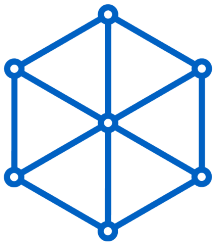

MCube
Munich Cluster for the Future of
Mobility in Metropolitan Regions

Urban mobility policy in pandemic times

The mobility policy priorities of eight European cities before and during Covid-19

Conception, data analysis and redaction: Franziska Meinherz & Betsy Middleton

Layout and graphic design: Giada Severini

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Introduction

Introduction

Covid-19 put everyday life to a standstill. Almost immediately, mobility researchers, think tanks and intergovernmental agencies concerned with questions of urban sustainability and mobility identified the disruption caused by the pandemic as a unique opportunity for urban planners to set the grounds for a shift onto low-carbon, active means of transportation, such as cycling and walking. Indeed, already in 2019, the European Environmental Agency had identified mobility as one of the sectors in which a profound transition was most needed: Mobility is a cornerstone of social and economic life, but in its current form, it is at the origin of high levels of air and noise pollution as well as of greenhouse gas emissions. Thus far, efforts to reduce the environmental impact of mobility had proven largely ineffective. Covid-19 offered a window of opportunity to break with locked-in mobility patterns and introduce new visions for urban mobility planning.

In this report, we show how eight Western European cities that had been struggling with different mobility issues and that had been pursuing different visions for the transition prior to the outbreak of the pandemic responded to the challenges and opportunities that it presented for urban mobility. We present the cases of Barcelona, Brussels, Copenhagen, Dublin, Madrid, Munich, Lisbon, and Paris. The report is based on the analysis of publicly available strategy documents, press releases and policy reports. As we show in the report, these documents revealed that not only had cities been struggling with different issues regarding the decarbonisation of their mobility systems prior to the pandemic. They had also drawn different conclusions from the experience of the Covid-19 pandemic and set different priorities for the recovery. Indeed, though having been a crisis of global extents, Covid-19 called for locally specific responses, depending on the configuration of a city's mobility system before the outbreak of Covid-19.

Case Studies

Barcelona

At a Glance

City and mobility statistics (2020)

Population: 1,636,762

Pollution (PM density): 16.63

Modal share (%):

- » Car: 18
- » Bike: 1
- » Walking: 36
- » Public Transport: 45

Congestion index: 26

Covid response

Barcelona responded to the challenges of the pandemic with

- » Pop-up bikes lanes, additional bike sharing and bike parking facilities
- » Removal of on-street parking and car lanes
- » Widened foothpaths and more pedestrianised areas
- » Additional urban planters, community spaces and terraces
- » Additional bus lanes, temporary car-free zones and 30km speed limit in some streets

Before the crisis

Guiding principles

Prior to the pandemic, Barcelona's mobility strategy was guided by the core principles of "safety", "sustainability", "equitability", and "efficiency", outlined in the Plan de Movilidad de Barcelona 2013-2018. These guiding principles were extended to include "smart" and "healthy" mobility for the planned update of the mobility strategy for 2019-2024, the implementation of which was cut short by the outbreak of Covid-19 in early 2020. Both plans focused on increasing safe and accessible infrastructure for pedestrians, encouraging the use of cycling and public transport, and reducing the use of private cars [1; 2]. In particular, the strategy outlined goals to facilitate a modal shift towards sustainable mobility in order to reduce atmospheric and noise pollution, reduce the transport-related accident rate, and energy consumption in the transport section, and to shift to renewable sources for essential vehicles [1].

There were also plans to implement 'Supermanzanas', or 'Superblocks', at regular intervals throughout the city [1]. Barcelona's urban planning is laid out in a grid-like structure with straight roads separating squared residential blocks. Supermanzanas correspond to pedestrianised zones encompassing three-by-three blocks of houses, within which there would be no private cars, public transport or bikes. They were intended to create "green connections" which would be safe pedestrian routes through the city. Thereby, they should discourage car use in favour of public transport and active mobility [1]. This

project was not welcomed by everyone; in 2017 a hundred residents of the Poblenou neighbourhood blocked a road to protest against the supermanzana that had been implemented in their area [3]. Residents complained that some car trips had tripled in length and the traffic around the perimeter of the supermanzana had also worsened since the measures had been implemented [4].

