie Paris Piéton)* was adopted in 2017. In line with this approach, the "Paris Breathes" *(Paris Respire)* scheme provides "breathing spaces" *(espaces de respiration)* for Parisians and visitors in all districts of Paris, on every Sunday and public holiday until 2024.
LTNs follow the idea of Circulation Plans on a smaller scale. LTNs comprises of several residential streets bordered by main roads and hinder motorised through-traffic. To achieve this, the road network for motor vehicles is interrupted at strategic points. The neighbourhood thus remains accessible for vehicles, but can no longer be driven through. In order to increase the living quality and quality of urban spaces, additional pocket parks as well as sitting areas, like benches or other street furniture can be installed. Moreover, LTNs can be connected, to create a safe, citywide network of direct routes for pedestrians and cyclists.	The base of the Open Street concept is the closure of the street for motorised vehicles. Both, the frequency of the event and the duration varies from city to city. Surveys from Ciclovías in Latin America and Open Streets in North America found out that the frequency of open street events vary from annually to monthly to several events per year. In Europe, a Car-Free-Day is integral part in the European Mobility Week by the European Commission that takes place from the 16th until the 22nd of September annually. In 2021, 3.197 cities from more than 50 countries have been participating. Furthermore, regulations for exceptions for certain kinds of motorised vehicles are also locally managed.	Areas of a different size are temporarily closed for traffic for a different time period with a different regime. More and more areas are closed permanently – in most such cases, only residents, delivery and emergency vehicles can enter the zones. Some are closed on the first Sunday of the o only (e.g. Paris Central and des Champs-Elysées), some only in the summer, while some at specific dates. The number of areas, included in the programme, is growing; there are 25 of them at the moment.

Table 1: Comparison of the selected concepts, continued.

	Woonerf	**Circulation Plan**	**Mini Hollands**
Implementations and concrete measures	Although the idea of traffic calming in residential areas is older, the name and more formal conception of the Woonerf approach was first developed and implemented in Delft, the Netherlands, in the late 1960s. Woonerfs gained popularity and were adopted in several countries around the world often under different names (e.g., Shared Zone in Australia, Wohnstrasse and Begegungzone in Austria and Germany, Home Zone in the United Kingdom, and Shared Street in the United States, living street, shared space). As the names suggest, the concept is primarily concerned with improving the living conditions in neighbourhoods. • Uniform street surface: no continuous curb in the cross-section profile of the road • Entrances and exits: the entrances and exits to a Woonerf clearly detectable and set at some distance back from the junction with other roads • Parking: sufficient parking space within woonerf to meet the needs of residents; parking spaces clearly indicated • Physical obstacles: barriers to induce a speed limiting for motor vehicles and to prevent motor vehicles to drive too close to the houses • Play areas: adequately marked and protected to distinguish them from areas intended for motor vehicle use • Public lighting: To assure visibility of all provisions	The city council decided to implement the plan in April 2017 as a whole, overnight. Numerous measures preventing the crossing of the sectors were implemented: • The driving direction of vehicles was changed in 77 streets. • More than 2500 traffic road signs were removed or newly placed. • Motorized through traffic has been made impossible at 14 locations; exceptions were made for cars with special permits (for example emergency services and health care suppliers), buses, and taxis. • 9 locations got a temporary design in anticipation of a permanent redesign. • Cameras with license plate recognition technology have been placed at three crucial points and pedestrian zone entrances. • Across the city, more space was given to pedestrians, cyclists and public transport. Other, indirect measures, were also part of the mobility plan: e.g. increase of parking restrictions and fees and the enhancement and promotion of park-and-ride areas in the outskirts.	The London government funded the Mini-Holland program starting from 2013. As of June 2019, 46 of the 59 proposed infrastructure schemes were complete or under construction. It has been implemented in three outskirts of London: Waltham Forest, Kingston and Enfield. In Waltham Forest alone in total, 700 new trees were planted and 15 pocket parks were created. In addition, over 1,200 bicycle hangars, 7 cycle parking garages, 300 bike parking spaces (the size of a car) and 22 km of secured cycling infrastructure were built, 100 crossings were improved and 40 modal filters installed. Measures for well-being of people: • Establishment of ‘pocket parks’ and ‘parklets’ • public seating and tree plantings, flowerbeds • areas for recreation and play • the construction of a pedestrian zone in the shopping street Measures for the safety of cyclists and pedestrians: • Redesign of traffic circles and crossroads • Cycle lanes • Low-traffic Neighbourhoods • Modal filters to avoid through-traffic • Speed limit Further measures and services for residents: • Bicycle lessons for adults and children • Free bicycle repair and maintenance courses • Free bicycle and cargo bike rentals • Bicycle parking

Table 1: Comparison of the selected concepts, continued.

Low-traffic Neighbourhoods	**Open Streets**	**Paris Respire**
LTNs gained popularity as part of the Mini-Holland program 2015-2019 in Outer London boroughs Waltham Forest, Enfield and Kingston. In this context, they were mainly associated with increased cycling and walking, greater participation of citizens and a reduced risk of injury. Possible measures for setting up a LTN (Sustrans 2020): • Modal filters: Bollards or planters that stop motor vehicles accessing a particular street • Pocket parks: Set of two modal filters to create a new area, that cannot be accessed by motor traffic • Diagonal filters: Bollards or planters placed diagonally through a crossroad, to minimise the need for reversing • Bus gate: A modal filter, which buses and emergency vehicles can travel through (usually camera-operated) • Banned turns: To stop motorised vehicles turning certain ways in residential areas which slows the flow of traffic • One-way streets: Streets that only allow traffic in one direction The Covid-19 pandemic has had a major impact on the rapid implementation of LTNs. Between March and September 2020, 72 so called “emergency LTNs” were implemented across London’s 33 districts, involving the placement of 377 new modal filter. 3.7% of London’s residents live inside a new LTN and 8.9% live within 500m of any new modal filter. The British government has supported the implementation through an Active Travel Fund. These newer emergency LTNs also follow the principle of traffic reduction, although they are designed and implemented rapidly, cheap and temporarily.	The implementation of some variety of the Open Streets model usually requires: • Extensive efforts in the field of public relations and media: Residents need to understand the concept and be informed about the concrete measures and access restrictions. Failing to do so could lead to a lack of public acceptance. • Define access regulations and exceptions: Usually, there are certain exceptions for local residents or people with reduced mobility. • Signage: Temporarily setting up signs might not only serve for information, but could also be legally required. • Physical barriers: Setting up temporary physical barriers to mark off the area and to protect from rule violations.	The measures in the concept include: • roads are exclusively reserved for buses, emergency vehicles and taxis in compliance with a speed limit of 20 km/h. • local residents returning from holidays are authorized to drive if they present proof of address during a possible control at the gates. The areas are graphically presented in the web map application with all the relevant information on traffic restrictions.

Table 1: Comparison of the selected concepts, continued.

	Woonerf	**Circulation Plan**	**Mini Hollands**
Results/lessons learned	Woonerfs are a relatively inexpensive and quick means of counteracting the negative impacts of motorised traffic and encouraging active transportation in neighbourhoods. Because the Woonerf concept focuses on reducing traffic speeds and discouraging through traffic, they contribute to road safety and improve the socialisation function of streets - providing more opportunities and space for social interaction, play, and other activities. Research has shown that traffic speeds have decreased, residents have a greater sense of safety and more efficient use of space, socialisation activities have been strengthened, and streets have become more visually attractive. Although Woonerf appears to be a measure that has a variety of positive impacts on the quality of life in neighbourhoods, there are also some concerns about Woonerf. One of these concerns relates to accessibility for emergency vehicles and other larger vehicles, which is critical in the event of fires, accidents involving injuries or sudden health problems, and when moving furniture. In neighbourhoods where the Woonerf concept has been implemented, there are also issues with providing adequate parking, increasing property values, traffic congestion in surrounding areas, and fear of accidents due to the mix of transportation modes.	A year after the implementation of the traffic Circulation Plan, an extensive analysis of its effects was conducted, following by in-depth observations at the beginning of 2019. Both studies showed that Circulation Plan reached its goals: there was a clear shift towards the more sustainable modes of transport, a differentiated improvement of the city's accessibility, and an improvement of the traffic liveability. Also the economic situation has improved; there has been a 17% increase in restaurant and bar start-ups, and the number of empty shops has been arrested. At the same time, some areas for improvement were identified that need thorough follow-up and, where necessary, have to be adjusted, e.g. a need to continue to inform the inhabitants and commuters on the possibilities of the Circulation Plan by means of appropriate signalisation and interactive communication. A year after the imposition of the traffic Circulation Plan, Filip Watteeuw, deputy mayor of Ghent, was re-elected with an increased majority.	In the beginning, the project was very controversial. In Waltham Forest many local storeowners worried that the road closures and the loss of parking would threaten their business. In Enfield, it also caused a strong backlash. The lesson learned was that participatory approach is vital for a successful implementation. The decision-makers enabled residents and businesses to express their feelings about the neighbourhood and improvements they would like to see. Waltham Forest Mini-Hollands supporters also talked to people in person and posted a great myth-busting page on their bike campaign website. In Enfield, they created a fact sheet for businesses that showed how beneficial bike lanes are to the economy. The project Mini-Hollands was able to overcome most of the people's objections. The 2020 survey demonstrated that the implemented measures have a positive impact on neighbourhoods. The social networks and participation have been strengthened through community gardens and green spaces. In Waltham Forest, the measures significantly reduced traffic on the main roads–by 56% (10,000 vehicles less per day than in the first full year of the regulation)–and positively affected the local economy (30% increase in retail trade and 17% decrease in retail vacancies). The pollution with nitrogen dioxide decreased by 15-25% and with particulate matter by 6-13%. Studies have shown that the amount of cycling already increased by 5% within the first year. In addition, Mini-Hollands lead to reduced car ownership, lower road injury risk, and reduced street crime.

Table 1: Comparison of the selected concepts, continued.

Low-traffic Neighbourhoods	**Open Streets**	**Paris Respire**
Low-traffic Neighbourhoods are a rather cheap and quick tool to counter negative effects of motorised traffic and foster active travel. As the focus lays primarily on tackling through traffic, they leave out desirably additional (and holistic) measures like junction improvements, greening, and cycle infrastructure. Nonetheless, LTNs have shown an increase of physical activity through more walking and cycling, many benefits for local businesses through an increase in sales, higher spend in people who walk or cycle to a high street and lower car-use for shorter trips. In fact, walking and cycling improvements can increase retail spend by up to 30%. It also created spaces for more social interactions between neighbours and has helped to strengthen communities. Overall, research shows that LTNs have a positive impact on air quality and traffic safety. There is a 75% reduction in the risk of being injured in a traffic accident in a low-traffic neighbourhood. However, the rapid implementation during Covid has led to strong political controversies and sometimes tangible resistance in the neighbourhoods. Many of the Covid-LTNs are reviewed after a trial period of several months and are partly being dismantled due to pressure from some residents and insufficient impacts on air quality and encouragement of active travel.	The opportunity to experience streets as public space raises awareness of the recent distribution of space. Since open street events only occur temporarily, these events do not directly tackle everyday mobility challenges. However, through the possibility to observe different kinds of usage of public space, Open Streets demonstrate a vision and hence contribute to spatial justice. Beside the abovementioned potential to create awareness, the comparably high administrative efforts and the accompanying financial and personal resources have to be taken into account. A lot of time and money is invested in something temporary, while the resources could be used for something permanent. Lastly, the event character of Open Streets must be considered as both risk and advantage, as Bertolini (2020) points out: While the focus on Open Streets as an event results in high media presence there is the risk that the intention of the event to raise awareness on distribution of space might fade in the background.	Some effects of the closure of the Georges Pompidou boulevard, a central thoroughfare, on the Parisian ring road traffic conditions was analysed. The results are mixed. It was found out that the closure increased the probability of congestion on ring road lanes with the same flow direction as the riverbank by 15%, translating into an additional 2 minutes spent on a 10 km trip. Train use and pollution data suggest that only a small fraction of affected commuters switched to public transportation and a majority of affected residents suffered from a decrease in air quality. During the whole of Paris Respire without a car on 19 September 2021 (between 11 a.m. and 6 p.m.), the concentrations of nitrogen dioxide (NO2) were almost 20% lower than those on a usual Sunday. In May 2021, Paris Mayor Anne Hidalgo has announced ambitious plans to pedestrianise the historic centre of Paris by next year - introducing a low traffic zone in the four central districts that would restrict most vehicles from entering the area. The programme has also faced some fierce opposition, namely among car drivers (e.g. French motorists' association), concretely on traffic banning measures in the city centre. They argue that such programmes are discriminating towards the people on the periphery and that other measures, such as free parking spaces on the outskirts and improved public transport should be implemented at the same time.

Table 1: Comparison of the selected concepts, continued.

	Woonerf	**Circulation Plan**	**Mini Hollands**
Other implementations	With a slight conceptual differences, woonerfs were implemented worldwide. E.g., a Woonerf in the Netherlands focuses on creating a sense of place, a Home Zone in the UK focuses more on traffic calming and accidents reduction. In the US, Shared Streets are implemented in commercial areas (Linden Street in San Francisco, CA; Palmer and Winthrop Street in Cambridge, MA), while they are very rare in residential areas (Sommerwille, MA; Play street in New York). All forms of Woonerfs include formal and informal spaces for mixed social activities and slowed motorised traffic.	Along Groningen, where the similar concept was already put in place in 1977, adoption of such plan has already been implemented in some British cities (London, Manchester, Birmingham), but on a smaller scale ("Low-traffic Neighbourhoods"), not city-wide.	Mini-Hollands have so far only been implemented in the three Outer London boroughs. As part of the British government's "Active Travel Fund", further Mini-Hollands are also to be realised in 12 non-London councils. In June 2021, the Department of Transport invited municipalities to apply for funding to implement Mini-Hollands.
Comparison to Superblock concept	Woonerfs aim to slow traffic, discourage through-traffic, create safe shared spaces, and build more cohesive communities. In this respect, the concept is based on a similar philosophy to Superblocks, but on a smaller scale. Woonerf is confined to one or a few streets with adjacent houses, whereas Superblocks function as "self-sufficient"; small towns with a wide range of services. Also the Superblock concept is much broader than Woonerfs. Besides community-building and traffic-calming effects, Superblocks also focus on climate change mitigation, particularly on reducing the urban heat island impact on the quality of life (green infrastructure) and reducing (global) traffic emissions.	Compared to Superblock implementations in Spanish cities, where localized neighbourhood-oriented approach was taken, the Circulation Plan in Ghent was implemented city-wide. Compared to Superblock, it can be described as a less radical solution as most places in the city, including the city centre, are still accessible by car. In addition, the concept of Circulation Plan does not emphasize the public space redistribution aspect, at least not directly.	In direct comparison of the Mini-Hollands with the Superblock concept, many overlaps become visible. This includes the spatial level (neighbourhood), the multidimensional objectives (social cohesion, health, traffic, urban space distribution) and the combination of different measures (Low-traffic Neighbourhood schemes, upgrading and redistributing urban spaces). However, in contrast to Barcelona's Superblocks Mini-Hollands have so far been realised in Outer London districts. Therefore, Superblock-like interventions may not be limited to inner-city contexts, but can also be beneficial and successfully implemented in less dense, suburban areas.
References	Collarte, 2012; Collarte, 2014; Nalmpantis et al., 2017; Gharehbaglou & Khajeh-Saeed, 2018; Zografos et al., 2020	Tsubohara & Voogd, 2004; Eltis, 2017; Cadence Team, 2018; Rezende Amaral et al., 2018; Transport & mobility Leuven, 2019; Reid, 2020; van der Zee, 2020	Waltham Forest, 2015; Hinchcliffe, 2016; ; Waltham Forest Council, 2019; Aldred, 2020; Allgemeiner Deutscher Fahrrad-Club, 2020; Department for Transport, 2020a; Goodman et al., 2020

Table 1: Comparison of the selected concepts, continued.

Low-traffic Neighbourhoods	**Open Streets**	**Paris Respire**
Low-traffic Neighbourhoods can be found throughout Great Britain. Next to London, LTNs have been introduced to many other cities including Birmingham and Manchester both during Covid and before. For Bath and North East Somerset Council it is even a reasonable option in their regional and rural context.	/	/
Low-traffic Neighbourhoods are primarily aimed at stopping through traffic. These measures are also an integral part of Superblocks, although redistributing and redesigning urban space play an integral role. However, these elements require long-term planning periods and is addressed, for example, in the context of the more holistic Mini-Hollands. At the same time, the Covid pandemic and the emergency LTNs have shown that improvements for residential neighbourhoods are quickly achievable through reversible measures.	The main difference between these two concepts is the time factor: While Superblocks constitute a permanent transformation of public space, Open Streets merely remain on the temporary scale. Another significant aspect is the scale: The areal scope of Open Streets can be smaller or bigger than a Superblock. Additionally, Open Streets are more restrictive for motorised traffic than Superblock. In general, Open Streets can be considered as valuable surplus in order to generate acceptance for potentially subsequent permanent restructuring of public space, e.g. Superblocks.	Among similarities, the spatial component needs to be stressed out since traffic banning areas are of a similar size than already implemented superblocks in Barcelona. Secondly, the traffic regime is similarly strict as a speed limit is radically reduced, the access is only permitted to local residents and special vehicles. Contrary to installed superblocks in Barcelona, the Paris Respire programme prioritize temporary measures (on a certain day during the week) in a more gradual manner.
Rosehill Highways, Living Streets & London Cycling Campaign, 2018; Department for Transport, 2020b; Jacobs Consultancy Ltd., 2020; MacMichael, 2020; Aldred et al., 2021; Aldred & Goodman, 2021; Laverty et al., 2021; Removal of Seven Low Traffic Neighbourhoods (LTNs), 2021; Sumner, 2021; Kings Heath Low Traffic Neighbourhood: Experimental Traffic Regulation Order - Birmingham City Council - Citizen Space, n.d.; Walking and Cycling: The Economic Benefits, n.d.; What Is a Low Traffic Neighbourhood?, n.d.; The Bee Network, n.d.	Kuhlberg et al., 2014; Chaudhuri & Zieff, 2015; Shu et al., 2016; Hipp et al., 2017; Sarmiento et al., 2017; Rachman, 2019; Bertolini, 2020; European Mobility Week, 2021 Participants, n.d.	“A Bobo’s Pipe Dream”: Can the Centre of Paris Really Be Made Car-Free?, 2018; Avec “Paris Respire”, la capitale se débarrasse des voitures le temps d'une journée, 2021; Ayuso, 2021; Paris Respire. (n.d.)