Main challenges

The main challenges of citizen mobility practices prior to the pandemic were the health-related issues with high levels of air pollution, high rates of traffic accidents and concerns about the contribution of transport-related emissions to the climate crisis. In 2019, the EU Commission asked the EU court to sue Spain for "regularly exceeding legal limits on nitrogen dioxide" in both Madrid and Barcelona, citing that it could cause almost 9,000 premature deaths annually [5]. As a result, pre-Covid mobility strategies focussed on reducing car use, with the aim of reducing traffic-related deaths by 30% by 2018 and bringing air quality standards in line with EU limits [1].

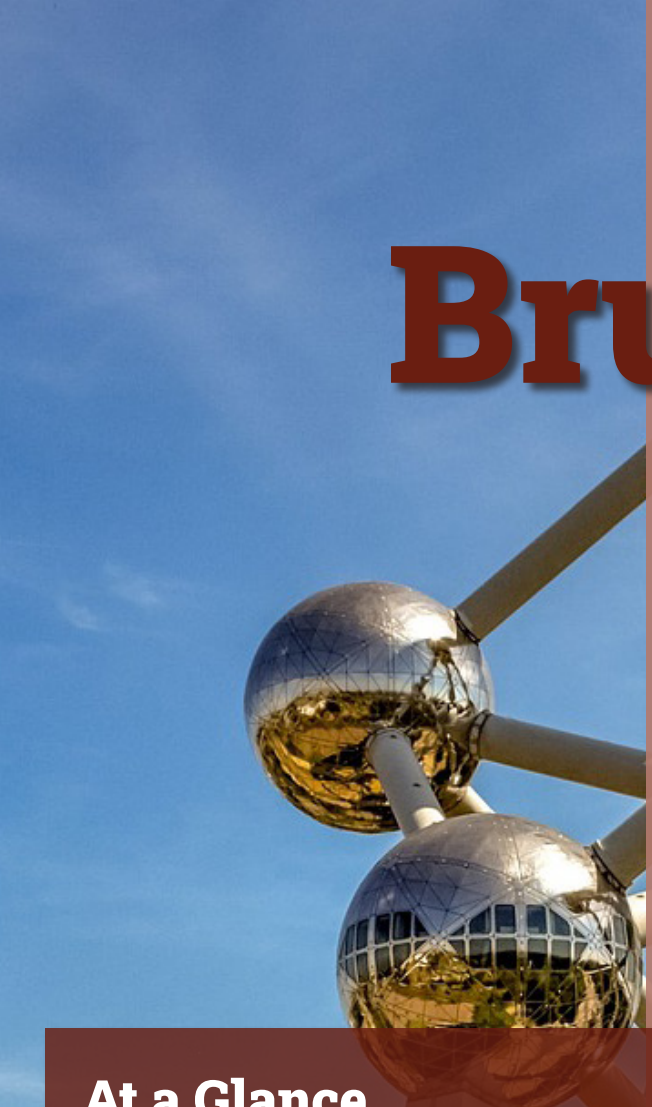
Measures implemented in response to Covid-19

Barcelona's urban planning response to the Covid-19 pandemic has been widely documented and hailed as one of the greatest success stories of the crisis. The main bulk of this praise is due to how the city seemed to lose no time in de-centering the car, reallocating urban space to cycling and walking, the development of green spaces, and areas for community use. Early in 2020, Barcelona City Council approved measures which aimed to make Barcelona "a healthier, more human place, where distances are shorter" and respond to the crisis by promoting sustainable and efficient mobility, on foot, by public transport and by bicycle which would be both "safer and non-polluting" [6, translated by the authors]. On-street parking and car lanes were retracted, replaced by widened pavements, new bike lanes, pedestrian and community green spaces and terraces [5]. In some streets, this reallocation was as drastic as removing two out of three car lanes on a single road and turning the space over to pedestrians and cyclists, leaving a single lane to be shared by private vehicles and buses. The city

also expanded the bike sharing system, implementing almost 100 new stops for the Bicing bikes [7]. The city's previous Supermanzana's project benefited from Covid-19 mobility measures, as the urgency of the crisis meant "a leap in scale and rhythm" for the plans of "creating a network of green axes and squares in which the pedestrian has priority" which contributed to Covid-19 mobility responses as well as the objectives of the city's previous mobility strategies [8, translated by the authors].