3 State-of-the-art

3.1 Existing Superblock implementations examples

Early implementations of Superblocks in Barcelona (they were not called superblocks) began in the 1970s and were limited to traffic calming plans. The first city block, free of motorized traffic was established in Barcelona's old town in 1993. Other traffic calming and banning implementations followed, for example in the Gràcia district in 2005, but they were not embedded in a larger city-wide mobility plan.[32]

The first implementation of the pilot Superblock project under the new mobility plan was realized in the district of Poblenou. It started in September 2016 and followed the principles of tactical urbanism, without establishing permanent infrastructure or any public participation with the residents. First measures included:

- cut off through traffic and radically reducing the speed limit in the interior
- designs painted on the ground, tires laid down in circles for play areas, trees potted to line the streets by architecture students.[33]

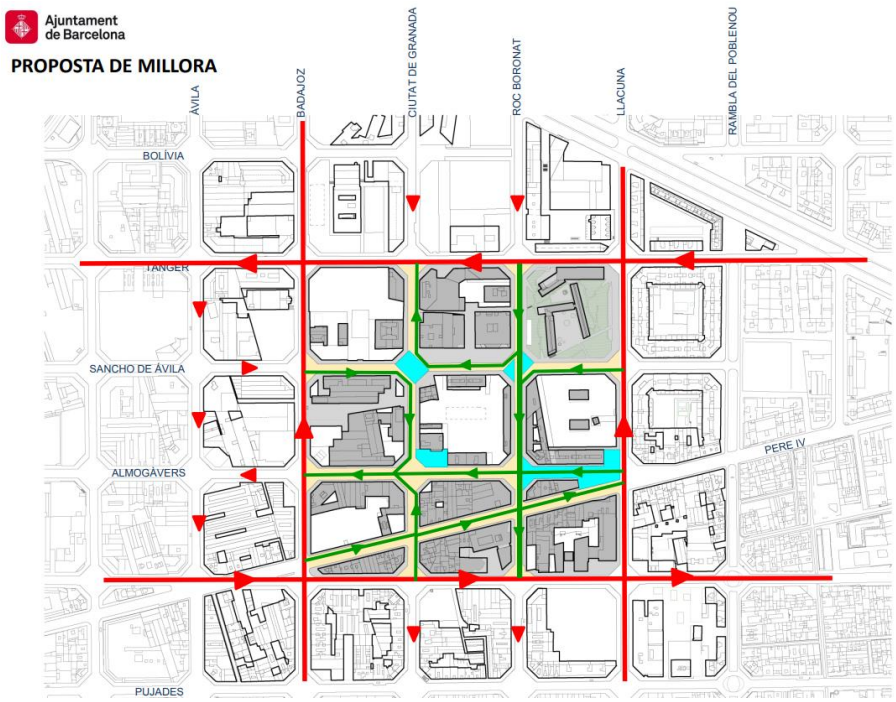

Figure 11: The map of the Poblenou superblock.[34]

As the intervention came unexpectedly for residents, suddenly changed their daily routine and assumed to brought benefits mainly for the interior part, faced strong resistance from certain political and civil society spheres, resulting in a non-legally binding local referendum in May

[32] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

[33] Roberts, D. (2019, April 9). Barcelona, Spain, urban planning: what the city learned from the first superblocks. Vox. Retrieved November 18, 2021, from https://www.vox.com/energy-and-environment/2019/4/9/18273894/barcelona-urban-planning-superblocks-poblenou

[34] Ajuntament de Barcelona. (2016, September 28). Omplim de Vida els Carrers: Implantació de les Superilles a Barcelona [Slides]. Ajuntament de Barcelona. https://ajuntament.barcelona.cat/superilles/sites/default/files/20160928_Superilles_ari.pdf

2017, when the majority of participants voted against continuing the pilot project.[35] However, time passed, the intensive consultation with the neighbours followed, opposition died down and the city built a more permanent playground, planted several green areas, and put in picnic tables.[36]

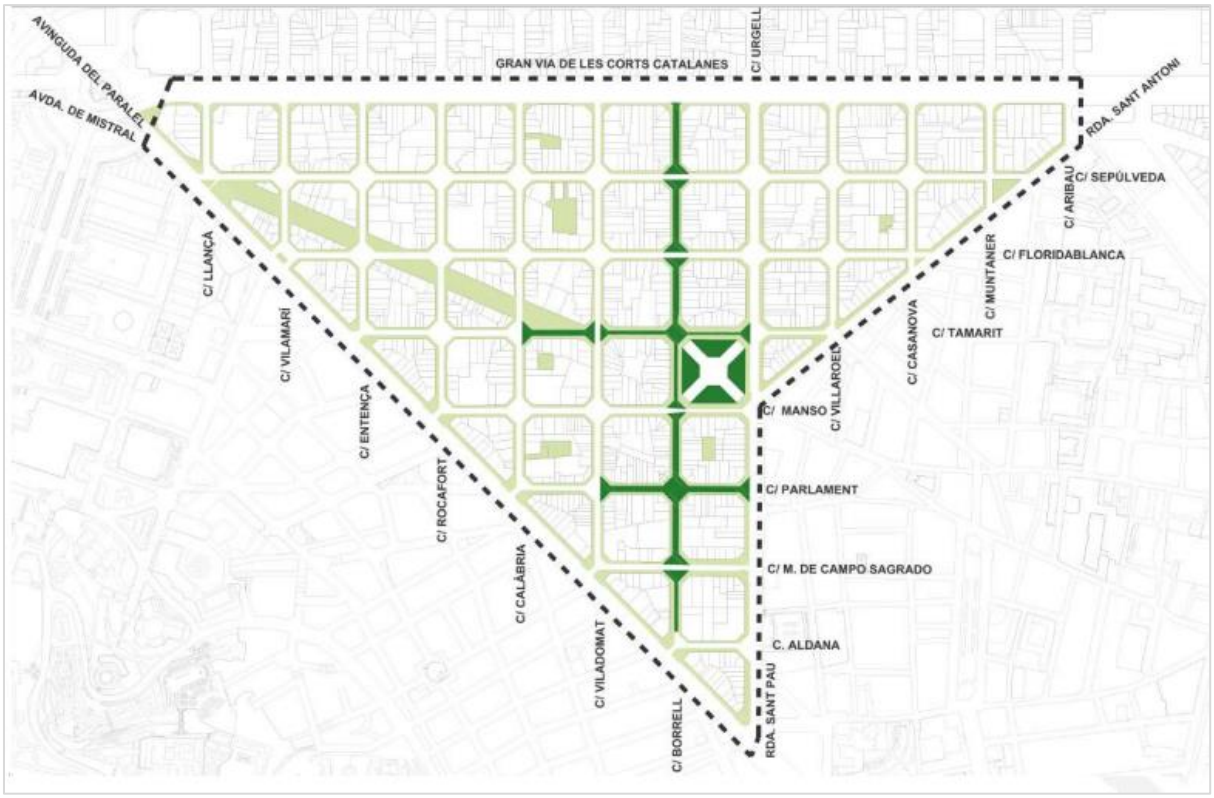

Figure 12: The map of the Sant Antoni superblock.[37]

The Sant Antoni superblock (Figure 13) is different to Rueda's ideal model because instead of 3x3 dimensions it includes the entire Sant Antoni neighbourhood. And, instead of pacifying two out of three streets, only one of three has been transformed. The transformations include four sections of street forming a cross shape (Comte Borrell between Floridablanca and Manso; and Tamarit, between Viladomat and Comte d'Urgell), and the creation of a public square of 1,800 m² in the middle. While a 'super plaza' emerges on the intersection of two green axes, when the green axes intersect with the superblocks inner streets, 'half plazas' are created by expanding the chamfers. Also part of the green axes network that give priority to pedestrians, are the streets Comte Borrell, between Gran Via and Floridablanca; and Tamarit, between Viladomat and Calàbria which underwent long-term transformations. Comte Borrell street between Manso street and Paral-lel avenue, as well as Parlament street between Ronda de Sant Pau and Viladomat, feature tactical urbanism changes. The Superblock interventions

[35] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

[36] Roberts, D. (2019, April 9). Barcelona, Spain, urban planning: what the city learned from the first superblocks. Vox. Retrieved November 18, 2021, from https://www.vox.com/energy-and-environment/2019/4/9/18273894/barcelona-urban-planning-superblocks-poblenou

[37] Ajuntament de Barcelona. (2019, December 9). Superilles de St. Antoni. Consell de barri de Sant Antoni [Slides]. Ajuntament de Barcelona. https://ajuntament.barcelona.cat/superilles/sites/default/files/Presentacio%CC%81_CdB_Superilla_St.Antoni.pdf

include some changes in direction, for example, on the intersection of Borrell and Parlament streets it is no longer possible to drive through because the streets expel cars by forcing them to turn. Public space is gained through the extension of sidewalks, the elevation of the streets to create single platforms, and the incorporation of vegetation and public furniture. In sum, the Sant Antoni superblock prioritises the extension and continuity of green axes over the creation of isolated 'pacified pockets'. This approach has become the model to be reproduced throughout the city by way of the Superilla Barcelona urban strategy.

The Horta superblock's objective (Figure 14) was the improvement of urban comfort through an increase of urban greenery, the creation of areas of stay, and the incorporation of urban furniture. The transformations, as in the case of Sant Antoni, did not strictly follow Rueda's model. Instead, the superblock changes took place along four streets which were identified as important based on their role in the pedestrian networks, as well as on other streets which required functional changes to improve mobility. Two-thirds of the transformed streets were changed through tactical urbanism, while one third underwent long-term changes. The interventions included functional changes in street directions, bus routes, and bicycle network, as well as transformations to improve public spaces through the removal of parking spaces, the expansion of sidewalks, raising of the street to create a single platform, introduction of new trees and planter boxes, and the addition of urban furniture.

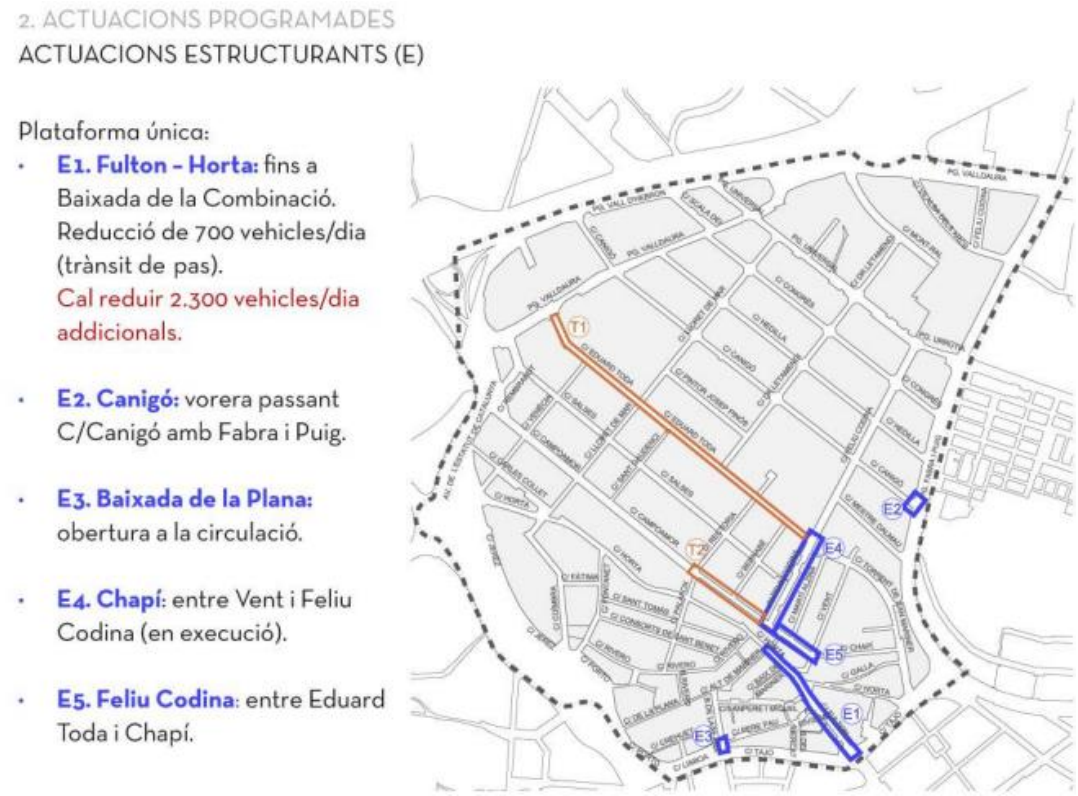

Figure 15: The map of the Horta superblock.[38]

[38] Ajuntament de Barcelona. (2019, November 6). Superilles Horta. Proposta de circulació - Fase final [Slides]. Ajuntament de Barcelona. https://ajuntament.barcelona.cat/superilles/sites/default/files/20191106_07-HOR-REUNI%C3%93%20GI.%20CANVIS%20DE%20SENTIT%20FASE%20FINAL.pdf

By November 2021, the Barcelona City Council has implemented six superblocks. They differ both in basic characteristics (such as size, form, economy, densities) and the outcomes.[39] [40] There are also other started and not yet finished interventions, but were reconceptualised and became part of the "umbrella strategy" of Superilla Barcelona.[41]

Table 2: Implemented superblocks in Barcelona.[42]

Neighbourhood	Population (2019)	Size (ha)	Year of implementation
La Ribera (Born)	5,993	12.48	1993
Gracia	18,631	22.96	2003
Poblenou	1,486	16	2016
San Antoni	38,566	48.81	2018
Les Corts	11,049	21	2018
Hortafrancs	8555	22.63	2018

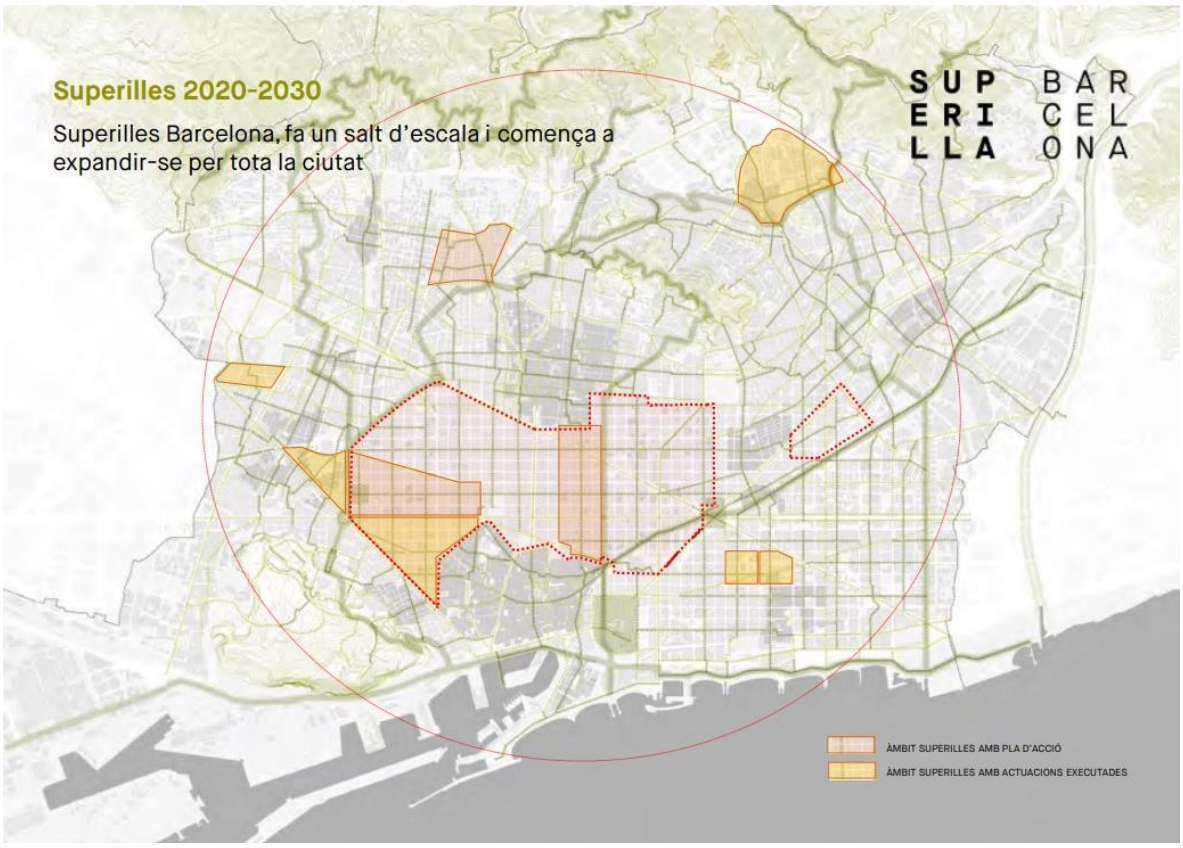

Figure 16: The map of implemented and planned superblocks.[43]

[39] Borisov, M. (2017, May). Car-free Intervention in Practice. A Case Study Of The Superblock In Poblenou (Master's dissertation). https://projekter.aau.dk/projekter/files/258793993/M_BORISOV_MT_URB4.pdf

[40] López, I., Ortega, J., & Pardo, M. (2020). Mobility Infrastructures in Cities and Climate Change: An Analysis Through the Superblocks in Barcelona. Atmosphere, 11(4), 410. https://doi.org/10.3390/atmos11040410

[41] Iturralde Farrus, B. (2021). Informal interview.

[42] López, I., Ortega, J., & Pardo, M. (2020). Mobility Infrastructures in Cities and Climate Change: An Analysis Through the Superblocks in Barcelona. Atmosphere, 11(4), 410. https://doi.org/10.3390/atmos11040410

[43] Grup Impulsor. (2021, September 28). Superilla Barcelona [Group meeting]. 1st meeting with the Impulsor Group, Barcelona, Spain. https://ajuntament.barcelona.cat/superilles/sites/default/files/20210910_Presentacio_Diagnosi_GI_1.pdf

The map (Figure 17) shows the local areas where there are implemented superblocks (in yellow) and planned superblocks (in red). A red dotted line to represent the leap in scale of the Superilla Barcelona strategy.[44] The map below (Figure 18) shows the interventions that will be carried out until 2023. The solid dark green lines are the green axes with pedestrian priority already implemented in Sant Antoni; the solid light green lines are the planned green axes with pedestrian priority; the dotted dark green lines are the other green axes with pedestrian priority that will be implemented in future terms; the dotted light green lines are existing green axes where pedestrians do not have priority; and the red dots are where the superplazas will be located.

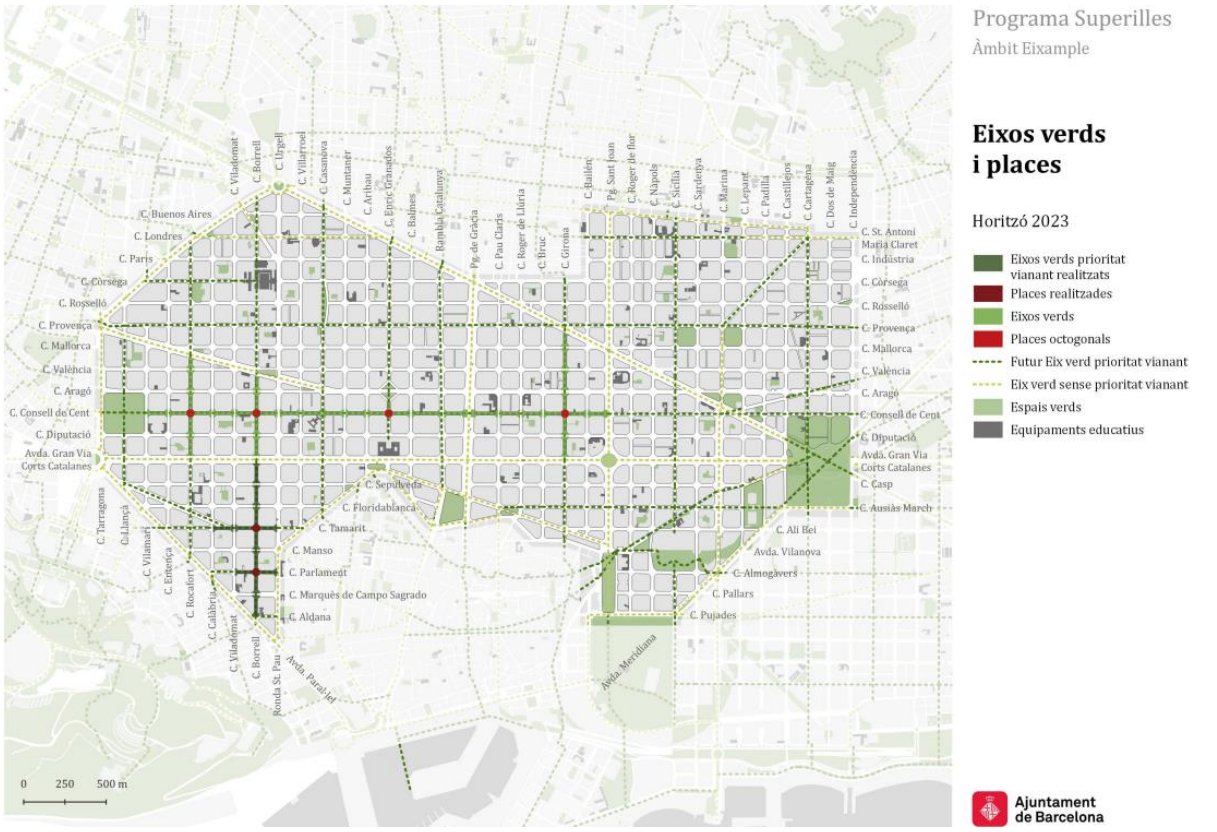

Figure 19 Interventions that will be carried out until 2023.[45]

The Superblock model has also been implemented in few other Spanish cities, such as larger cities of Vitoria-Gasteiz and La Coruña (pop. around 250,000) and medium-sized towns, such as Ferrol, Viladecans and El Prat (pop. between 60,000 and 80,000). Among the most ambitious implementations, Vitoria-Gasteiz, Spain (pop. 250,000) should be noted. The city introduced Superblocks in 2006 as the basic spatial unit for the reorganisation of mobility network. So far, notable actions include the implementation of the Sancho el Sabio superblock pilot (between 2009 and 2010) and a pilot traffic calming initiative in 2013 with interventions in 47 streets, arranged as 30 km/h zones with numerous measures as a first step in the gradual progress towards implementation of the Superblocks throughout the city. Within the new

[44] Grup Impulsor. (2021, September 28). Superilla Barcelona [Group meeting]. 1st meeting with the Impulsor Group, Barcelona, Spain. https://ajuntament.barcelona.cat/superilles/sites/default/files/20210910_Presentacio_Diagnosi_GI_1.pdf

[45] Ajuntament de Barcelona. (2021, October 15). Eixample. Retrieved November 19, 2021, from https://ajuntament.barcelona.cat/superilles/ca/superilla/eixample

adaptation of the Plan for Sustainable Mobility and Public Space 2020-2030, the superblock model is implemented at the whole city level through vehicle access restrictions and traffic calming measures.[46] [47] Among others, Vitoria-Gasteiz have been working on two superblocks (Medico Tornay[48] & Centro Memorial[49]) since September 2019. Few months earlier, the Environmental Studies Centre of Vitoria-Gasteiz assessed ex-ante situation in each of the locations, collecting data on pedestrians, cyclists, private vehicle traffic, noise, and public perception. Once the two superblocks are completed, they will be monitored again to assess their impact as part of the CIVITAS ReVeAL project.[50]

Across the globe, there are some projects which try to transfer the Superblock concept to the local environment. One of such projects is Kiezblocks initiative in Berlin, which is heavily inspired by superblocks in Barcelona, but carried out on a neighbourhood level (defined based on identity). So far, 51 out of 180 neighbourhoods already expressed their desire to change. The initiative works through collecting signatures from people living in the neighbourhood or the district and showing them to politicians.