The new cycling infrastructure was particularly highly praised in global media, as the city built more than 20km of additional bike lanes in the first 12 months of the pandemic [7]. Much of the new cycling infrastructure consisted of temporary, painted bike lanes [5; 7]. This new infrastructure, coupled with the more rigorous restriction of cars, encouraged a shift in modal share towards bicycles. Whereas public transport and car use remained below pre-pandemic levels in 2021, cycling had increased by 20% [9]. However, "it is too early to say to what extent this will be permanent." [10, translated by authors]. Much of the new cycling and pedestrian infrastructure implemented during Covid-19 was temporary, made "not with road works, but simply with paint to signal new areas". There is hope that these measures will be made permanent, and the government has expressed that there will be "no going back", or at least not without good reason [7].

Brussels



At a Glance

City and mobility statistics (2020)

Population: 1,223,520

Pollution (PM density): 10.08

Modal share (%):

- » Car: 32
- » Bike: 3.5
- » Walking: 37
- » Public Transport: 26

Congestion index: 34

Covid response

Brussels responded to the challenges of the pandemic with

- » The digitalisation of some of its services (submission of demands for urbanistic interventions)
- » Pop-up bike lanes
- » A subsidy for leasing bicycles

Before the crisis

Guiding principles

Brussel's mobility policy has been guided by different strategies: The "Bicycle plan 2010 - 2015" aimed to contribute to Brussels' sustainability transition, and stipulated that all roadworks need to give priority to pedestrians and cyclists and respect quality criteria regarding cycling [11]. In 2012, the city adopted a "Strategy for pedestrian mobility" which was centred around the vision for a city of "short distances" and set the objective of making Brussels a model for pedestrian-friendly city planning by 2040. In 2019, the city adopted the "Good move" Regional mobility plan 2020 - 2030 [12]. This plan substituted the previous mobility strategies "Iris I" from 1998 and "Iris II" from 2010, which had failed to produce the expected changes. The plan aimed to promote a city that is "more human, greener and friendlier, and with more and better quality public spaces for the residents" [12. p. 2]. To this end, the city aims to create 50 low-traffic neighbourhoods and to become a city of short distances which favours walking and cycling. The plan also aimed to improve road safety and develop a user-centred mobility offer.

Main challenges

One of the reasons why previous plans failed to produce the expected changes in infrastructure development was the lack of financial capacity to develop infrastructure, and a lack of coherence of the proposed interventions. However, infrastructure development is essential for Brussels: The city is expected to grow further until 2030 and is already characterised by a large geographic

separation between workplaces and homes. Two thirds of Brussel's population are exposed to high levels of noise pollution. The impermeability of soils has also progressed sharply, with half of Brussel's soils being covered, increasing the city's vulnerability to floods. With an ageing population, Brussels furthermore needs to adapt its mobility system to make it accessible for all. Mobility in Brussels is also expensive: the part of households' revenues spent on transport has increased over the past 20 years. Mobility is now the second largest household expenditure after housing. The lack of safe cycling and pedestrian infrastructure produces heavily gendered mobility patterns. The cycling network is patchy and in particular intersections are badly designed. Despite having been massively extended since the adoption of the plan "Iris II", the public transport network operates at the limit of its capacity and needs to be extended further to meet the continually increasing demand due to population growth and the city's ambition to reduce car use [12].