We should also note the exploratory project SUPERBE, which investigated the spatial organisation principle of a Superblock for possible applications in the context of Austrian cities. It identified so called “Superblock candidates” – building blocks in densely populated areas, that are defined by surrounding main roads or roads with public transport – via an automated GIS script. In the second step, those candidates were enriched with additional indicators accounting for the suitability and necessity of implementation. The former including population density and accessibility of public transport, the latter the access to public green, the number and coverage of trees in public space and the ratio of pedestrian space and space for cars. By overlaying a map of the Urban Heat Vulnerability Index (UHVI), a further prioritization indicator was used to identify three pilot blocks for which a more detailed implementation concept was applied. Areas for redistributing public space were found through a bottom-up approach starting with possible locations for trees, sufficient sidewalk widths and minimum road widths.

The SUPERBE project also showed the applicability of the Superblock concept to different, non-“regular” street networks. Even in neighbourhoods diverting from a regular grid, individual motorized through traffic can be prevented while safeguarding the local accessibility, e.g. for emergency vehicles and patient transfers, construction or freight traffic.

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[46] New book: “Vitoria-Gasteiz, a city on a human scale.” (2020, October 9). Civitas ReVeAL. Retrieved November 18, 2021, from https://civitas-reveal.eu/vitoria-gasteiz/new-book-vitoria-gasteiz-a-city-on-a-human-scale/

[47] CIVITAS. (n.d.). Vitoria-Gasteiz. CIVITAS ReVeAL. Retrieved November 18, 2021, from https://civitas-reveal.eu/reveal-cities/vitoria-gasteiz/

[48] Así quedará la calle Medico Tornay después de la reforma integral. (2019, February 8). GasteizBerri.com. Retrieved November 18, 2021, from http://gasteizberri.com/2019/02/asi-quedara-la-calle-medico-tornay-despues-de-la-reforma-integral/

[49] Ayuntamiento de Vitoria-Gateiz. (2019). *Reforma del entorno del Centro Memorial de Víctimas del Terrorismo* [Slides]. Https://Blogs.Vitoria-Gasteiz.Org/. https://blogs.vitoria-gasteiz.org/medios/files/2019/08/DOSSIER-REFORMA-ENTORNO-CENTRO-MEMORIAL-1.pdf

[50] CIVITAS. (2020, February 7). *Two superblocks, one Vitoria-Gasteiz*. Retrieved November 18, 2021, from https://civitas.eu/news/two-superblocks-one-vitoria-gasteiz

3.2 Impact analysis

3.2.1 Impact of Superblocks on urban sustainability

Our analysis on Superblocks' impact on urban realm was designed around six lenses (resilient, healthy, circular, low-carbon, green and inclusive city) which represent headline perspectives on urban environmental sustainability reflecting the environmental remit of European Environmental Agency (EEA); they also cover the key elements of relevant EU environment and climate policies and frameworks. These perspectives are not conflicting and may overlap, and together they mutually reinforce the transition towards urban environmental sustainability.[51] The impact analysis was based on available studies and papers.

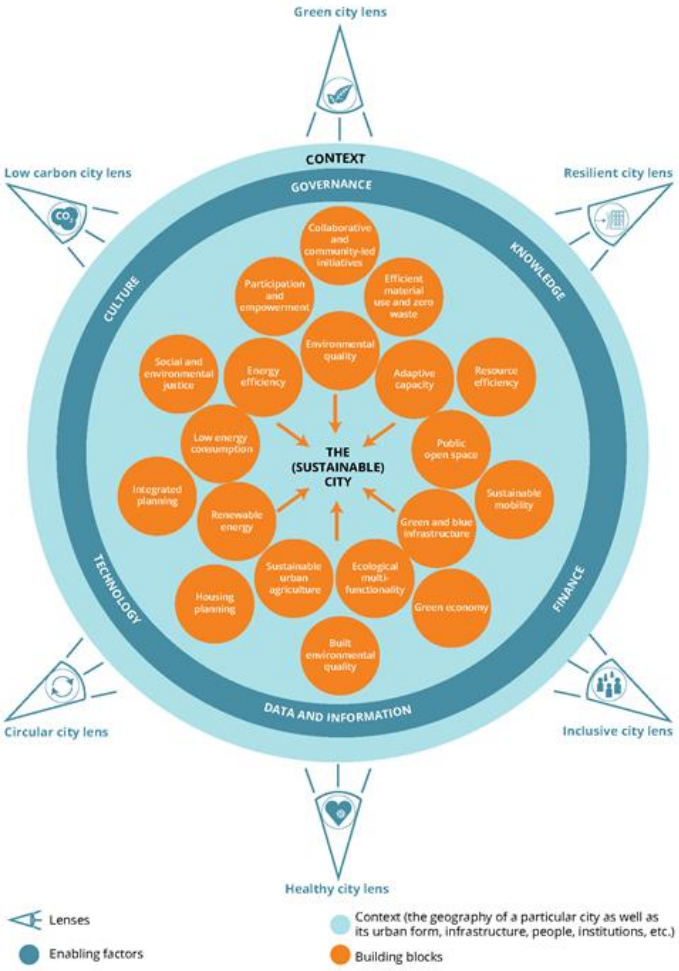

Figure 20: EEA's framework of urban sustainability.[52]

[51] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

[52] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

The resilient city lens

Resilience perspective illustrates the city's (both built and social environment) ability to survive, adapt, and grow in response to chronic stress and acute shocks. Adaptive capacity of cities means that they are able to absorb the impacts and risks of climate change and related natural hazards without compromising the quality of life of city residents.[53] The crucial elements from the resilience perspective, which also lie at the heart of Superblock concept, are urban climate adaptation and the expansion of public space and urban green infrastructure on the expense of the current unsustainable mobility practices.

Evidence on existing Superblock implementations from the resilience perspective is scarce and has not been explicitly addressed. One study states that pedestrianizing the Barcelona Superblocks has increased the pedestrian space to 67.2% so far, and will achieve a total increase of 270% once the total number of Superblocks is implemented.[54] In another study, an increase of green space in the case of Superblock implementation was estimated exclusively for the Eixample neighbourhood in Barcelona. Baseline mean percentage green space of 6.5% was estimated to be increased to 19.6% if Superblocks would be implemented. That corresponds to 1 °C assumed reduction of ambient air temperatures, which means that the daily mean temperature of 21.5 °C (minimum mortality temperature) would be exceeded 16 days less in a year.[55]

The healthy city lens

The healthy city lens considers cities as physical and social environments that enable people and communities to perform all the functions of life and reach their maximum potential.[56] The Superblock concept tries to make neighbourhoods healthier and more sustainable by promoting the modal split and improving indicators related to quality of life, green space availability, physical activity, air quality, noise levels and road safety.

A recent study by the Barcelona Public Health Agency analysed the effect on health and well-being in the superblocks implemented in Poblenou, Sant Antoni and Horta by both quantitative assessment and qualitative and observational study. Significant gains were achieved in well-being, tranquillity, sound quality, noise reduction, pollution reduction and social interaction and mobility. For example, NO2 emissions in the Sant Antoni superblock decreased by 25% and PM10 level by 17%. The change was also perceived positively among the majority of the residents; they especially praised the reduction of motorized traffic and perceive public space as more peaceful and encouraging interactions.[57]

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[53] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

[54] López, I., Ortega, J., & Pardo, M. (2020). Mobility Infrastructures in Cities and Climate Change: An Analysis Through the Superblocks in Barcelona. Atmosphere, 11(4), 410. https://doi.org/10.3390/atmos11040410

[55] Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020b). Changing the urban design of cities for health: The superblock model. *Environment International*, *134*. https://doi.org/10.1016/j.envint.2019.105132

[56] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

[57] *Superblocks are having positive effects on health and well-being*. (n.d.). Ajuntament de Barcelona. Retrieved November 18, 2021, from https://ajuntament.barcelona.cat/superilles/en/noticia/superblocks-are-having-positive-effects-on-health-and-wellbeing

The expected impacts of Superblocks were also assessed through modelling, carried out a quantitative health impact assessment for the scenario if all 503 Superblocks were implemented. The results show substantial health benefits, such as increased life expectancy for almost 200 days, 667 less premature deaths annually,[58] and a reduction in the overall burden of disease in cities.[59] Recently, preliminary results on changing Superblock soundscape to a more acoustically pleasant environment (pedestrians, natural sounds – wind, birdsong) were published, indicating another aspect of Superblock implementation with concrete benefits for health and well-being.[60]

The circular city lens

The circular city concept considers cities as places where all products and material flows can be recycled after use and become a resource for new products and services.[61] Circular in this respect is not limited to the narrow notion of circular economy (production and consumption). It is translated into the broader urban context: how are different places and assets in cities used, reused, shared and functionally modified to meet the needs of urban residents, and mitigate global climate change.[62]

In the rationale of the Superblock model, the circular dimension is not explicitly integrated although the Rueda's theoretical model also builds on "metabolic efficiency" and states that every Superblock emerges as a little city with a wide range of functions. However, this perspective is probably the least taken into account and offers possibilities for further expansion of the concept. So far, no study has evaluated the impact of Superblocks implementation from the perspective of the circular city.

The inclusive city lens

In an inclusive city, the processes of development include a wide variety of citizens and activities and involving spatial, social and economic inclusion.[63] In the original Superblock concept, inclusion is one of the key objectives as it tries to reconvert most of the urban space to multiple uses and rights and giving citizens public space back that was lost due to the current model of mobility. In addition, the traffic speeds in the model enable equal rights to use of the space also by vulnerable groups (blind, impaired, children). Moreover, one of the principles of ecosystemic urbanism which stands behind the Superblock idea, is also social cohesion and spatial justice, which refers to the coexistence of different groups of people, accessibility to

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[58] Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020b). Changing the urban design of cities for health: The superblock model. *Environment International*, *134*. https://doi.org/10.1016/j.envint.2019.105132

[59] López, I., Ortega, J., & Pardo, M. (2020). Mobility infrastructures in cities and climate change: An analysis through the Superblocks in Barcelona. Atmosphere, 11(4), 410. https://doi.org/10.3390/atmos11040410

[60] Alsina-Pagès, R. M., Ginovart-Panisello, G. J., Freixes, M., & Radicchi, A. (2021). A Soundwalk in the heart of Poblenou superblock in Barcelona: Preliminary study of the acoustic events. *Noise Mapping*, *8*(1), 207–216. https://doi.org/10.1515/noise-2021-0016

[61] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

[62] Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020b). Changing the urban design of cities for health: The Superblock model. *Environment International*, *134*. https://doi.org/10.1016/j.envint.2019.105132

[63] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

housing and the provision of public facilities, located at a walking distance,[64] and also reducing the core-periphery gradient.[65] Citizen empowerment is also essential to the concept especially in the framework of Superilla Barcelona.[66] The recent developments of the concept also emphasize the gender perspective and taking a collective stand against gender violence during carrying out interventions in public spaces, although still being a "lukewarm approach" which at times fails to challenge oppressions based on gender and other power structures such as race, ethnicity, and age.[67] Numerous social cohesion indicators are also included in the Superblock monitoring process.[68]

Evidence on impact of Superblocks on any form of inclusion is scarce. As concerns implementation lessons, one of the key barriers in the Poblenou superblock was related to discontent over public participation aspects (perception of exclusion from the process) and a perceived imposition of authority. The implementation also ended up triggering off a number of conflicts and discriminations between different groups of people (according to travel mode, living inside or at the fringe of superblock, residents or non-residents of superblock etc.).[69] [70] The authors believe the Poblenou experience should also be treated as a reminder of the contradictions of pluralism in search of sustainable solutions.[71]

The low carbon lens

Under the low carbon perspective, we try to understand how have cities achieved or have been moving towards achieving low-carbon practices in all its aspects including economy, daily life (e.g. mobility), politics and culture.[72] [73] The aim of low-carbon practices is to minimize greenhouse gas emissions in order to achieve the carbon neutrality and contribute to limit global warming below 1.5 °C.[74]

One of the central notion of the superblock concept is to promote sustainable mobility with zero or low carbon emissions (walking, cycling and public transport) in order to adapt and to mitigate

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[64] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen & H. Khreis (Eds.), *Integrating Human Health into Urban and Transport Planning: A Framework* (Softcover reprint of the original 1st ed. 2019 ed., pp. 135–153). Springer.

[65] Scudellari, J., Staricco, L., & Vitale Brovarone, E. (2019). Implementing the Supermanzana approach in Barcelona. Critical issues at local and urban level. *Journal of Urban Design*, *25*(6), 675–696. https://doi.org/10.1080/13574809.2019.1625706

[66] Ajuntament de Barcelona. (2016, May). *Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life*. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

[67] Iturralde Farrus, B. (2021, September). Feminist urbanism for cities that recognise a plurality of voices: a collective assessment of the Sant Antoni Superblock (Master's dissertation). https://www.4cities.eu/wp-content/uploads/2021/10/MSCthesis_4CITIES_ITURRALDE_BELEN.pdf

[68] Ajuntament de Barcelona. (2016, May). *Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life*. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

[69] Scudellari, J., Staricco, L., & Vitale Brovarone, E. (2019). Implementing the Supermanzana approach in Barcelona. Critical issues at local and urban level. *Journal of Urban Design*, *25*(6), 675–696. https://doi.org/10.1080/13574809.2019.1625706

[70] Oliver, A., & Pearl, D. S. (2017). Rethinking sustainability frameworks in neighbourhood projects: a process-based approach. Building Research & Information, 46(5), 513–527. https://doi.org/10.1080/09613218.2017.1358569

[71] Zografos, C., Klause, K. A., Connolly, J. J., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona Superblock project. Cities, 99. https://doi.org/10.1016/j.cities.2020.102613

[72] European Environment Agency. (2021, October). *Urban sustainability in Europe. A stakeholder-led process*. Publications Office of the European Union. https://www.eea.europa.eu/publications/urban-sustainability-in-europe-a/at_download/file

[73] Helsinki Region Environmental Services Authority. (n.d.). *Low Carbon District. Action cards for developing low carbon station districts*. Low Carbon District. Retrieved November 18, 2021, from https://lowcarbondistrict.com

[74] C40 Cities Climate Leadership Group. (n.d.). *Defining carbon neutrality for cities and managing residual emissions: Cities' perspective and guidance*. C40 Knowledge. Retrieved November 18, 2021, from https://www.c40knowledgehub.org/s/article/Defining-carbon-neutrality-for-cities-and-managing-residual-emissions-Cities-perspective-and-guidance?language=en_US

climate change. On the contrary, the energy aspect, does not seem to play an important part in the concept, although energy consumption is one of the main causes of climate change. However, some energy-related indicators on consumption and self-sufficiency are included in the initial monitoring tool of Barcelona superblocks.[75]

Recent attempts of pedestrianizing the public space in Barcelona has already increased the pedestrian space by 67.2%.[76] However, the effects of Superblocks on travel behaviour have not been fully evaluated. Few modelling studies were performed: one showed that with the implementation of the 503 Superblocks, the car mode share was projected to be reduced by 19.2% (from 26.1% to 21.1%) which translated into almost 230,000 car/motorcycle trips per weekday being shifted to public transport, cycling or walking.[77] A study, made on a case study of Vitoria-Gasteiz, Spain, showed that city-wide implementation of the Superblocks due to the reduction of obstacles, such as pedestrian crossings and traffic lights, could reduce pedestrian travel times by approximately 4–5%. The greatest improvements in pedestrian mobility were found in the city centre or in streets linking important residential areas with the centre[78].

Green city lens

EEA defines green city perspective as a "*city model based on approaches to functional and ecological urban development design that provides healthy and sustainable environments for both natural systems and communities*." Urban greening is one of the central elements of the original Superblock concept as it lies in the heart of the ecosystemic urbanism, also covered by the Barcelona Green Infrastructure and Biodiversity Plan for 2020, which plans long-term initiatives to achieve ecological infrastructure.[79]

Superblocks implementation could significantly increase the amount of green space. According to Rueda (2019), the current green surface in the area of Eixample is 171.2 ha, which corresponds to 2.7 m^2 of square meters per inhabitant, which is far below the WHO recommendation (9 m^2). With superblocks, green surfaces increase significantly to 403.7 ha of potential green space, which means an increase from 2.7 m^2/inhabitant to 6.3 m^2/inhabitant for the whole area of Cerdà's plan. If adding other green infrastructure, such as green covers, green surface per inhabitant increases up to 9.6 m^2/inhabitant.

Increase of green space in the case of Superblock implementation was estimated exclusively for the Eixample neighbourhood in Barcelona. Baseline mean percentage green space of 6.5%

[75] Ajuntament de Barcelona. (2016, May). Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

[76] López, I., Ortega, J., & Pardo, M. (2020). Mobility Infrastructures in Cities and Climate Change: An Analysis Through the Superblocks in Barcelona. *Atmosphere*, *11*(4), 410. https://doi.org/10.3390/atmos11040410

[77] Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020b). Changing the urban design of cities for health: The superblock model. *Environment International*, *134*. https://doi.org/10.1016/j.envint.2019.105132

[78] Delso, J., Martín, B., & Ortega, E. (2018). A new procedure using network analysis and kernel density estimations to evaluate the effect of urban configurations on pedestrian mobility. The case study of Vitoria –Gasteiz. *Journal of Transport Geography*, *67*, 61–72. https://doi.org/10.1016/j.jtrangeo.2018.02.001

[79] Ajuntament de Barcelona. (2016, May). Annex 1. The implementation of the Superblocks Programme in Barcelona: Filling our streets with life. http://www.sustainablecities.eu/fileadmin/templates/esc/lib/transformative_actions//_utility/tools/push_resource_file.php?uid=dd9bf772

was estimated to be increased to 19.6%, which corresponds to 1 °C assumed reduction of ambient air temperatures.[80]

Within the new Superblock Programme (2020), the gain of urban greenery is expected to be at least 10% of the overall surface area for green streets and squares. There will be roughly 300 m^2 of greenery along street sections, while in the squares at the junctions the potential space to be gained for greenery is between 190 and 4,000 m^2.[81]

3.2.2 Effects of Superblocks and similar concepts on traffic flows

This section focuses on the impacts of Superblock and other traffic calming and banning measures on traffic related indicators such as traffic volumes, emissions and mode shifts.