Measures implemented in response to Covid-19

In Summer 2020, Brussels adopted a "Relaunch plan" which aimed to "better prepare the city for protecting its population and ensure that everybody can find their place in Brussels" [13, p. 3]. The Relaunch plan affirmed the city's ambition to address the climate emergency and to focus on health and quality of life, and to "make solidarity notably with the elderly and precarious population the core condition of the relaunch". Indeed, solidarity was defined as essential for any transition efforts [13, translated by the authors]. Brussels declared its commitment to seize the momentum created by the pandemic to generate a renewed focus on some of the city's core functions in terms of services provided to the population, as well as in terms of a transition towards a more sustainable, socially just and resilient city and urban economy, and to take into account the lessons learnt from the pandemic for Brussel's future development. The post-Covid vision

for Brussels also brought forward the idea to reduce car traffic in neighbourhoods through the creation of superblocks [13].

Measures contained in the relaunch plan include the digitalisation of some of the services offered by the city (submitting requests for urbanistic interventions) and the intention to deploy tactical urbanism measures to prepare the implementation of the “Good Move” regional mobility plan for the period 2020 - 2030, which the city published in 2019 and which it deemed to be coherent with its vision for the relaunch after the pandemic. Based on these considerations, Brussels created pop-up cycling lanes, new bicycle parkings, and introduced a subsidy for leasing bicycles [13].

On January 1st 2021, Brussels introduced a 30km/h general speed limit, with the intention to improve road safety [14].

Copenhagen

At a Glance

City and mobility statistics (2020)

Population: 805,420
Pollution (PM density): 10.24
Modal share (%):
- » Car: 34
- » Bike: 29
- » Walking: 19
- » Public Transport: 18

Congestion index: 20

Covid response

Copenhagen did not introduce any specific mobility measures in response to the pandemic.

Before the crisis

Guiding principles

Prior to the Covid-19 pandemic, mobility policy in Copenhagen was focussed on achieving "green growth" [15]. Transport in Copenhagen was to be "both efficient and green"; it was seen as the key to achieving economic development and higher quality of life, as well as an opportunity to improve the energy use and access to healthy lifestyles within the city [15, translated by the authors]. This guiding principle was manifested in city wide targets that remained a priority in the municipality's 2020 mobility report, including being the first carbon neutral European capital by 2025 and reducing the modal share of cars to 25% [15; 16]. The city placed an emphasis on the opportunities presented by active modes of transport, as well as encouraging green mobility solutions and situating the city as a place where such solutions could be "tested in practice" and where innovation was encouraged [15, translated by the authors].

Main challenges

Despite the city's notoriously good active mobility infrastructure, and the low modal share of cars compared to other European capitals, the municipality identified congestion, traffic-related accidents and air pollution as some of the main mobility challenges. In fact, cars were the source of nearly all mobility challenges articulated in the municipality's 2012 mobility report which included noise and air pollution above the recommended limit on busy routes, congestion causing delays and road-safety issues, and high CO2 emissions [15]. In order to address this,

the city aimed (among other measures) to vastly improve cycling facilities and infrastructure, introduce electric car sharing schemes, expand pedestrian zones, and find alternative fuels for their public transport fleet [15].

In spite of these measures, which were explicitly aimed at reducing car use, Copenhagen reported an increase in both car ownership and modal share of trips in 2017. In addition, the modal share of bicycles in use for trips to work and education fell from 45% to 41% between 2014 and 2016 [17] and public transport use, of which the modal share oscillated around 20% before the pandemic, also remained below the target share of 25% [16].

Measures implemented in response to Covid-19

In its 2021 Mobility Report, the municipality of Copenhagen acknowledged that the impact of the pandemic had changed mobility patterns in the city. There was a sharp drop in public transport use, which went from 21% in 2019 to only 13% in 2020, and an increase in the modal share of pedestrians. Less significant was a slight increase in the modal share of the car and a slight decrease in the modal share of cycling [16]. Despite these changing patterns of mobility, Copenhagen did not implement any specific measures to facilitate or improve mobility infrastructure in light of the Covid-19 pandemic.

The 2021 Mobility report marks, however, a turn in Copenhagen's reporting strategy: Whereas until 2020, Copenhagen published an annual bicycle statement, with the 2021 Mobility report, the city changed to a reporting strategy that accounts for all means of transportation.

Dublin

At a Glance

City and mobility statistics (2020)

Population: 554,554
Pollution (PM density): 8.08
Modal share (%):
- » Car: 58.7
- » Bike: 8.4
- » Walking: 17.1
- » Public Transport: 13.1

Congestion index: 36

Covid response

Dublin responded to the challenges of the pandemic with
- » Pop-up bike lanes
- » 30 Km speed limit
- » Additional bus routes and contra-flow bus lanes
- » Temporary pedestrian zones
- » New bike parking stalls

Before the crisis

Guiding principles

Prior to the outbreak of Covid-19, the city council of Dublin had articulated a number of guiding principles for the city's mobility policy. These principles were all part of a wider strategy to "contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods." [18]. The overarching target for the mobility strategy from 2016-2035 was to reduce the modal share of cars to a maximum of 45%. In order to achieve this, the strategy particularly emphasised a commitment to "enhancing the public transport system" and to achieving a more "compact urban form" [18].
The pre-Covid mobility plans aimed to address two main regional challenges: providing for the needs of a growing population of workers and residents in the city centre, and integrating suburban villages by improving transport connections through surrounding green belts and agricultural areas [19]. More concretely, the articulated mobility strategies particularly emphasised a commitment to improving the bus network of the Greater Dublin Area which was considered to be the "backbone of public transport in Dublin" [19].

A specific plan to improve the cycling network was also published, with the vision that "Dublin and the other large towns in the region [would become] a walking and cycling city-region with a street environment that is attractive, safe and designed with the pedestrian and cyclist in mind at all times" [20]. The target of the strategy was to achie-

ve at least a 10% modal split in cycling to contribute to the larger target of reducing private car use.

Main challenges

One of the main challenges faced by Dublin before 2020 was the economic fallout of the 2008 financial crash. Unlike some of the other major European capitals, Dublin suffered a long and severe economic recession which was still affecting mobility patterns and policy decisions up to the time when the pandemic hit. The recession and accompanying high levels of unemployment changed mobility patterns in the greater Dublin area as far fewer people made the journey into the city centre, causing a decline in both public transport use and private car journeys [19]. This temporarily reduced congestion in the city; however, as the economy began to recover, people with access to a private car who would previously have chosen to use the bus or rail, due to their ability to avoid delays caused by congestion, shifted back to the car [18]. By 2011, the modal share of the car had increased to 60.8% compared to 59.5% in 2006. As a result, congestion rebounded to a worse state than it had been before the crash. In 2018, congestion remained “one of the most significant challenges facing the State” [19].

The recession also affected the quality of public transport that was offered in the Greater Dublin Area. In addition to reduced passenger numbers, resulting in lower revenue from fares, public financing of the bus service after 2007 was very limited. This caused a decline in the quality of the bus fleet. Older buses were not updated; resulting in worse comfort levels for passengers and higher operation and maintenance costs, thereby putting further pressure on public finances [19]. With an expected rise in population and plans to increase social, cultural and economic activity in the Greater Dublin Area, the expansion of public transport capacity in the centre, but also between the centre and the surrounding villages and suburbs became a high priority.

Measures implemented in response to Covid-19

In response to the outbreak of Covid-19, Dublin released

a report in May 2020 entitled Enabling the City to Return to Work, outlining the key mobility challenges resulting from Covid-19 and the proposed strategy to facilitate the new patterns of travel that resulted from the crisis [21]. Chief among these challenges was the need to maintain social distances, which particularly affected the capacity of public transport. In order to address this, the council intended to improve cycling and pedestrian facilities with the aim of encouraging people who regularly used public transport to resort to active mobility instead, hence preventing a crisis in congestion that would result from everyone using private cars instead. The report emphasised that measures put in place to encourage walking and cycling would not be at the expense of the public transport system, which was essential for those that do not have the option of using a car or were unable to benefit from the improvement in active mobility infrastructure [21].