López et al (2020) describe the intended and assumed impacts on space and traffic of superblocks in Barcelona. 70% of the space taken up by cars will be freed up. A total of 61% thoroughfares are banned for cars. The authors assume an NO2 reduction of 24%. A theoretical derivation of impacts on health has been done by Mueller et al. (2020). The measured modal shifts before and after the implementation of Superblocks reveal a reduction of car traffic by 5%, and an increase in bicycle trips by 2% and walking trips by 3%.

Other studies refer to traffic concepts that are closely related to Superblocks. The effects on traffic of the Circulation Plan in Ghent have been measured in Transport & Mobility Leuven (2019). They observed an increase in the mean bicycles volumes by 46% and 55% in the morning and evening rush hour (p.30), higher usage of P+R (p.33), and a reduction of motorised individual transport by 20% inside the circuit road and by 12% outside in the morning and by 20% (inside) and by 19% (outside) in the evening. However, the closure of thoroughfares caused additional traffic on the circuit road. About +9% to +18% more traffic volumes are observed in the morning and evening rush hour, clock and anti-clockwise (p.128-p.129) after the Circulation Plan was implemented. Potential disadvantages of the Circulation Plan have also been elaborated in Rezende Amaral et al. (2018). The authors simulated the Traveling Salesperson Problem in Ghent with and without a Circulation Plan using the example of delivery tours for pharmacies. The duration of deliveries increases in average by 126% and the travelled distance by 20%.

Sleiman (2021) analysed the effects of the closure of the Georges Pompidou boulevard, a central thoroughfare, carried out in the context of the Paris Respire programme. The author observed only a slight shift of car users to public transit from the periphery. Measures of the traffic volumes on the *boulevard périphérique*, the ring motorway showed an increase of 15%. Based on the occupancy levels of the highway, it is assumed that the travel time on a 10 km trip increased in average by 2 min in general, and by 6 min for those who were directly affected by the closure.

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[81] *Questions and answers*. (n.d.). Ajuntament de Barcelona. Retrieved November 18, 2021, from https://ajuntament.barcelona.cat/superilles/en/content/questions-and-answers

Short-term interventions like car free Sundays and special events (e.g. Olympia, Tour de France) lead to a reduction of air pollution (Nieuwenhuijsen and Khreis, 2016) but do not lead to sustainable changes in travel behaviour (Masiol et al., 2014).

The reduction of parking space has a significant impact on the mobility behaviour. Christiansen et al. (2017a) conclude that limited access to parking is the single most effective way of reducing car use on work trips. The authors found out that the likelihood of driving decreases with increasing distance to the parking place. This observation has also been made by Knoflacher (2006). In a further study, Christiansen et al. (2017b) specified they previous study results. Their findings reveal that access to private or reserved parking triples the likelihood of car ownership. There are significant differences in the number of trips by foot (more), car (less) and public transport (more) if parking lot is more than 50 m away from home. Longer distances between home and home parking location reduce the car's modal share significantly.

Table 3: A summary of impacts related to traffic calming interventions.

Concept	Reference	Description	Emissions	Mode shifts/VMT/other traffic impacts	Private car ownership
	U.S. Department of Transportation, Federal Highway Administration (1994)	Traffic calming concepts in the US and their effects, review of case studies worldwide		Lower average speed; E.g.: Traffic cells in Gothenburg, Sweden, in the 1970ies lead to up to 45% traffic reduction. Increase in travel speeds on the ring-road from 16 to 23 km/h. Reduced radial traffic meant longer green times for the orbital route.	
	Davies et al., 2009	Correlation between noise and NO2 and NOx	Varying correlations between noise and NO2 and NOx (0.2-0.8)		
	De Nazelle et al., 2010	US: 13% of short car trips converted into other modes; Europe: 30% VMT reduction	US: 2% less CO, CO2, VOC (volatile organic compound) and NOx; Europe: 12% for NOx, 26% for VOC		
	Rojas-Rueda et al. (2012)	Simulation of 40% mode shift to bicycles or bicycles and public transport (scenarios)	Reduction of 203,251 t CO2/year		
	Holman et al. (2015)	Review – low emission zones	German LEZs may have reduced PM10 and NO2 concentrations by a few percent; elsewhere no clear effects on PM10 and NO2 observed		
Superblock	López et al. (2020)	Describing plans for the Barcelona Superblock concept – based on presentations of the municipality and other studies		+67.2% pedestrian space (when fully implemented: +270%: 230ha → 852 ha) 7% of car space will be freed up 61% of through-fares banned for cars	
	Mueller et al. (2020)	Quantitative health impact assessment (HIA) study for Barcelona following the comparative risk assessment methodology. Physical activity derived from Barcelona Health Survey 2016/17.		−5% car, +2% pt, +3% walk	
	Zhang et al. 2021	Simulation for optimal number of entry points for a superblock in China.		3% mode shift from car to pt in the scenario with an optimal number and positioning of entry points	

Table 3: A summary of impacts related to traffic calming interventions, continued.

Concept	Reference	Description	Emissions	Mode shifts/VMT/other traffic impacts	Private car ownership
Circulation Plan	Rezende Amaral et al. (2018)	Simulation for travelling salesperson problem in Ghent with and without Circulation Plan (examples delivery for pharmacies)		Average increase in delivery tour duration by 126%, tour distance increase by 20%	
	Transport & Mobility Leuven (2019)	Analysis of the traffic in Gent before and after Circulation Plan – Report Part II includes some adaptions in the traffic guidance		Increase in mean bicycle volumes by 46% and 55% in the morning and evening rush hour, higher usage of P+R, MIT reduction by 20% (inside), 12% (outside) in the morning and −20% (inside) −19% (outside) in the evening. Additional traffic on the circuit: +9%−18% in the morning and evening rush hour, clock and anti-clockwise.	
Mini Holland	Goodman et al. (2020)				Decrease in car ownership by 6% after two years (2% decrease in areas with no intervention), stronger effect with a longer duration of the Mini Holland concept (at least 1 year)
Open Streets / Car free days / Special Events / Paris Respire	Sleiman (2021)	Evaluates the impacts of the downtown “Georges Pompidou” riverbank closure in 2016		Probability of congestion on ring road lanes with the same flow direction as the riverbank increased by 15% (2 min more travel time on a 10 km trip, directly affected car drivers 6 min); only small fraction changed to pt); Speed reduction on the entire ring by 1.7 km/h and 3.1 km/h in the South which most car drivers used as a bypass.	
	Ku et al. (2020)	Review of Low-Emission Zones in Europe: Milan, London, Paris (no data), Rome	Reduction of NOx in all cities about 13−18%, reduction of CO2 in all cities about 15%−35%	Reduction in traffic in all cities 20−35%	
	Nieuwenhuijsen and Khreis (2016)	Car free Sundays	−40% NOX reduction		
	Nieuwenhuijsen and Khreis (2016)	Tour de France start in Leeds	−20% NO2 reduction		

Table 3: A summary of impacts related to traffic calming interventions, continued.

Concept	Reference	Description	Emissions	Mode shifts/VMT/other traffic impacts	Private car ownership
Open Streets / Car free days / Special Events / Paris Respire	Brussels Environment (2015)				
	Masiol et al. (2014)	Examined 13 years of air pollution data in the city of Mestre in the Po Valley and tried to assess the effect of motorized traffic free Sundays.	No statistically significant impact of traffic free Sundays on air quality / weather more important, traffic often diverted to the suburbs of the city on car-free Sundays		
Reduced parking spaces	Christiansen et al. (2017a)			Limited access to parking is the single most effective way of reducing car use on work trips Likelihood of driving decreases with increasing distance to the parking place	
	Christiansen et al (2017b)	Norwegian national transport survey 2013, in-depth parking survey with 2000 urban dwellers		Longer distances between home and home parking location reduce the car's modal share significantly. People are on average willing to accept 155m between home and home parking (sd = 167 m)	Access to private or reserved parking triples the likelihood of car ownership
	Knoflacher (2006)			Transport planning that provides parking spaces for car owners at their homes, workplaces, shopping centres and recreational places has supported increased private car use.	
	Guo (2013)	Measuring residential parking supply using Google Street View in New York			Residential parking supply is more important than income and demographic attributes; Garage, driveway, and street parking affect car ownership differently. Maximum standard, resident permits, and street cleaning affect car ownership.
	Holtzclaw et al. (2002)	Car ownership and mileage in three North-American cities: Chicago, Los Angeles, San Francisco			Average auto ownership is primarily a function of the neighbourhood's residential density, average per capita income, average family size and the availability of public transit

3.2.3 Implementations – some lessons learned

From the pilot Superblock implementation experience in Poblenou, Zografos et al. (2020) point to some key barriers, which relate to both the political struggle for authority and discontent over public participation. Authors argue that the extent and success of the Superblocks implementation will be very much dependent on the interaction between the initiative and ongoing everyday politics.

To Janet Sanz, Barcelona's deputy mayor for ecology, urbanism, and mobility, the key lesson of Poblenou example has to do with the necessary balance of "tactical urbanism" and "structural urbanism." The advantage of tactical urbanism is that it can produce relatively large changes in behaviour with minimal investment of time and money. In Poblenou, it was used as a kind of low-level shock therapy, to kick-start the process. But it also stirred up early resistance, when there were only fast and cheap changes and no concrete promise of anything else. But later, when the administration began a closer consultation process with neighbours, which figured out what they want and that they actually gained the public space, that resulted in more permanent, structural changes, opposition almost muted. [82] In terms of temporal progression of the realization of the Superblocks, the experience of Poblenou showed that a quick transition from the functional to the structural implementation is essential to assure that superblocks are really vibrant.[83]

Next, the Superblock model seems to be more easily accepted when applied to urban areas which show a clear and physically evident hierarchy between main and secondary streets (such as Gracia and Ciutat Vella in Barcelona), than to homogeneous street networks such as the Cerdà grid. The implementation of the Poblenou superblock ended up triggering off a number of conflicts and discriminations (e.g. between residents of superblock and other residents; residents and activities inside a superblock and those located at its verges; residents and visitors of a superblock; car drivers and non-motorized citizens; pedestrians and cyclists).[84]

Those lessons were very valuable for next Superblock implementations, e.g. in the Sant Antoni neighbourhood, where also a more flexible approach was used, not strictly following the original Rueda's conceptual model, which was found too rigid.[85]

From the implementation experience and monitoring results of similar urban interventions (see chapter 2.2), we can extract some other valuable conclusions. On one hand, all concepts indisputably show positive impacts on urban sustainability and liveability of residents, such as reduction of traffic, reduced air pollution, improved road safety, positive effects on local economy, modal shift to sustainable transport, increase of physical activity, reduced street crime etc. On the other hand, in the beginning of most implementations they faced with the opposite voices, mainly from local storeowners (e.g. in Enfield and Waltham Forest during implementation of Mini Hollands), which expressed concerns over their business, from car drivers association (in Paris), which marked the plans for closure of the city centre as elitist and discriminatory, or from residents and local politicians as a response rapid implementation during Covid-19 pandemics (in LTNs). In the case of Mini Hollands, good communication and consultation proved to be vital for a successful implementation.

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[84] Scudellari, J., Staricco, L., & Vitale Brovarone, E. (2019). Implementing the Supermanzana approach in Barcelona. Critical issues at local and urban level. *Journal of Urban Design*, *25*(6), 675–696. https://doi.org/10.1080/13574809.2019.1625706

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4 Conclusion

Due to its transformative nature, marrying traffic regulation schemes with the repurposing of public space, combination of top-down and bottom-up action and integration into municipal plans, the Superblock model is a multiple-leverage-point intervention that could act as a catalyst for additional systemic transitions required for a societal transformation to sustainability. Current development shows a flexibility of the concept and its potential to be implemented also in other types of urban built environment across the globe.

Original theoretical model of Superblocks of Salvador Rueda (2014) was built mainly on climate change-related concerns, based on the principles of the ecosystemic urbanism. Among numerous characteristics, the model had a clear distinction between exterior and interior component; in the interior part, motorized traffic is drastically limited and public space reconverted to multiple and shared uses. Superblocks model was integrated in the vision of the city of Barcelona and found its place in the concrete Superblock Programme with strategic goals, guidelines, phases and budget. Based on lessons learned in the first Superblock implementations (2016-2018), the city authorities took another step and divert from the 'ideal' Superblock towards the *Superilla Barcelona strategy*. The new Superblock programme, drawing upon implementation of Sant Antoni Superblock (2018), seeks structural changes through the "vision of green streets" over the larger area, namely the Eixample district in the first phase. New approach is depicted as less radical, but with a higher chance of success, also due higher level of public participation.

An overview of other selected similar traffic calming and banning approaches, which found their place in the planning practice (Woonerf, Circulation Plan, Mini-Holland, Low-Traffic-Neihgborhod, Open Streets, Paris Respire), showed that most concepts resulted in increased liveability and reduced traffic within the areas, where they were realized, while on the wider, city-level, they were mostly not able to induce more systemic change yet. The comparison with the Superblock showed that Superblock is in fact the most ambitious transformational intervention approach due to its (at least planned) city-wide application, a strong climate-change related component and aiming for a long-term structural change.

The description of three Barcelona Superblock implementations shows some valuable lessons learned and flexibility and deviation from the original Rueda's model, especially after the Poblenou experience. Sant Antoni approach, applied in the whole neighbourhood, which can be marked as less radical as only one of three streets in the area has been transformed, and prioritises the extension and continuity of green axes over the creation of isolated 'pacified pockets', has become the model to be reproduced throughout the city.

Impact analysis of existing Superblock implementations from the urban sustainability perspective showed a significant presence of resilience, health, low-carbon, green and inclusion components (less the circular one) of Superblocks at the theoretical level. From the practical impact point of view, the evidence is scarce due to few Superblocks implementations and absence of a continuous monitoring process, despite the initial ambition to do so by developing numerous indicators (new monitoring programme is under preparation). From the city-scale point of view, it should be noted that both analyses and impacts are limited due to only partial implementation and the transformative intent of superblocks, which requires a tipping point to be reached before impacts can be realized; many impacts can only appear until enough superblocks are implemented to trigger various systemic transitions.

Similar conclusion relates to the review of effects of existing mobility interventions on traffic flows. On one hand, studies observed an increase of sustainable transport uses in the areas, where measures took place (also in case of temporary interventions), but on the other hand,

they have not induced long-term modal shift. Some studies indicate to limited access to parking as the single most effective way of reducing car use; this finding has also potential implications for future Superblock implementations and potential expanding of the concept with parking component.

Existing Superblock implementation experiences also revealed some weaknesses of the original concept, key barriers and lessons learned, such as political struggle for authority, discontent over lack of public participation, necessary balance between tactical and structural urbanism, a need for a quick transition from the functional to the structural implementation and a difference in public acceptance in respect to the differentiation of the street network. These lessons not only served the evolution of the new Superblock programme in Barcelona, but can also be valuable for other future implementations elsewhere and further expanding of the concept. The latter could also contain pairing with other interesting concepts that promote liveable, healthy and sustainable societies, such as the 15-minute city, [86] focused on walking and bicycle accessibility of amenities for satisfying human needs, which are not (yet) incorporated into the Superblock concept.

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6 Annex: Case Study “Superblocks in Barcelona”

SUPERBLOCKS IN BARCELONA

Belen Iturralde

Case study for the *TuneOurBlock* project.

Commissioned by LAUT – Landscape Architecture and Urban Transformation.

15 December 2021

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PROJECT HISTORY

The superblocks urban model prioritises everyday life by redistributing public space, improving green areas, and supporting sustainable forms of mobility. Superblocks involve functional changes and transformations of public space that are welcomed by many of those involved in creating sustainable urban environments.

The urban theory behind the superblocks model was developed by Salvador Rueda and inspired by Ildefonso Cerdà's original plan for the city of Barcelona: The Cerdà Plan (1860), a project designed to transform the area of the city which lay beyond the mediaeval walls. The original plan was based on a grid, each of which enclosed a block of houses. The city blocks of the new neighbourhood, the Eixample, were open and featured houses of limited height and discontinuous construction, green areas, and social and cultural infrastructure. In terms of traffic, the original plan was flexibly structured to include streetcars in all directions. Cerdà incorporated chamfers, widening the crossroads to improve circulation and increase visibility for road traffic. A chamfer is an urban resource that involves removing the sharp edges of a city block's 90-degree corner (*Figure 1*). The Cerdà Plan, however, was never fully adopted as land speculation led to densification and infill and subsequent loss of open space (public space) and the greenspaces that were initially conceptualised between the buildings, in favour of housing and transport infrastructure.

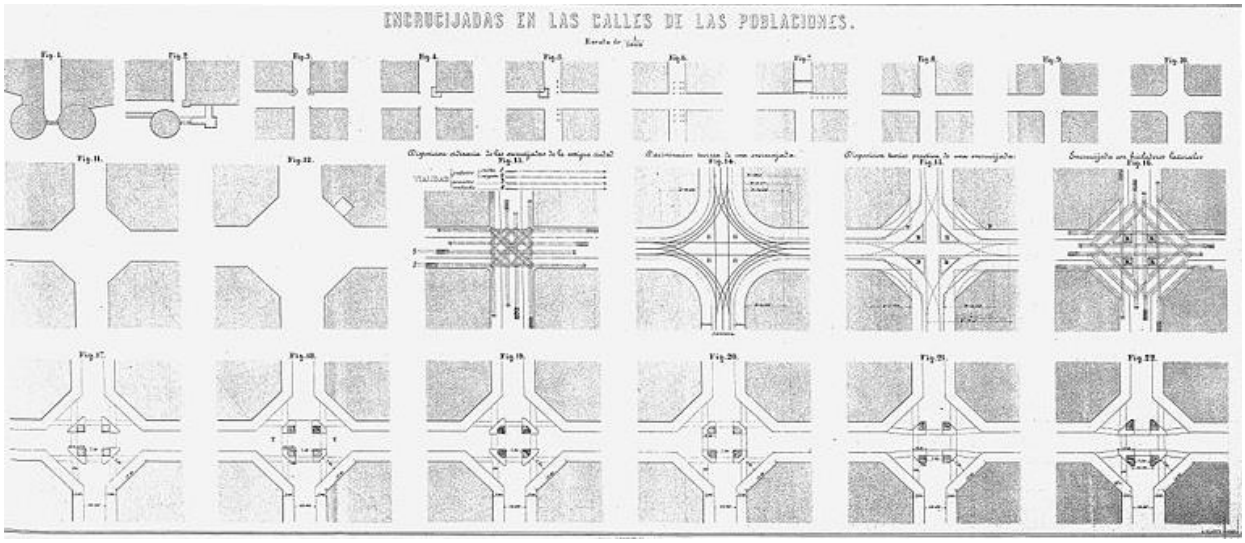

Figure 1. Shows a map of crossing streets in the Pla Cerdà (1859) (Source: Wikimedia Commons, the free media repository)

Rueda's urban theory, Ecosystemic Urbanism, aims to restore the balance contained in Cerdá's original plan by reclaiming public space from the car. Ecosystemic Urbanism calls for a contextualised approach to city-making that incorporates the principles of habitability, proximity, metabolic efficiency, environmental sustainability, sustainable mobility, accessibility, comfort,

safety, diversity of uses and functions, and coexistence[1]. Rueda's theory finds expression through the superblocks model, an "urban recycling project" based on creating road hierarchies to recover public space from the automobile and encourage a modal shift towards walking, cycling and public transport. Superblocks should be reproduced throughout the whole city if the model is to generate environmental comfort without compromising the functionality of the urban system.

Rueda's criteria for a 'perfect' superblock are the following: First, superblocks are formed by grouping together nine blocks, or three blocks squared. The 3 x 3 dimensions and the creation of main crossings every 400 metres in the perimetral roads avoid the disruption of traffic flows. Second, superblocks require population density. And third, roads are organised in a hierarchy. In the superblocks' perimetral roads the maximum speed is 50 km/h and there should be bicycle infrastructure with separate cycle lanes, and shared roads between cars and buses. Inner roads have a limited speed of 10 or 20 km/h; one-way loops prevent motorised vehicles from driving straight through a superblock. As for people on bikes, they can ride in both directions, but must give way to pedestrians. The pacification of such roads should make it safer for children to go to school without being supervised.

Inside superblocks, the reclaimed urban spaces are transformed to host a diversity and multiplicity of uses. Pedestrians and cyclists gain about 70% of the space previously used by through-traffic, and four new public squares emerge at the inner intersections featuring different kinds of vegetation and urban furniture. According to Rueda, these changes can positively impact air quality, noise pollution, and greenhouse gas emissions indicators, (three of the major urban issues currently affecting Barcelona's city centre).

[1] Rueda, S. (2019). Superblocks for the design of new cities and renovation of existing ones: Barcelona's case. In M. Nieuwenhuijsen, Haneen, K. (Ed.), Integrating Human Health into Urban and Transport Planning (pp. 135-153): Springer International Publishing.

SUPERBLOCKS IN PRACTICE

The superblocks strategy was first approved in the *Barcelona Urban Mobility Plan 2013-2018*[2]under Mayor Xavier Trias (2011-2015). Yet, these ideas had been in planners' minds since the late 1990s (*Figure 2)*. Indeed, the pacification projects in the Born neighbourhood in 1993 (*Figure 3*), and in Gràcia in 2005 (*Figures 4 and 5)*, are considered as 'early superblocks'.

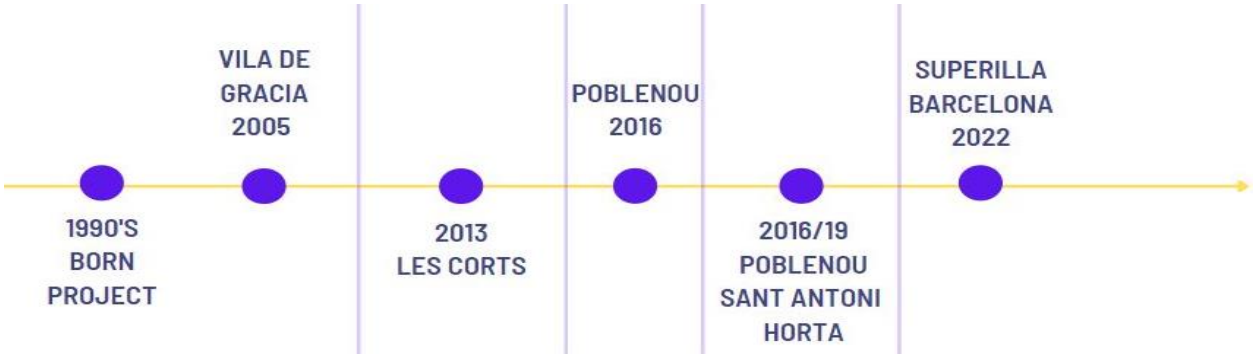

Figure 2. Shows a timeline of superblock projects (Source: graphic produced by the author based on the information available on the Superilles website).

Figure 3. Shows People going to the Born Market, walking along one of the pacified streets of the neighbourhood (Source: Antonio Lajusticia Bueno).

[2] PMU (2014). Pla de Mobilitat Urbana de Barcelona 2013–2018. Ajuntament de Barcelona. Retrieved from https://www.barcelona.cat/mobilitat/sites/default/files/1_pdfsam_PMU_BCN_2013-2018_definitiu2.pdf.

Figure 3. Shows the pedestrianised area around the Santa Maria del Mar Cathedral, in the Born neighbourhood (Source: the author).

Figure 4. Shows a neighbours' dinner in Plaça de la Virreina, in the Gràcia neighbourhood (Source: Goroka).

Figure 5. Shows pedestrians walking along Asturies street, in the pacified Gràcia neighbourhood (Source: Vicente Zambrano González).

Later, in 2013, Trias' government - known for its business friendly and 'smart city' approach - selected the Les Corts neighbourhood as the area where the first superblock would be piloted. However, when Mayor Ada Colau won the elections in 2015, the political decision was made to roll out the first superblock pilot not in Les Corts, but in Poblenou[3]. The implementation of the Les Corts superblock was revisited under Ada Colau's mandate and its implementation began in 2017. The transformations involved some permanent changes to widen sidewalks, introduce green areas, and create a park (*Figures 6 and 7*).

The superblocks model continued to change after the Poblenou pilot (a project which closely followed Salvador Rueda's theoretical model). The rest of this section will expand on the evolution of the superblocks strategy by describing the interventions in Poblenou, Sant Antoni, Horta, and the recently announced *Superilla Barcelona* project.

[3] Zografos, C., Klause, K. A., Connolly, J. J. T., & Anguelovski, I. (2020). The everyday politics of urban transformational adaptation: Struggles for authority and the Barcelona superblock project. Cities, 99, 102613. doi: https://doi.org/10.1016/j.cities.2020.102613

Figure 6. Shows the redevelopment of Conxita Supervia street in the Les Corts superblock (Source: image taken by the author from Google Street view).

Figure 7. Shows the redevelopment of Regent Mendieta street in the Les Corts superblock (Source: image taken by the author from Google Street view).

In 2016, the government measure *Omplim de Vida els Carrers* (Fill the Streets with Life)[4] opened the way for the superblocks project to be implemented in Barcelona. A government measure is a planning document that anticipates policies to be followed in municipal management, or reports on specific initiatives of the municipal government. Local government measures must be presented in the Municipal Council. The *Omplim de Vida els Carrers* was authored by the Municipal Council Commission of Ecology, Urban Planning, and Mobility (Comissió d'Ecologia, Urbanisme i Mobilitat del Consell Municipal de Barcelona) and the Government Commissions' Area of Ecology, Urban Planning, and Mobility (Àrea d'Ecologia, Urbanisme i Mobilitat). The Government Commissions work under the auspices of the Mayor's Office. In the governance section, the reader will find more details on government organization.

In line with Rueda's theory, the aims of Barcelona City Council's (BCC) superblocks programme are to make the Eixample district more "healthy, egalitarian, sustainable and full of life" by supporting a modal shift and improving indicators related to habitability, availability of and access to green spaces, noise and air pollution levels, traffic accidents, sedentarism, urban heat island effect, and CO2 emissions[5]. In practice, superblock transformations require changes in traffic organisation as well as spatial interventions to improve habitability. The latter involve long-term structural changes as well as bringing into play tactical urbanism techniques – light, quick, and inexpensive interventions aimed at exploring and testing ideas[6].

The Poblenou superblock was implemented during European Mobility Week 2016 using a Tactical Urbanism approach with quick and temporary interventions (*Figure 9*). This was the first superblock that closely followed Rueda's conceptual model (*Figure 8*). This superblock is in a residential neighbourhood not as densely populated as the rest of the Example, and where most of the housing stock is public[7]. It is delineated by Badajoz, Pallars, Llacuna, and Tànger streets. The main issue with this project was the lack of prior consultation with locals. Pressure from community groups led to a '*a posteriori*' participation process[8] which significantly helped in creating acceptance for the project. Presently, the transformations in Poblenou include tactical urbanism interventions to introduce new play and stay areas (*Figure 9*) as well as structural changes to elevate some streets and create green patches and veggie gardens (*Figure 10*). A major change resulting from the participation process was that planners agreed to allow a bus route through the superblock (which contradicts Rueda's theoretical model) because neighbours considered it to be important for inclusive mobility.

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[4] Ajuntament de Barcelona. (2016). Omplim de Vida els Carrers: La implantació de les Superilles a Barcelona. Retrieved from https://www.slideshare.net/Barcelona_cat/mesura-de-govern-oomplim-de-vida-els-carrers-lla-implantaci-de-les-superilles?from_action=save

[5] Ajuntament de Barcelona. (2017). Pla d'Acció per a l'àmbit de superilles de Sant Antoni: Pla d'Acció Consensuat [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/pla_accio_superilles_santantoni.

[6] The Street Plans Collaborative. (2021). Tactical Urbanist's Guide. Retrieved from: http://tacticalurbanismguide.com/about/

[7] Ajuntament de Barcelona. (2016). Presentació Superilla Poblenou [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/20161013_SIP9_ConsellBarri_0.pdf

[8] Ajuntament de Barcelona. (2018). Superilla del Poblenou. *Superilles*. Retrieved from: https://ajuntament.barcelona.cat/superilles/ca/content/poblenou

Figure 8. This image shows the map of the Poblenou superblock (Source: Ajuntament de Barcelona).

The study *Salut als Carrers: Avaluació dels àmbits Superilles* (Health in the Streets, an evaluation of the Superblocks)[9] evaluated the impacts of the Poblenou, Sant Antoni, and Horta superblocks as of the year 2021. The impacts of the Poblenou superblock have been assessed in relation to environmental, public space and mobility, as well as wellbeing and health aspects. In terms of pollution, a decrease in acoustic pollution is perceived. Regarding the use of public space and mobility, the results show that while local families with young children and people who work in the area are the groups that use the superblock the most, young people and older people are not frequent users. Some older people feel that changes in mobility have had negative effects on access to certain areas. Also, inside the superblock, there is a perceived improvement in mobility due to the reduction of motorised vehicles, and it is perceived that traffic may have shifted away from streets with pedestrian priority to the surrounding streets. Lastly, there is some tension between pedestrians and cars due to unclear signalisation. In relation to well-being and health, it is believed that the superblock has facilitated interaction between neighbours and has favoured social relations. Workers report that the picnic tables promote

[9] Agència de Salut Pública de Barcelona. (2021). *Salut als Carrers: Avaluació dels àmbits Superilles*. Retrieved from: https://www.aspb.cat/documents/salutalscarrers/.

healthier eating habits. Overall, there appears to be a more relaxed atmosphere within the superblock which translates into reduced stress levels and improved mental health.

Figure 9 shows the tactical urbanism interventions inside the Poblenou Superilla (Source: José Luis Muñoz Díaz).

Figure 10 shows the permanent transformations inside the Poblenou Superilla (Source: Curro Palacios).

The Sant Antoni superblock[10], completed in 2018, is different to Rueda's ideal model because instead of 3x3 building blocks it includes the entire Sant Antoni neighbourhood which consists of 12X8X8 city blocks in an arrow-shaped form (see *Figure 11*). Moreover, instead of pacifying two out of three streets, only one in three became civic axes. This, however, does not mean that the remaining streets of the superblock did not undergo any transformations - While there might be no changes to streetscapes, shifts in traffic organisation occurred.

The transformations to improve habitability include four sections of street forming a cross shape (Comte Borrell between Floridablanca and Manso; and Tamarit, between Viladomat and Comte d'Urgell), and the creation of a public square of 1,800 m² in the middle. A 'super plaza' emerges on the intersection of the two green axes. When a green axis intersects with the inner streets of the superblock, 'half plazas' are created by expanding the chamfers. Part of the green axes network that prioritises pedestrians, include the streets Comte Borrell, between Gran Via and Floridablanca; and Tamarit, between Viladomat and Calàbria, which underwent long-term transformations (*Figure 12*). Borrell street between Manso street and Paral-lel Avenue, as well as Parlament street between Ronda de Sant Pau and Viladomat, feature tactical urbanism changes (*Figure 13*). These interventions also include changes in traffic organisation, for example, on the intersection of Borrell and Parlament streets you cannot drive straight through because the streets organised as one-way loops expel cars by forcing them to turn. Public space is gained through the extension of sidewalks, the elevation of the streets to create single platforms, and the incorporation of vegetation and public furniture. In sum, the Sant Antoni superblock prioritises the extension and continuity of green axes over the creation of isolated 'pacified pockets'. This approach has become the model to be reproduced throughout the city by way of the Superilla Barcelona urban strategy[11].

[10] Ajuntament de Barcelona. (2017). Pla d'Acció per a l'àmbit de superilles de Sant Antoni: Pla d'Acció Consensuat [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/PLA%20D%27ACCI%C3%93-CONSENSUAT_low.pdf

[11] Ajuntament de Barcelona. (2020, November 11). *Barcelona Superblock: new stage.* Superilles. Retrieved from: https://ajuntament.barcelona.cat/superilles/en/

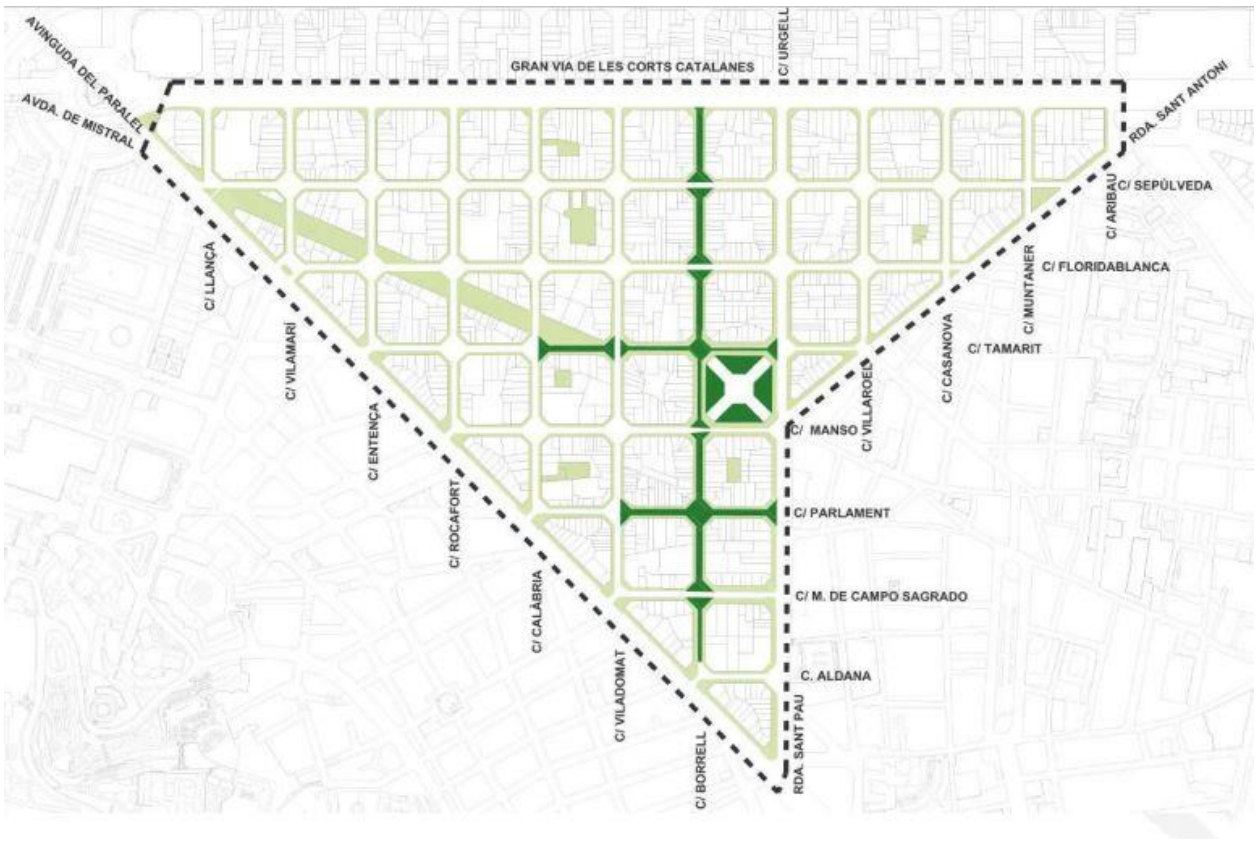

Figure 11. This image shows the map of the Sant Antoni superblock (Source: Ajuntament de Barcelona).

The *Salut als Carrers: Avaluació dels àmbits Superilles* report found that, in the Sant Antoni superblock, there has been a reduction in pollution levels: NO2 emissions decreased by 25% and PM10 by 17%. In addition, noise pollution is perceived to have been improved thanks to a reduction in the number of cars. In terms of uses of space and mobility aspects, older people significantly use the new public spaces while young people are under-represented. While families with young children also enjoy the new spaces, they believe that road safety in the superblock must be improved. In general, there is a diversity of uses of the space, activities that take place include shopping, strolling, passing by, exercising, and socialising. People who identify as women walk more than men, but more men use the public space for physical activities. In terms of health, the Sant Antoni superblock is perceived to be more peaceful, safer and more satisfying than before the transformations took place. This, in turn, improves people's capacity to rest and socialise.

Figure 12 shows the 'super plaza' next to the Sant Antoni market. The public spaces around the market were permanently transformed by Ravetllat arquitectura studio, the same architecture studio behind the redevelopment of the Sant Antoni market (Source: the author).

Figure 13 shows the 'super plaza' in the intersection of Parlament and Borrell streets, in Sant Antoni made through tactical urbanism interventions (Source: the author).

The works for the Horta Superblock began in 2018 with the objective of improving urban comfort through an increase of urban greenery, the creation of areas of stay, and the incorporation of urban furniture[12]. The transformations, as in the case of Sant Antoni, did not strictly follow Rueda's model. Instead, the superblock changes took place along four streets which were identified as critical based on their role in the pedestrian networks, as well as on other streets which required functional changes to improve mobility (*Figure 14*). Two-thirds of the transformed streets were changed through tactical urbanism, while one third underwent long-term changes (*Figure 15*). The interventions included functional changes in street directions, bus routes, and bicycle network, as well as transformations to improve public spaces through the removal of parking spaces, the expansion of sidewalks, raising of the street level to create a single platform, as well as introducing of new trees, planter boxes, and other urban furniture.