In order to achieve these goals, the city of Dublin proceeded to implement a number of temporary infrastructural changes to facilitate active mobility. In 2020 alone, 10km of temporary bike lanes were laid. Many of these began as pop-up infrastructure, demarcated by paint or small bollards, but were later replaced with planters or kerbs to reduce conflict with other road users and improve safety of cyclists [22]. New pedestrian zones were implemented by extending the width of footpaths onto built-outs on the road, and identifying new pedestrian zones in the city centre which could also be used to extend outdoor space for businesses [21; 22]. These temporary measures were mostly implemented at the expense of car infrastructure, including the removal of on-street parking, and the removal or shrinking of car lanes on larger roads. Furthermore, a 30km/h speed limit was applied across the city to protect the higher volume of active mobility users [23]. To ensure the public transport routes were still efficient and safe, some bus routes were changed to avoid newly pedestrianised streets, and contra-flow and additional bus lanes were added [21].

Lisbon

At a Glance

City and mobility statistics (2020)

Population: 2,957,000
Pollution (PM density): 8.7
Modal share (%):
- » Car: 45
- » Bike: 0.6
- » Walking: 30
- » Public Transport: 22

Congestion index: 22

Covid response

Lisbon responded to the challenges of the pandemic with
- » Pop-up (and permanent) bike lanes
- » Temporarily widened pavements
- » Speed reductions and co-existaence zones
- » Subsidies for purchase of bikes, e-bikes and cargo-bikes
- » Increased bike parking infrastructure
- » Larger terraces and additional shaded outdoor spaces

Before the crisis

Guiding principles

Prior to the outbreak of Covid-19, Lisbon's guiding principle regarding its mobility strategy was "choose to evolve", a statement which aimed to capture the conscious effort of Lisbon's government and community to adapt their city to current and future challenges by putting ecological and community resilience at the heart of their municipal strategy [24]. The long-term vision of the city was to implement changes that would "future-proof" the city and its inhabitants in light of worsening ecological and economic crises [25]. Lisbon began reinventing the city's mobility options during the 2008 financial crisis by investing in environmental urban solutions and green infrastructure [24]. In 2012, Lisbon unveiled a "masterplan" which presented a new approach to planning and land use centred on ecological rehabilitation and de-centering the car in public mobility [24].

By 2014 Lisbon had already surpassed their initial 2030 goal of reducing CO2 emissions by 40% (2002 baseline) and by 2017 had reduced energy consumption by 28% (2012 baseline). These achievements were heavily related to mobility changes implemented by the city, which had reduced mobility related emissions by de-centering the private car in transport planning and promoting public transport and active mobility instead [25]. In 2017, the city regained national ownership of the public transport system, and invested in restoring the historic tramline as well as implementing two new public tramlines lines. A "tariff shock" was introduced in 2019 which reduced the

price of all public transport tickets to encourage universal use of the new services [26]. In 2017, the government invested in a new bike sharing scheme, with a two-thirds of the fleet consisting of electric bikes to encourage cycling in hillier parts of the city. Between 2016 and 2017, Lisbon saw an increase of circa 700% in bicycle use. In 2018, Lisbon was the first southern European country to be awarded European Green Capital (awarded for the year 2020) for its success in implementing a city planning strategy which prioritised innovative solutions to challenges and contributed to the goal of becoming the world's first climate neutral continent by 2050 [24].

Main challenges

Lisbon is a southern European, coastal city with a history of flooding and earthquakes. It is thus in a precarious position regarding the consequences of the climate crisis, with risks of flooding, heatwaves, and more extreme weather as global temperatures rise. Furthermore, Lisbon had a very high modal share of cars prior to the implementation of their new green strategy. Individual car use in the city increased from 38% to 48% between 2001 and 2011, with low public transport use and little cycling or pedestrian infrastructure. The city's hilly topography also adds an additional challenge to encourage cycling and walking over car use. At the beginning of 2020, the building and transportation sectors were responsible for 90% of the city's energy use and despite significant improvements in the city, air pollution remained a problem [24].

Measures implemented in response to Covid-19

At the beginning of the Covid-19 pandemic, the biggest concern with regards to mobility was that new social distancing rules and fears of infection would cause a backslide on the progress of the previous decade [27]. In a presentation on emergency mobility measures, the mayor stated that the city could not afford to confine the public during Covid-19 only to expose them to the health risks of air pollution and "unbreathable" city air on their release [27]. Thus, Lisbon focused on providing mobility infrastructure that continued to promote public transport

and active mobility over private car use.