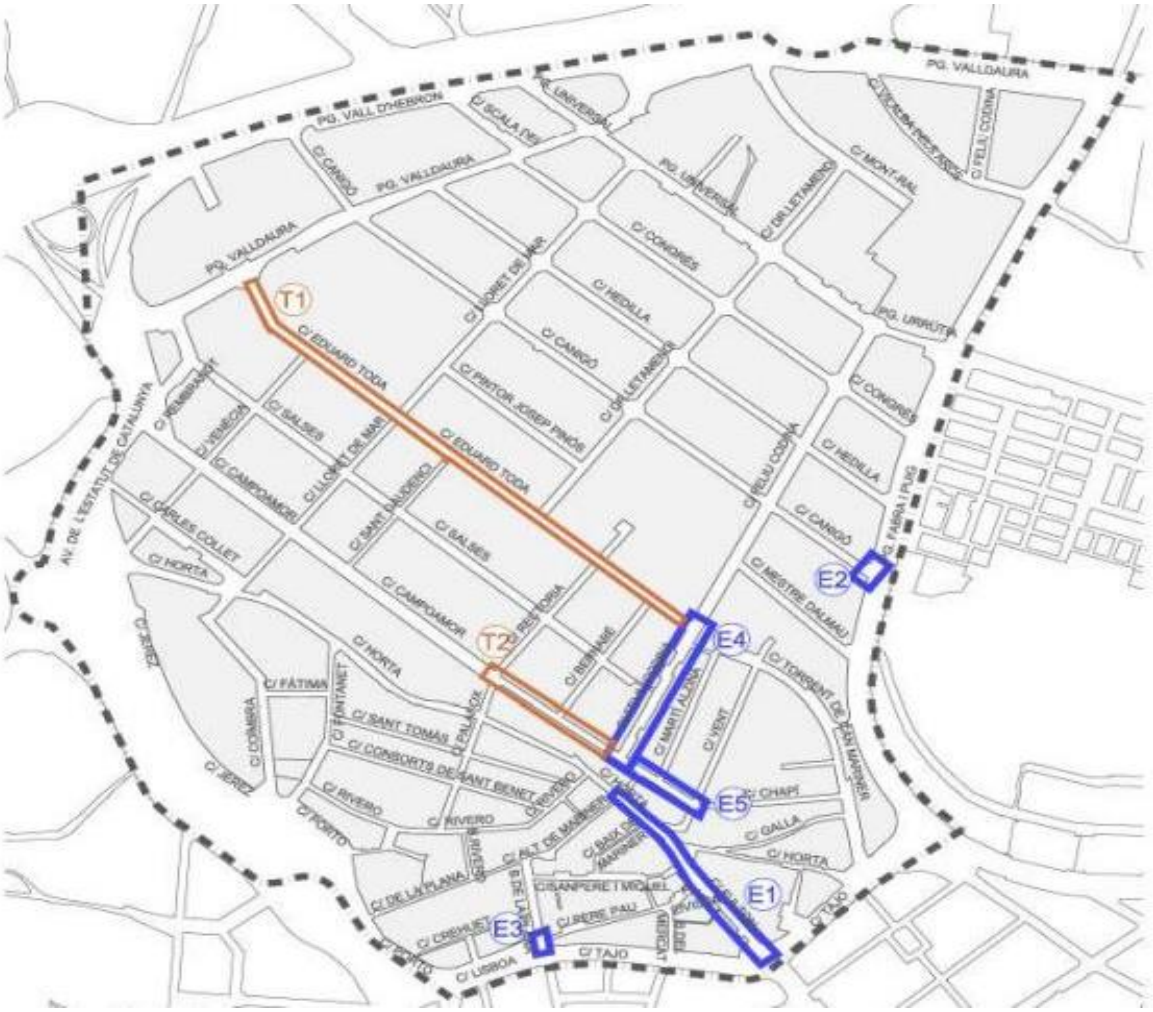

Figure 14. This image shows the map of the Horta superblock, the permanent transformations are marked in blue and the tactical urbanism interventions in yellow (Source: Ajuntament de Barcelona).

[12] Ajuntament de Barcelona. (2018). Pla d'Acció per a l'àmbit de superilles de Horta: Pla d'Acció Consensuat [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/pla_accio_superilles_horta.pdf.

The *Salut als Carrers* report found that, in general terms, the pollution levels for NO2 and PM10 in the Horta superblock remain low and have not changed with the superblock interventions. For the main street of Horta an increase of black carbon was observed after the implementation of the superblock, while a decrease of black carbon was observed for the inner streets (those which underwent transformations). The survey, a sample of 1200 people of different genders and ages on mobility and uses of space, found that 60% of women and 66% of men consider that walking comfort has increased. Similarly, fewer women (68%) than men (74%) consider that accessibility for cars has improved. On the main street, there is perceived to be a high number of cars which circulate at speeds above the permitted limits. This creates perceptions of insecurity, especially for children. In the inner streets, there is a perceived reduction in the number of cars and the speed at which they circulate. In addition, the superblock changes are regarded as having created more space for pedestrians and better accessibility for people with reduced mobility. In terms of health and well-being, it is believed the transformations of public space, overall, created quality areas for stay and socialising. Yet only 6% of surveyees stated they use public spaces for exercise, and only 45% of women and 56% of men consider the transformed spaces to improve their well-being.

Figure 15. This image shows people walking along Carrer d'Horta, one of the pacified roads in the Horta superblock (Source: Mónica Moreno).

In sum, while the environmental impacts of individual superblock interventions may differ (the report found some neutral and some negative effects in the different neighbourhoods), environmental indicators and the perception of residents confirm a reduction in overall air and noise pollution in the superblock environments. At the same time, while the interventions have reclaimed much needed public space for the community, the *Salut als Carrers: Avaluació dels*

àmbits Superilles report suggests that "more extensive pacification measures should be considered", as well as "inclusive spaces for all stages of life and ages"[13].

This is where the *Superilla Barcelona* comes in (*Figure 16*). The *Superilla Barcelona* represents the latest stage of the evolved understanding of superblocks that was announced by Mayor Ada Colau and Deputy Mayor Janet Sanz in a press release on November 11, 2020[14]. The *Superilla Barcelona* urban model focuses on creating green axes along routes that connect public infrastructure with other areas of everyday activity; and on interconnecting these green axes to form a 'super superblock' in Barcelona. The strategy is to reproduce the Sant Antoni superblock approach throughout the city centre by 1) transforming one out of every three streets into green axes, creating a total of twenty one green axes (33 Km); 2) building twenty one new public squares (totalling to 3.9 hectares of public space); 3) reclaiming 33.4 hectares of public space for pedestrians; 4) greening 6.6 hectares of urban spaces; 5) ensuring a coverage of 200 metres proximity to green spaces, meaning that the population living in the Eixample district will either directly live on a green axis or at a maximum distance of two blocks away from one[15].

According to the press release, the project's first stage will see the transformation of four streets into green axes with pedestrian priority and build four super plazas. The design competitions were also announced in the press release[16]. The first competition selected the teams in charge of the redevelopment projects for the first four green axes (Consell de Cent, Rocafort, Borrell, and Girona streets), which amount to 4.65 km and 11.12 Ha. The second competition selected the teams in charge of creating each of the four 'super plazas' at the intersections of Consell de Cent with Rocafort, Borrell, Enrique Granados, and Girona streets. Works are scheduled to start in June 2021 and end by March 2023.

[13] Carey, C. (2021, November 8). Barcelona 'superblock' sees 25 percent drop in pollution. Retrieved from Cities Today: https://cities-today.com/barcelona-superblock-sees-25-percent-drop-in-pollution/
[14] Ajuntament de Barcelona. (2020, November 11). *Cap a la Superilla Barcelona*. [Press Release]. Retrieved from: https://ajuntament.barcelona.cat/premsa/wp-content/uploads/2020/11/201111-DOSSIER-Superilla-BarcelonaVDEF.pdf
[15] Ajuntament de Barcelona. (2020). Superilla Barcelona Presentation [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/Presentacio_SUPERILLA_BARCELONA.pdf
[16] To find out more about the design competition, the winners, and their project proposals, visit this link: https://ajuntament.barcelona.cat/superilles/es/content/resolucion-de-los-concursos-de-ideas-de-superilla-barcelona

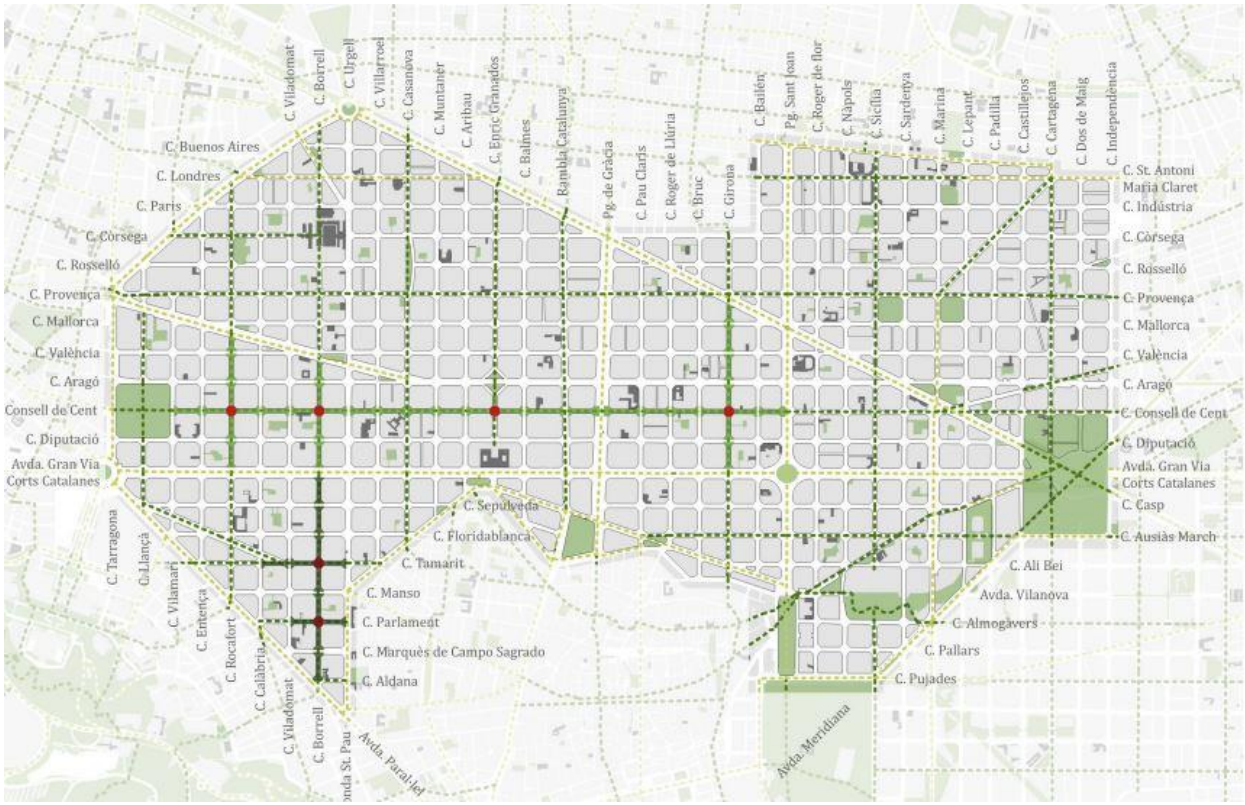

Figure 16. This image shows the map of the Superilla Barcelona. The solid dark green lines show the green axes with pedestrian priority already implemented in the Sant Antoni neighbourhood; the solid light green lines represent the planned green axes with pedestrian priority that will be implemented by 2023; the dotted dark green lines show are the green axes with pedestrian priority that will be implemented in the future; the dotted light green lines indicate existing green axes where pedestrians do not have priority; and the red dots show the existing and soon to be built 'super plazas' (Source: Ajuntament de Barcelona).

GOVERNANCE

The superblocks project in Barcelona is led by a technical team that provides professional support and is made up of representatives from the Urban Ecology Area of the City Management Office (Gerencia Municipal, Área de Ecología Urbana). This office responds to the Mayor's Office of the BCC. This team is instrumental in realising the superblocks strategy. Additionally, the government measure *Omplim de Vida els Carrers* (Fill the streets with life) establishes that the implementation of superblocks will involve the coordination and participation of the following actors[17]:

- **Public entities:** Provide specialised knowledge on the aspects linked to the superblocks (i,e., sustainable mobility, and green and public space). These entities could be at supra-local (such as Barcelona Metropolitan Transport Agency) and at local level. The latter includes autonomous municipal institutions; enterprises where local government is a partial stakeholder; business associations; and consortiums, foundations and associations attached to BCC.

- **The Area of Ecology, Urban Planning and Mobility (Área d'Ecologia, Urbanisme, i Mobilitat):** This is an area within the Local Government Commission that responds directly to the Mayor's Office[18]. The head of this area is Barcelona's Second Deputy Mayor Janet Sanz. In regard to the superblocks project, this entity provides specific knowledge for the planning, design, infrastructure, mobility and maintenance of public space.

- **The District Councils[19]:** These entities are the representative and collective participation bodies of the districts. Their main functions are to report on proposals and propose plans and programmes on issues affecting the territory. The District Councils approve the distribution of expenditure allocated to the District and the District Municipal Action Plan (PAD). District councillors are appointed by the Mayor and act with the right to speak but not to vote. In other words, the district councillor is the head of the territorial government and, in this mandate, a representative and member of the municipal government. Regarding the superblocks strategy, the District Councils provide expertise on the specific physical and social contexts. There is no specific structure in place or officers

[17] Ajuntament de Barcelona. (2016). Omplim de Vida els Carrers: La implantació de les Superilles a Barcelona. Retrieved from https://www.slideshare.net/Barcelona_cat/mesura-de-govern-oomplim-de-vida-els-carrers-lla-implantaci-de-les-superilles?from_action=save

[18] For more information on the municipal organisation chart, visit this link https://ajuntament.barcelona.cat/es/organigrama-municipal/arbol-jerarquico

[19] Ajuntament de Barcelona. (2021, December 7). Consejo de Distrito. *L'Eixample*. Retrieved from: https://ajuntament.barcelona.cat/eixample/es/el-ayuntamiento/estrategia-y-accion-de-gobierno/consejo-de-distrito

leading the implementation of superblocks at a district level. The superblocks become the District Council's responsibility once the implementation has been completed.

- **Neighbours, local entities and specific groups in the territory:** These provide the contextual knowledge (problems, needs, demands…) of those who live in the superblock area.

- **Experts:** This category includes external experts who provide research, innovation, and comparison with other world experiences.

Figure 17. This graph shows the key actors involved in pushing forth the superblocks strategy in Barcelona (Source: image produced by the author with the available information on the Omplim de Vida els Carrers document).

Once the stages of the superblock's participatory process are complete (as explained in the following section), all matters regarding the superblock become the responsibility of the corresponding District. The district has several public participation channels available where neighbours can present their feedback and voice claims on a variety of issues such as mobility, functional aspects, public space, wellbeing and health, and pollution. This can be done in person or via the postal service at the district office, through the online complaints portal, and at the District Council's sessions.

PARTICIPATION

Encouraging community participation and co-responsibility was a strategic goal of the government measure *Omplim de Vida els Carrers* (Fill the streets with life), which, until now, has guided the implementation of superblocks in Barcelona. This section will expand on the specific superblock projects already implemented or taking place in Barcelona and shine a light on how the approach to community engagement has become more intensive with the evolution of the strategy: from Superilla Poblenou to Superilla Barcelona.

SUPERILLA POBLENOU

The functional and tactical changes first introduced in the Poblenou superblock were implemented practically overnight, by a team of planners and architecture students during Mobility Week 2016. The transformations proved controversial among residents because many believed the project did not reflect their needs in relation to the new uses of space, traffic, public transport, cycling, parking, and loading zones. Neighbours organised to voice their concerns about the top-down approach of the project, and demanded their voices be heard. The BCC became aware of the generalised discontent, admitted there were defects in the design, and announced they would make amends. Deputy Mayor Janet Sanz made a point to visit the Poblenou superblock and talk with residents to identify key concerns[20].

The participatory process in the Poblenou superblock was carried out *a posteriori*, that is, after the main transformations had already taken place (although through tactical urbanism techniques). The participatory process aimed at co-designing an action plan for a second phase of superblock transformations in Poblenou[21].

Firstly, superblocks planners collected complaints and contributions from Poblenou residents and categorised them by topics (private vehicle traffic, public transport, parking and loading zones, bicycle network, and streets and public spaces). The main ideas put forth by neighbours included creating seated areas (public furniture, picnic tables); incorporating greenery (trees and flowerbeds); marking play areas on the ground; creating sports areas (such as fitness circuits, athletics track, table tennis); and generating spaces for debate, exchanging books, and reading, as well as for hosting art exhibitions and markets.

[20] Soro, S. (2016, September 12). Barcelona reconfigurarà la superilla del Poblenou davant les queixes dels veïns. *ara*. Retrieved from: https://www.ara.cat/societat/barcelona-reconfigurara-superilla-queixes_1_1373859.html#_=_

[21] Ajuntament de Barcelona. (2016). Presentació Superilla Poblenou [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/20161013_SIP9_ConsellBarri_0.pdf

Secondly, a Steering Group was created that would work with superblock planners to review the action plan for the second phase of transformations. The Steering Group included local entities and collectives such as the *Plataforma d'afectats per la Superilla* (a collective of people affected by the superblock intervention), the *Col·lectiu Superilla Poblenou* (the Poblenou Superblock Collective), the *Associació de Veïns i Veïnes de Poblenou* (Poblenou's neighbours association), the 22@ Network (private business association), universities, schools, trade associations, and guilds. The Steering Group's work sessions were formatted as thematic workshops based on the above-mentioned categories. The aim was to collectively debate neighbours' specific contributions, which had been collected by superblock planners at the start of the process. These sessions were designed for the Steering Group but were also open to anyone who wished to attend.

The reader can find more about the participation process format and methods used in '**Support document 1: Participation methods**'.

Superilles Sant Antoni, Horta, and Hostafrancs

Applying the lessons learned from the first superblock implementation, subsequent superblocks interventions in Sant Antoni, Horta, Hostafrancs - under the government measure *Omplim de Vida els Carrers* - incorporated a carefully designed participation process. This process involved the following actions[22]: First, these processes began with the formation of a steering group that would be involved in the project from design through to the evaluation phases. The goal of a steering group is to provide planners with specific information about the territory, contextualising the project, and improving it. The steering groups are made up of people belonging to neighbourhood entities and planners.

The work structure of the steering groups in Sant Antoni, Horta[23] and Hostafrancs[24] was relatively similar. The process of the Sant Antoni[25] superblock, however, was the most comprehensive of the three. In this neighbourhood the steering group participatory sessions were structured as follows: 1) Presentation of the Programme; 2) Goals to reach and diagnosis of the area; 3) Application of the model to the local context to define the proposal; 4) Thematic session in relation to local businesses and 5) Thematic session in relation to public space. Lastly, 6) Working session to define the proposal for superblock. Once there is an agreement on the

[22] Ajuntament de Barcelona. (2018). Pla d'Acció per a l'àmbit de superilles de Horta: Pla d'Acció Consensuat [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/pla_accio_superilles_horta.pdf.
[23] Ajuntament de Barcelona. (2017). *Superilles: Omplim de vida els carrers: Sessió amb veïns i veïnes d'Horta.* Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/20170626_INFORME_Sessio%CC%81_Vei%CC%88nat_Horta.pdf
[24] Ajuntament de Barcelona. (2018). Pla d'Acció per a l'àmbit de superilles de Sants-Hostafrancs: Sessió de treball oberta a la ciutadania [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/03_SANTS_PLA_D_ACCI%C3%93_29-05-2018_v9%20CURTA%20PROJECTAR_low.pdf
[25] Ajuntament de Barcelona. (2019). Programa Superislas: Proceso técnico participado.

proposal (the so-called 'action plan'), this document is presented to local associations and neighbours in an open debate.

Second, the participation process included work sessions with groups of key stakeholders to pay special attention to the voices of local traders as well as parents' associations, and other groups such as the visually impaired - who, according to the planners, would be particularly affected by the project and do not usually have a voice in urban processes. Third, workshops open to members of the community were organised to foster open participation so that anyone in the area can be informed and participate. And fourth, the superblocks' website was promoted as an instrument for transparency, monitoring, and community participation. All the information can be found on the municipal website *decidim.Barcelona* and interested parties could make contributions throughout the whole process through the BCC online participation platform *decidim*.

The information gathered through the meetings, the workshop, and the virtual contributions is eventually brought back to the steering group for consideration. When the technical team and the steering group agree on a final proposal, this can be presented to the *Consell de Barri* (a Neighbourhood Forum that convenes at the District Council). Works can start when the proposal is approved. Shortly after the completion of the project the superblocks participation process includes one or two follow-up sessions with the steering group to review the interventions and make the necessary final adjustments.

Superilla Barcelona

The participation process for the *Superilla Barcelona* was structured in three stages, first an information and dissemination stage, then a stage in which the different perspectives of the key stakeholder groups were incorporated, and, finally, a stage for collective consideration, discussion, and making concrete proposals. This is explained in *Figure 18*.

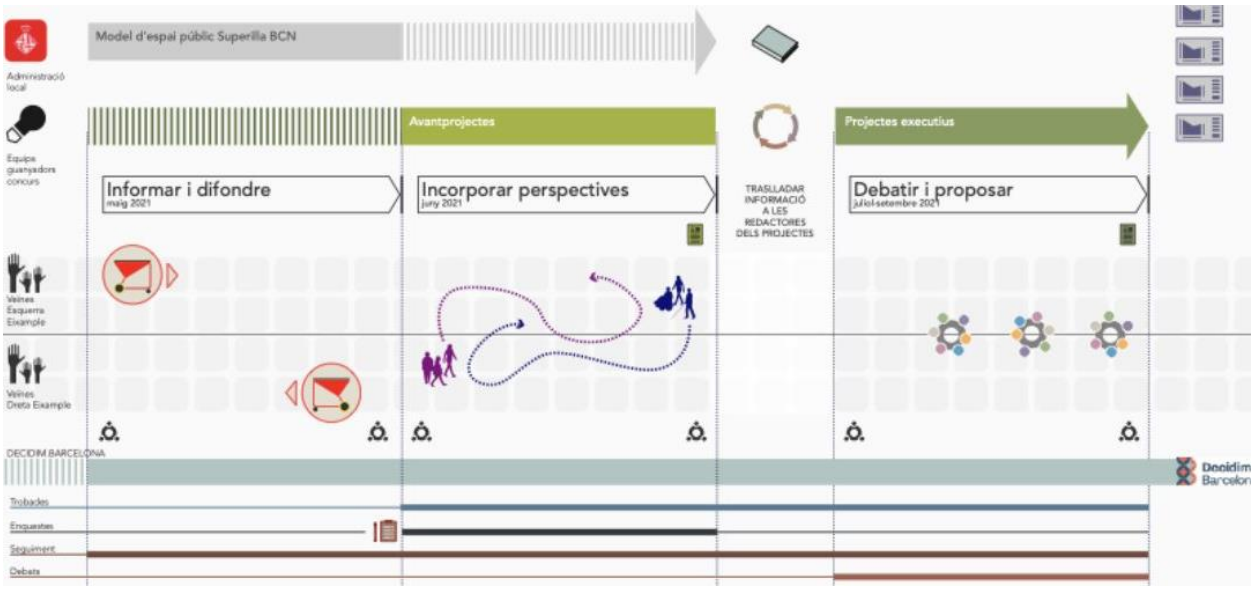

Figure 18 shows the three stages of the Superilles BCN participatory process: 1) inform: with the mobile information carts, 2) incorporate diverse perspectives: through walks with neighbours and women, 3) debate and make concrete proposals: through workshops. In the lower part, the solid grey line shows how the decidim.Barcelona portal is active throughout the whole process, as well as the work of the steering group, represented in a solid brown line (Source: decidim.Barcelona).

The *Superilla Barcelona* participation process is still underway and incorporated new methods to complement the ones used so far[26], including: 1) *decidim.Barcelona*; 2) The steering group; 3) Community information outings; 4) A merchants survey; 5) Exploratory walks from a gender perspective; 6) Neighbourhood walks with locals; 7) Open workshops with members of the community; 8) Open workshops with members of the community, and planners and architects; 9) Participatory sessions in schools; and 10) An information campaign for local merchants. Once the information produced with the community has been processed, the participation process wraps up with the redaction of the executive plan and its presentation at the District Council's Neighbourhood Forum. Works can start when the proposal is approved.

To find out more about the participation methods used in each superblock project, visit '**Support document 1: Participation methods'**. There, the reader will find a short description of the method, as well as comments on the target group, how people were reached, how the method was used, and some notes on success and learnings.

[26] Ajuntament de Barcelona. (2021, November 8). Superilla Barcelona en el Eixample. Retrieved from Decidim: https://www.decidim.barcelona/processes/SuperillaBarcelona/f/4580/?locale=es

STRATEGIES FOR REDUCING ON-STREET PARKING

The superblocks strategy promotes "mobility on foot, by bicycle and by public transport" - and discourages the use of private vehicles - by creating extensive and well-connected green axes. These axes are inherently walking networks. Walkability, therefore, is improved because public space is taken away from the car and given to people, and made greener, safer, accessible, and healthier. The spatial transformations of the green axes also support bike mobility, although cyclists must share these spaces with other users. In addition to this, the BCC is working to extend the city-wide bicycle network. Certainly, more people moving sustainably means less car-dependence, and thus, less demand for on-street parking.

At the city level, there are actions and interventions in place that seek to encourage a modal change. In relation to public transport, before the superblocks were implemented the City of Barcelona transformed its old bus network into an orthogonal network with lines oriented in either North-South or East-West directions. This resulted in better orientation, more efficient trips and better coverage. The metro line 9 - which is still under construction - is a ring line that aims to connect at the periphery the eight metro lines which radiate from Barcelona's city centre. There are also measures planned to link disconnected tram lines that run at the northern and southern ends of the Barcelona Metropolitan Area. All these local government interventions interact with and complement the *Superilla Barcelona* urban strategy.

On-street parking in Barcelona's city centre consists of blue and green zones, loading zones, motorbike parking, and on-street parking for vehicles owned by persons with reduced mobility (*Figure 19*). The green or residential zones are parking spaces reserved for Barcelona residents. To park in green zones, if you are not a resident, there is the option of paid parking for one or two hours (depending on the sign). The green zone is open from Monday to Friday from 8:00h to 20:00h. After 8 pm, these parking areas are exclusive for Barcelona residents. The blue zone is a paid parking zone for everyone, with a time limit ranging from 1 to 4 hours. The blue zone in the city centre is open from Monday to Saturday from 9:00h to 20:00h. Outside these hours, parking is free of charge. According to the BCC website, the percentage of registered vehicles in Barcelona neighbourhoods, which hold a 'residents permit', is around 8-12%[27]. The remaining available parking is off road, in public or private underground car parking. Regarding the latter,

[27] This information is from the Superilles Q&A section and can also be found in some public statements from 2017 quoting Janet Sanz. To access the BCC's Q&A section on superblocks, visit this link https://ajuntament.barcelona.cat/superilles/en/content/questions-and-answers

the BCC maintains that the Eixample is characterised by a surplus of underground parking spaces [28].

Figure 19 shows regulated parking in a section of the Sant Antoni superblock. Legends: blue lines represent blue parking zones and the green lines, green parking zones; pink lines indicate bicycle parking; yellow stands for loading zones; purple shows motorbike parking; red lines represent parking for people with reduced mobility; and dark red indicates reserved parking zones. This is just a small section, yet the whole district of the Eixample is regulated in this way (Source: Ajuntament de Barcelona).

However, having available on-street parking seems to be a main concern for residents and other persons who visit the superblocks on a daily basis. With this in mind, at the beginning of a superblock implementation process, superblock planners carry out a diagnosis of the parking network (along with an analysis of other functional networks such as the bicycle, public bus, and loading zones). In the implementation of the Sant Antoni[29] and Horta[30] superblocks, the diagnosis, along with the proposed changes, were presented and debated early on in the participation process at the Steering Group work sessions.

[28] This information is from the Superilles Q&A section and can also be found in some public statements from 2017 quoting Janet Sanz. To access the BCC's Q&A section on superblocks, visit this link https://ajuntament.barcelona.cat/superilles/en/content/questions-and-answers

[29] Ajuntament de Barcelona. (2017). 3a Reunió de treball per l'àmbit de superilles de Sant Antoni [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/170613_Presentacio%CC%81_GI_StAntoni.pdf

[30] Ajuntament de Barcelona. (2017). Reunió de treball per l'àmbit de superilles de Horta [PowerPoint slides]. Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/170607_Presentacio%CC%81_HORTA_Comerciants.pdf

According to the *Superilles* website[31], the implementation of Superilles in Barcelona represents an average on-street parking reduction of 1%[32]. Considering this figure, ideas for public provision of parking alternatives - such as local government subsidies for underground parking - were contemplated at an initial stage, but quickly disregarded. Barcelona superblocks website maintains that the overall change in terms of on-street parking is of little significance for the city. Moreover, as Superilla Barcelona Head Architect Rosa López[33] argues, the main goal of the superblocks project in Barcelona is to discourage people from using private vehicles, and any attempt to compensate for on-street parking would undermine such a goal.

[31] Ajuntament de Barcelona. (2021, December 5). Questions and Answers. *Superilles*. Retrieved from: https://ajuntament.barcelona.cat/superilles/en/content/questions-and-answers

[32] This information is from the Superilles Q&A section and can also be found in some public statements from 2017 quoting Janet Sanz. To access the BCC's Q&A section on superblocks, visit this link https://ajuntament.barcelona.cat/superilles/en/content/questions-and-answers

[33] Superilla Barcelona Head Architect Rosa López, personal communication, October 26, 2021.

MONITORING & INDICATORS

CHANGES IN THE NATURE OF THE INDICATORS

The indicators used to measure the impacts of the superblocks projects have evolved since the first superblock was implemented in Poblenou. In the same way the superblocks theoretical project had to adjust the reality of Barcelona's districts, the indicators to measure their impact also changed with the evolution and territorialisation of the urban strategy. Rueda's and Barcelona Urban Ecology Agency's theoretical superblocks model and indicators were developed in an academic context. According to Rosa López, these indicators were complex and very scientific, to the point that they proved to be rather confusing when applied to real life settings such as communication with the public. Journalists, planners, politicians, etc. found it hard to interpret such complex indicators. Moreover, the indicators' calculations required information that was often not available, hence, those in charge of monitoring and evaluation usually recurred to working with hypothetical cases and modelling instead of factual data. The approach to the indicators system changed with the Sant Antoni superblock implementation. Consequently, monitoring and evaluation efforts are now put towards collecting basic data - which can be later related to each other to create more complex indicators.

COMPREHENSIVE LIST OF INDICATORS FROM BARCELONA

The table below lists the indicators used to measure the impact of the different superblocks projects. The project implemented in Poblenou, under the local government's initiative *Omplim de vida els carrers* (Fill the streets with life)[34], encompasses the most comprehensive set of complex indicators, developed by the Barcelona Urban Ecology Agency[35]. The list also includes the indicators used in the aforementioned report by the Barcelona Public Health Agency[36], and those present in the BCC's presentations of the action plans for the superblocks discussed in this document.

To access the table, please visit '**Support document 2: Superblock indicators**'.

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[34] Ajuntament de Barcelona. (2016). Omplim de Vida els Carrers: La implantació de les Superilles a Barcelona. Retrieved from https://www.slideshare.net/Barcelona_cat/mesura-de-govern-oomplim-de-vida-els-carrers-lla-implantaci-de-les-superilles?from_action=save

[35] Agència d'Ecologia Urbana de Barcelona. (2015). *Superilles pilot al districte de Sant Martí: Informe Diagnòstic Situació Actual.* Retrieved from: https://ajuntament.barcelona.cat/superilles/sites/default/files/20150217%20%20Diagnostic%20Superilla%20Poblenou%201_0.pdf

[36] Agència de Salut Pública de Barcelona. (2021). *Salut als Carrers: Avaluació dels àmbits Superilles*. Retrieved from: https://www.aspb.cat/documents/salutalscarrers

INDICATORS CURRENTLY USED BY THE SUPERILLA BARCELONA URBAN STRATEGY

As of December 2021, there is no document that comprehensively collects the indicators used by planners to monitor and evaluate the impact of the Superilla Barcelona urban strategy. Superblocks planners are currently working on putting a document together, and Rosa López expressed that it will be ready around the beginning of 2021. The types of data that superblock planners are interested in collecting are divided into five themes: 1) Mobility, 2) Environment, 3) Habitability, 4) Socio-economic, and 5) Health.

1. **Mobility:** Data on the mobility of pedestrians, bicycles, and motor vehicles. They measure this with traffic counters and want to implement cameras that can count without compromising the privacy of users.

2. **Environment:** Data on air quality (NO2 and PMs); as well as on the evolution of environmental noise. They have measuring stations scattered across the Eixample district.

3. **Habitability:** Data on green areas per m2, benches per m2, spaces of stay per m2, number of fountains per m2, play areas per m2, number of trees per m2.

4. **Socio-economic:** To understand the impact of gentrification processes, the evolution of rent prices is tracked both in relation to private housing as well as retail rent. Moreover, data is gathered to understand the usage of credit cards in the area. Increased use of credit cards indicates greater commercial vitality.

5. **Health:** Qualitative surveys are developed to monitor the evolution of neighbours' healthy behaviours in public space. x

Support document 1: Participation methods

Method (name)	Project					Short description (to understand the format)	Target Group(s) (for whom?)	How are people reached?	How was it used and when during the project?	Success & learnings
	Poblenou	Sant Antoni	Horta	Hostafrancs	Superilla					
Online participation					■	In the municipal website, interested parties could make contributions throughout the whole process through the BCC online participation platform decidim.	Open to anyone in the community. To make contributions, people need to have a device with internet access and register with a facebook, microsoft, or google account	*Decidim.Barcelona* is the main platform for community participation. Here, all the participatory processes initiated by the Barcelona City Council are posted, and members of the community can register to access information and attend the participatory sessions.	This option is available to make contributions throughout the entire duration of the participation process.	The digital gap is a main limitation. People are not sure whether their contributions will be actually considered or if it is a waste of time.
Steering group	■	■	■	■		This is a restricted group of stakeholders which, ideally, will remain unchanged throughout the participation process. The steering group is involved in the project from design through to the evaluation phases. The goal of a steering group is to provide planners with specific information about the territory, contextualising the project, and improving it.	The steering groups are made up of representatives of neighbourhood entities and some engaged neighbours. They work alongside superblock planners.	The call was made public on the online participation platform, and the BCN City Council contacted local entities and organisations.	This group is created at the beginning of the participation process and is actively engaged in the development of the project proposal throughout the entire process. The steering group begins its work by developing a base proposal for the action plan, which will be enriched with the information produced in subsequent work sessions where key stakeholders and members of the community share their views and make proposals. Once the action plan has been co-designed, the steering group, along with planners, make final adjustments and present the executive proposal to the District Council. Once the works are completed, this group meets again to review the	The creation of a steering group is the result of the lessons learned from the first superblock implementation in Poblenou. Those who partake develop a sense of ownership within the project.
Community information outings				■		These outings involve two or three people and a cart, which has been designed as a mobile information point. Their aim is to go to the public spaces where there will be transformations and reach out to locals to connect the different superblocks projects and collect their perspectives on the quality of the public spaces in the Eixample.	Aimed at reaching out to anyone in the community.	Locals and passers by can approach the information cart and ask questions.	These things take place in the first phase of the process, in parallel or even before the work with the steering group begins. The aim of these autings is purely informative.	Oftentimes, this is only carried out to pursue political interests.
A merchants survey					■	A survey aimed at gathering information about the trades sector in relation to the Superilla strategy.	Local traders, shop owners, and businesses.	A group of surveyors went door to door to survey each shop along soon-to-become 'green axes' under the Superilla Barcelona strategy.	This method was applied at an initial stage of the participatory process. The aim was of an informative nature, to collect general information on the types of shops, perceptions, characteristics and needs, and identify businesses with 'special needs'.	
Exploratory walks from a gender perspective					■	These sessions were held in the areas where the Superilla Barcelona project will be implemented. The groups were of around 8 women plus the facilitators. At the beginning, the objectives of the walk were explained, an initial activity was carried out which involved perceiving the public space in a multi-sensorial way. Afterwards, the route was discussed and agreed based on the views of the participants as to which spaces were most adequate to discuss the 4 themes that guided the walk. The themes were: Care work, health, safety, and everyday infrastructure.	Diverse women participated in the walks, the majority were aged over 40 years old and were representatives of neighbourhood associations.	The call was made public on the website, and the BCN City Council contacted local organisations that work with women, such as the Women's Council of l'Eixample.	These sessions took place during the diagnosis phase of the participatory process, where the bringing to the fore diverse voices was the focus. The objective was the incorporation of a gender perspective into the diagnosis of daily life in Eixample.	These walks allowed planners to identify physical, social, and functional characteristics that produce and reproduce gendered inequalities, and provoked a collective reflection on issues of public space, mobility, everyday infrastructure, housing, participation, and safety. However, the participants belonged to a very specific social group: mostly European and generally Catalan, aged 35 years old and over, professionals, and committed citizens.
Neighbourhood walks with locals					■	These sessions were held in the areas where the Superilla Barcelona project will be implemented. The groups were of around 8 people plus the facilitators. The structure of the walk was: first, explain the objectives of the walk; second, agree upon the route based on the views of the participants as to which spaces were most adequate to discuss the themes that guided the walk. The themes were: neighbours' everyday networks, main motor vehicle axes, mobility hotspots, spaces with maximum influx of people and activities, and quality of public spaces in the area.	Many people participated in the walks, the majority were long-term residents and representatives of local entities.	The call was made public on the website, and the BCN City Council contacted community organisations such as Grupo Impulsor Superilla Barcelona (steering group), the Mesa Contra la Contaminación del Aire (Round Table Against Air Pollution), the Grupo Accesibilidad de la Red de Accesibilidad y Vida Independiente (Accessibility Group, from the Accessibility and Independent Living Network), the Consejo Ciudadano por la Sostenibilidad y Red Barcelona +Sostenible (Citizens' Council for Sustainability and the Barcelona +Sustainable Network), the Pacto para la Movilidad (Mobility Pact), the Mesa de Emergencia Climática y Medio Ambiente de la Eixample (Eixample Climate Emergency and Environment Committee), the Entidades comerciales del Distrito de l'Eixample (Eixample District Business Organisations), and the Consejo de las Mujeres de l'Eixample (Women's	These sessions took place during the diagnosis phase of the participatory process, where the bringing to the fore local needs and desires was the focus.	The participants belonged to a very specific social group: mostly European and generally Catalan men, aged 50 years old and over, professionals, and committed citizens.
Work sessions with groups of key stakeholders		■	■	■		These work sessions are designed to pay special attention to the voices of those who, according to the planners, would be particularly affected by the project and do not usually have a voice in urban processes. These sessions usually include walks or collaborative work over maps of the neighbourhood to identify problems to overcome and aspects to reinforce in relation to the built environment.	The steering group, local traders, associations of parents of schoolchildren, and other groups such as the visually impaired	The call was made public on the website, and the BCN City Council contacted community organisations. Grupo Impulsor Superilla Barcelona, the Mesa Contra la Contaminación del Aire, the Grupo Accesibilidad de la Red de Accesibilidad y Vida Independiente, the Consejo Ciudadano por la Sostenibilidad y Red Barcelona +Sostenible, the Pacto para la Movilidad, the Mesa de Emergencia Climática y Medio Ambiente de la Eixample Eixample, the Entidades comerciales del Distrito de l'Eixample, and the Consejo de las Mujeres de l'Eixample	A work session per collective, during the diagnosis phase of the participation process. The aim is to gather information on the specific problems and experiences of marginalised groups.	These sessions are important to emphasise the experiences of silenced groups. The contributions of participants are incorporated into the project. In relation to associations of tradespeople, they tend to be against the transformations because they believe that it will negatively impact their activities
Open workshops with members of the community	■	■	■	■		These sessions are organised to foster open participation so that anyone in the area can be informed and participate. The sessions begin with an introduction to the Superilles programme and a description of the participatory process. Subsequently, discussion groups are created, and people are placed in different tables. The group work starts with the facilitators explaining to their groups the proposed road hierarchies, and tactical and long-term interventions. The changes in terms of loading and unloading zones and surface parking spaces are also explained. After this, group work begins with the support of maps. The participants are encouraged to express their opinions on the plans by talking or writing on sticky notes. The idea is to identify potentials, risks, proposals and doubts. At the end of the work in groups, the facilitator of each group briefly explains the results obtained in their work group.	The steering group, local associations and open to anyone in the community	The City Council publishes the invitation on their website, reaches out to associations (such as the abovementioned), and pastes invitations around the neighbourhood to appeal to locals.	These workshops contribute to the proposals phase of the participation process. The aim is that the participants can assess the quality of their neighbourhood and the proposed transformations in relation to aspects of public space, accessibility, and mobility; and make concrete proposals. These sessions involve work over a base proposal previously developed by the steering group along with planners. In the Sant Antoni, Horta, and Hostarancs processes, this was the main space for the community to contribute (in person). Unlike the Superilla BCN process, the participants of the Sant Antoni, Horta, and Hostafrancs processes do not get to comment on the actual projects developed by architects.	These workshops represent a unique opportunity for members of the community to have their voices heard. The problem is that, generally, the Council's efforts to reach out to people are not enough. Very few people read the flyers on the streets, and an even lower number feel that this invitation is aimed at them. Usually these sessions lack the diverse views, especially of young people and of people from other cultural or ethnic backgrounds.
Open workshops with members of the community, and planners and architects					■	The workshop began with an introduction to the Superilla Barcelona strategy by Superblock planners. This was followed by work in groups, each group focusing on a specific geographic area of the project (i.e., the area around the superplaza of Girona and Consell de Cent streets; or the area around the Enrique Granados and Consell de Cent). There were about six groups with approximately 15 participants per table, the architects in charge of designing the sections of a given area and planners were also at each table. After the general introduction, the architects presented their projects to their groups, and the participants had a space to	Members of the community, local associations, as well as members of the steering group.	The organisation leading the participation process published the invitation in the *Decidim.Barcelona* platform and reached out to the abovementioned organisations, additionally, the City Council pastes flyers around the neighbourhood to appeal to locals.	These workshops took place in the third stage of the participatory process, where the aim was that members of the community can assess the architects' proposals and make concrete proposals.	These workshops represent a unique opportunity for members of the community to have their voices heard. The problem is that, generally, the Council's efforts to reach out to people are not enough. Very few people read the flyers on the streets, and an even lower number feel that this invitation is aimed at them. These sessions, however, attracted more people and showcased more diversity than the walks. Lastly, while the aim was to get proposals from the community, these sessions were largely about resolving questions.
Participatory sessions in schools					■	Three workshops that involved an outdoors group activity followed by individual work. Firstly, out in the school playground, there was an activity for the children to understand the size of the new 'super plazas' of the Eixample, draw on the ground the elements that are typically in public space, and reflect upon the different uses. Secondly, the children went back to the classroom to work individually on a model of an intersection of two streets (proposing uses, design, and features to be incorporated in the proposal of the Superilles project). This session concluded with a moment to share the individual work and other thoughts on how Superilla Barcelona	Children who attend educational centres selected as reference for each area of the Executive Project of the Superilla Barcelona.	These schools were selected by the Barcelona City Council, and workshop facilitators went to deliver the sessions on a school day during school hours.	These workshops took place in the third stage of the participatory process. The aim was to collect the ideas put forward by the children with a view to incorporate this information in the Executive Project.	While the workshops had the aim of collecting proposals, it does not seem likely that the schoolchildren's contributions will be incorporated into the design. From the perspective of planners, these workshops were more about informing school children about the changes that will take place in their neighbourhood and encouraging them to re-imagine other ways of appropriating these public spaces.
An information campaign for local merchants					■	Logistically, the routes were carried out by a team of two facilitators who visited every shop and business along the green axes that will be transformed between 2022-2023. A third of the outings were carried out with the supplement of a cart that served as a mobile information point. The visits to local businesses involved providing a technical explanation about the Superilla Barcelona changes in terms of uses and mobility and gathering information about specific needs of shop owners. The mobile information point aimed at approaching the community and explaining the upcoming transformations.	Local traders, shop owners, and businesses. The mobile information point targeted locals and passers by.	Door to door, and the businesses identified as 'special' will be contacted at a later stage directly through phone or email.	These workshops took place in the third stage of the participatory process. The goal was to identify and anticipate possible problems in relation to circulation, loading zones, and other questions of interest to merchants. Local businesses and members of the community. These sessions were also aimed at creating an inventory of shops in the area.	The concerns of most of the special shops can be solved with an information campaign. The information should be presented in a clear, simple and graphic way because there are many traders who do not speak the local language. This information should reach the traders directly, physically, by email, or by telephone. Reaching out only through traders associations leaves out of the loop many small businesses, particularly those of immigrants. Apart from this, there are a number of special shops that should meet with the Council to have a more extended discussion because their loading and unloading needs cannot be fulfilled by the changes proposed by the Council (furniture shops, art galleries, supermarkets, pharmacies).

Support document 2: Superblock indicators

Indicator	Description	Value / How is it calculated? (If information is available)	Source	Cluster
Density of dwellings	This indicator describes the number of dwellings that are concentrated in a given area. This indicator shows a first approximation of the urban configuration and the territorial organisation of a given urban area. territorial organisation of a given urban area: degree of compactness - urban dispersion.	[Number of housing units/Unit of land]	Barcelona Urban Ecology Agency (2015)	
Absolute compactness	Absolute Compactness (AC) is the ratio between the built volume over the surface area of the study area. It provides information on the building intensity exerted by any type of construction (residential, tertiary or industrial) on a given urban area (residential, tertiary or industrial).	[Volume of built up area/Unit of surface area]		
Corrected compactness	The corrected compactness relates the built-up volume to the living space (relationship space, leisure and urban green space) of a given urban fabric. This indicator corrects for absolute compactness, as excessive compactness can lead to problems of congestion and urban saturation.	[Volume of built up area/Surface of spaces of stay]		
Living space per inhabitant	The aim is guaranteeing a minimum reserve of recreational spaces per inhabitant. The coverage of recreational areas in cities is of great importance as it directly affects the quality of life of their citizens and the environmental health.	[Surface area of spaces of stay/Population]		
Street proportion	Level of opening between the façades that mark a street or an open space (height h) in relation to the distance (d) between these façades. The proportion of a street or open space expresses the type of section based on its morphological characteristics.	[Street sections (linear metres) with a ratio h /d <2 / Total road length (linear metres)]		
Air quality	The air quality index indicates the proportion of the population exposed to levels of immission not exceeding the air quality objectives (limit values for the protection of human health, critical level for the protection of vegetation) established in Annex I of the Royal Decree 102/2011, dated January 1, on the improvement of air quality. The two most worrying pollutants in the study area are analysed: nitrogen dioxide (NO2) and particles smaller than 10 microns (PM10). The estimation of air quality of the air quality carried out considers traffic as the main source of pollution, including the other sources other sources in terms of background air pollution.	[Population exposed to permanent levels of immision according to pollutant/ Total population] x 100		
Acoustic comfort	‼ there is an error on the document and there is no description about this indicator	[Population with noise levels lower than 65 dB during the daylight hours/ Total population] x 100		
Thermal comfort	Percentage of hours per day between 8am and 10pm in which a street offers adequate thermal comfort conditions for a person. Thermal comfort takes into consideration the following aspects: the climate, the morphology of the street, the materials used in pavements and façades, the presence façades, the presence of vegetation and the metabolic activity of the individual.	[Surface area of public roads with comfort potential in summer of more than 50% / total surface area of public roads] x 100		
Accessibility	Degree of accessibility of the streets depending on the width of the sidewalks (right and left) and slope of the section. Road accessibility is measured in terms of its impact on pedestrian mobility. The assessment criterion is based on two basic accessibility requirements for people with reduced mobility.	[Sections of road (linear metres) with sufficient accessibility or higher /Total length of road (linear metres)] x 100		
Road space for pedestrians	Percentage of road space dedicated to pedestrians in relation to the total amount of road space. Once the calculated the percentage of road space for pedestrians in each section, the calculation is made for the whole area of the the entire study area.	[Stretches of road (linear metres) with a road distribution equal to or greater than 60% / Total length of road (linear metres) 60%]		
Visual perception of the urban green	Fracció de l'espai del camp visual d'un vianant que ocupen els elements que configuren the urban green. This fraction of space occupied mainly by trees is calculated on the basis of the volume represented by their canopies according to their type of measurement. The indicator is expressed as a percentage of the green volume per street section.	[Volume of the tree canopies / visual volume of the street section] x 100		
Index of habitability of public space	The Index of Habitability of Public Spaces (IHEP) consists of a comprehensive evaluation system for the of new variables that condition the positive perception of the streets by citizens. These variables are classified into: - ergonomic variables, which affect the movement and movement of people in public space. in public space. The following indicators are taken into consideration: Road space for pedestrians, Accessibility, Accessibility to the public transport system. to the pedestrian, Accessibility of the road and Proportion of the street. - Physiological variables, which affect the well-being of people and assess the levels of comfort. levels of comfort. The following indicators are taken into consideration: Air quality, Acoustic comfort and thermal comfort. - Psychological variables, which affect the degree of attraction of people to the street. The following indicators are taken into consideration: Density of activities on the ground floor, Diversity of activities and Visual perception of the urban green	[IHEP = [∑PV ERGONOMICS+ ∑PV PHYSIOLOGICAL + ∑PV ATRACTION]		
Space occupied by motorised mobility	The predominance of motorised mobility in our cities is a determining factor in the quality of public space, especially in terms of air pollution, noise and visual intrusion into the environment. As this occupation tends towards an inverse hierarchy, urban quality could improve, as it will urban quality could improve, since, among other things, the type of activities in public spaces could become more diverse. public space will be able to diversify.	[Road surface destined to motorised mobility/Total road surface]*100		
Proximity to bicycle parking	Percentage of population with coverage of one or more bicycle parking spaces within a distance of less than 100 metres.	[Population living <100m from a bicycle parking station / total population] x 100		
Simultaneous Proximity to Alternative Transport Networks	Proximity to alternative means of transport is a basic criterion for reducing private motorised traffic. For the calculation of the indicator, the coverage considered are bus stops (300 metres, less than 5 minutes on foot), fixed infrastructure transport stations (metro and tram, 500 metres away, since these are means of transport with a large number of users and with a great connectivity with other lines in the other lines in the most important public transport hubs), and on the cycle lane network (300 metres).	[Population with simultaneous coverage to the 3 alternative transport networks considered/Total population]*100		
Parking for vehicles outside the street	Percentage of parking spaces for vehicles located outside the road and available for residents.	[Number of parking spaces outside the road/Total number of parking spaces inside and outside the road]*100		
Provision of parking spaces for vehicles	Percentage of parking spaces demanded by resident users (with registered vehicle), located outside the road, which are covered by the existing offer. located outside the road, which are covered by the existing offer.	[(Offer of on-street parking spaces/ Theoretical demand for parking spaces for residents]*100		
Biological index of soil	Soil permeability is calculated by means of the Biological Soil Index (BPI). It indicates the relationship between the functionally significant surface areas for the natural cycle of the silt and the total surface area of a study area. Soil is classified according to its degree of naturalness and permeability: soils with permeable surfaces, soils with semi-permeable surfaces and soils with permeable surfaces. soils with impermeable surfaces.	IBS = [∑ (PERMEABILITY FACTOR * AREA) / TOTAL AREA].* 100		
Simultaneous proximity to green spaces	The proximity to green spaces analyses the percentage of the population with simultaneous access to 3 categories of green space according to functional and welfare standards and the distance covered on foot: (1) Green space equal to or greater than 1000 m2, at less than 300 metres. (2) Green space equal to or greater than 3.5 ha, less than 750 metres. (3) Green space equal to or larger than 10 ha. less than 4 km.	(Population with simultaneous coverage of the 3 specified categories of green spaces / Total population) * 100		
Street tree density	The density of street trees evaluates the number of trees according to their size in relation to the length of the street. This calculation does not is not taken into account the trees present in parks and gardens. only roadside trees are considered.Depending on the recommended planting pattern a suitable density is established for the trees along the line. Trees are living and changing elements over time. For this reason, account is taken of the measures that may be taken in the future. future. The port is related to the height and the capacity, and is a measure of the maximum development of the species. If we consider these two parameters, it is possible to establish three sizes: small, medium and large.	[(No. of large sized trees *12) + (No. of medium sized trees *8) + (No. small sized trees *6) / Length of street section] *100		
Green areas per inhabitant	The green area per inhabitant is defined as the area of parks and gardens and other public spaces with vegetation cover (more than 50% of the surface area) in the urban area in relation to the number of inhabitants	[Surface area of urban green spaces/Population]		
Urban diversity index	The index considers the number of species present in the study area (richness) and the relative number of individuals of each of these species (abundance). Individuals in the city translate into legal entities: economic activities, associations, entities and facilities. In urban systems the values oscillate between 0 and 7, being 7 the fabrics of greater urban complexity.	[H = -∑Pi Log2 Pi] H: Urban Diversity Index. n: Number of different types of activities (richness of species). Pi: Probability of occurrence (relative abundance of each species).		
Balance between activity and housing (uses)	The balance between uses linked to activity and housing determines the percentage of non-residential built-up area in relation to the total built-up area.	[Built surface area (m2 c) of commercial+tertiary+industrial use / Total built surface area (m2 c) x 100]		
Spatial and functional continuity of the street	The spatial and functional continuity of the street is measured on the basis of the degree of interaction of each section, depending on two variables: (1) Number of activities on the ground floor, and (2) Road space for pedestrians in relation to total road space (pedestrians and vehicles).	[Street sections (linear metres) with high or very high interaction / Total linear metres of street] * 100		
Knowledge-based activities	Percentage of knowledge-based activities in relation to the total number of legal entities present in the study area present in the study area.	[Number of knowledge-based activities / Total number of activities] *100		
Public lighting	Public lighting is necessary to guarantee the safety and comfort of citizens in public spaces during night-time periods. The consumption of lighting represents one of the greatest economic costs for the administration, which can be reduced in a very significant way by improving its efficiency. Energy efficiency in public lighting public lighting is determined by various factors: - Type of lighting: sodium vapour, mercury vapour, metal halide lamps, LEDs... - Type of luminaire: luminaires are the elements that focus the light on the desired spaces. to the spaces to be illuminated. - Levels of illumination: the levels of illumination must be adapted according to the type of road (pedestrian, road transport, green area...) and the activity being carried out. - Management of lighting: the lighting switch-on and switch-off timetable must coincide with the time of with the sunrise and sunset.	[Annual consumption of public lighting/ Area of public space]		
Energy consumption in buildings	The energy consumption of buildings is necessary to meet the demand for air conditioning (heating and cooling), domestic hot water (DHW) and electrical equipment (lighting, appliances, computers, etc.) in buildings. The use, building type, orientation, passive elements and the number of users of a building are factors that directly influence energy demand and consumption. In order to reduce energy consumption, it is necessary to promote the application of energy efficiency measures (renovation of building envelopes and roofs, acquisition of new consumption equipment, etc.), as well as promoting good practices through education and awareness-raising among the population.	[Energy consumption/Roof surface]		
Energy self-sufficiency	This indicator only aims to evaluate the capture of solar energy in buildings, a value that will be related to the climatic conditions of the area. in buildings, a value that will be related to the climatic conditions of the municipality, the energy demand of the buildings and the availability of their roofs. the energy demand of the buildings and the availability of their roofs.	[Local energy production/Energy consumption]		
CO2 emissions	This indicator calculates the emissions of greenhouse gases (GHG), derived from energy consumption (fossil fuels and electricity), per inhabitant. This indicator includes the energy consumption of buildings, public lighting and mobility and subtracts energy production from solar panels (photovoltaic and thermal).	[Annual emissions of CO2 equivalent/ Population]		
Proximity to garbage and recycling bins	Proximity to landfill is represented by the percentage of the population with access to garbage and recycling bins or stations in less than 600 meters (<10 minutes walk).	[Population with access to garbage and recycling bins / Total population] *100		
Simultaneous proximity to public facilities	Simultaneous proximity measures how close the population is at the same time to different types of facilities, each of which meets different daily needs. This indicator also provides information on the degree of urban compactness and the mix of uses in the city. This analysis only considers nearby facilities and excludes city facilities, considering a radius of influence of 600m or 300m (5 or 10 minutes walking respectively) depending on their service capacity. The city facilities do not require proximity on foot and cover other non-daily needs.	[Population with proximity/ Total population]		
Protected housing provision	Total number of protected housing in relation to the total housing. All action on a city's real estate stock, be it transformation, replacement, rehabilitation or, inactivity, has consequences on its social structure. Housing is the first factor of urban segregation. And access to housing is the most basic need that a city must cover to avoid urban segregation.	[n° protected dwellings / Total number of dwellings]		
Air quality	Concentrations of NO2, PM10 and PM2.5	[Population exposed to permanent levels of immision according to pollutant/ Total population] x 100	Barcelona Public Health Agency (2021)	Environmental quality
	Resident's perceptions of quality of air			
Acoustic comfort	Decibels during the day	[Population with noise levels lower than 65 dB during the daylight hours/ Total population] x 100		
	Residents' perceptions of acoustic comfort			
Frequency of visits and type of activities carried out	Percentage of frequency of visits and type of activities carried out in the transformed public spaces			
Walking comfort	Residents' perceptions of walking comfort, for women and men			
Private vehicle accessibility	Residents' perceptions of car accessibility, for women and men			
Number and speeds of cars	Residents' perceptions of number of cars and speeds, in the main and basic roads			
Road safety	Residents' perceptions of road safety			
Evolution of the number of people per hour	Evolution of the number of people per hour counted in the superilla during the week	number of people/hour		Characteristics and uses of space
Type of uses	Type of use of the superilla per hour during the week, for men and women	type of uses/hour		
Type of users	Social groups who are least and most present in the superilles			
Characteristics of the built environment on a micro-scale that influence walkability and physical activity	The audit was carried out using the MAPS instrument. The characteristics that are audited are categorised in 1. Route: destination and use of the site (housing, shops, restaurants, institutional and public services, parking and public transport stops), characteristics of the urban landscape (presence of stray cats, graffiti or debris), and structural characteristics (presence of traffic signs and signs for pedestrians); 2. Crossings: characteristics in the design of crossings (pedestrian crossings, quality of the edges, regulation of intersections, width of the streets and presence of obstacles); and 3. Segments: height of buildings, proportion between the height of buildings and the width of the street, separation space, cycling infrastructure, trees, the aesthetics and design of buildings, the presence of obstacles and hazards on the sidewalk, or the design of wide one-way and sloping streets.			
Wellbeing	Percentage of people who think that certain characteristics in the area in question (i.e., car numbers; the presence of urban furniture; the number of people in public spaces; pollution levels; the number of spaces to socialize, stay and take the sun; and safety) have increased or decreased. The information is accounted for considering gender.			Wellbeing and social interaction
Stress levels	Residents' perceptions about the effect of superilles in lowering stress levels			
Mental health	Residents' perceptions about the effect of superilles in supporting mental health			
Healthy habits	Residents' perceptions about the effect of superilles in fostering healthy habits			
Socialisation	Residents' perceptions about the effect of superilles in encouraging socialisation			
Spaces to rest	Residents' perceptions about the effect of superilles in creating spaces to rest			
Safety	Residents' perceptions about the safety in the superilles			
Distribution of uses			Ajuntament de Barcelona (2017) (2018) (2020)	Habitability of public space / Environment
Acoustic comfort		[Population with noise levels lower than 65 dB during the daylight hours/ Total population] x 100		
Thermal comfort		[Surface area of public roads with comfort potential in summer of more than 50% / total surface area of public roads] x 100		
Furniture		Public furniture /m2		
Sidewalks				
Paving				
Lighting				
Everyday infrastructures		Everyday infrastructure / m2		
People				
Bicicles				
Public transport	Data on the mobility of pedestrians, bicycles, and motor vehicles. They measure it with traffic counters, and want to implement cameras that can count without compromising the privacy of users.			Mobility
Transport of goods				
Private transport				
Parking		Parking spaces / m2		
Tree vegetation		Trees / m2		Urban Green and Biodiversity
Shrub vegetation		Shrubs / m2		
Planters		Planters / m2		
Fauna		Fauna / m2		
Water elements		Water elements / m2		
Permeable surfaces		Permeable surfaces / m2		
Green patches		Green patches / m2		
Evolution of housing rent prices	To understand the impact of gentrification processes, the evolution of rent prices is tracked both in relation to private housing as well as the rent of shops. Moreover, data is gathered to understand the usage of credit cards in the area. More use of credit cards indicates a greater commercial vitality.			Economic
Evolution of commercial rent prices				
Usage of credit cards in the area				

Project
Poblenou
Sant Antoni
Horta
Hostafrancs
Superilla BCN