At the beginning of the pandemic, public transport use in Lisbon fell by 85-90%. The government immediately committed to maintaining the usual service so that essential workers would have the same options for their journey to and from work regardless of whether they had a car [28]. The municipality also committed to more than doubling the number of fully segregated cycling lanes on offer (some as permanent fixtures and some only temporary) and increasing bike parking capacity around areas such as stations and schools [27; 29]. The city also encouraged pedestrians by widening footpaths, and by creating larger terraces and shaded pedestrian areas [26; 27]. The implementation of low emissions zones and restricted parking in the city was advanced to prevent a return to the high congestion levels the city had begun to amend before the pandemic [30].

Madrid

At a Glance

City and mobility statistics (2020)

Population: 3,223,334

Pollution (PM density): 8.93

Modal share (%):

- » Car: 32
- » Bike: 0.5
- » Walking: 32
- » Public Transport: 33

Congestion index: 18

Covid response

Madrid responded to the challenges of the pandemic with

- » Pop-up bike lanes
- » Temporary pedestrianised zones and car free days
- » Subsidies for public transport
- » Additional bus lanes

Before the crisis

Guiding principles

Prior to the outbreak of Covid-19, the city of Madrid was operating under a mobility strategy published in 2013 which was intended to be in place until 2025. The 2013-2025 strategy had the goal to reduce air pollution and congestion, and to facilitate economic growth in the city and surrounding regions [31]. The objectives of the strategy encompassed economic development, improved quality of life, sustainability and equal opportunity. According to the strategy, mobility is "never an end in itself" but an important factor in improving social, environmental and economic conditions for residents [31, p. 83, translated by the authors].

Main challenges

Madrid has been designed around the car. In a 2019 newspaper article, Cristina Suárez reported that the car-centric design of Madrid heavily contributes to the widening gap between the rich and the poor as urban design and transport frequencies "discriminate against those who cannot afford to buy a car" and prevent people living in low-income areas from applying for jobs that they are qualified for [32]. The city was built with the car in mind, and is now catered to those who can afford a private vehicle rather than to regular workers and families. An indication of this can be found in Madrid's poor cycling infrastructure. There are around 15 times fewer cycle lanes in Madrid than in other large Spanish cities such as Seville, Valencia and Barcelona [33].

The emphasis on private vehicles causes high levels of air pollution. In 2017, Madrid launched an Air Quality and Climate Change Plan (Plan A) which aimed to reduce air pollution to meet European and national legislation as well as WHO recommendations by 2020, and "to reduce greenhouse emissions caused by urban mobility by 50% by 2030" through the implementation of measures mostly concerning inner-city transport patterns [34]. These included measures to discourage car use, such as low emissions zones, more car parking regulations, lower speed limits, and a prioritisation and extension of pedestrian and cycling infrastructure. Other measures targeted the vehicle pool of other transport sectors, such as upgrading the buses to a 100% low emissions fleet, providing incentives to taxi companies to transition their fleet to low-emissions vehicles, and promoting shared vehicle initiatives [34].

In 2018, the European Commission threatened to refer Spain to the European Court of Justice if it did not take immediate action to improve air quality after a number of years in which cities, including Madrid, had violated EU health standards for air pollution. This resulted in the almost immediate implementation of low-emissions zones in Madrid which reduced nitrogen oxide levels by 32% within a few months. However, a few months later the municipal government changed hands and the new mayor announced a moratorium on the low emission zone. This was met by mass street protests from residents who won a victory against the moratorium in a local court [35].

Measures implemented in response to Covid-19

In 2020, at the end of May, the municipality of Madrid released a Plan for Reactivation after the Covid-19 Crisis which intended to achieve the triple objective of " activating the economy and employment, helping the most vulnerable people and normalising and reinforcing the provision of public services in the region affected by the health crisis" [36]. The measures, which were more long-term in scope than the initial emergency responses, included commitments to develop the public

transport system by improving the connection to outlying districts, making some of the provisional Covid-19 bus lanes permanent, and guaranteeing financial and economic solvency of the Municipal Transport Company. There were also measures put forward to permanently pedestrianise parts of the historic centre, and work on a pilot model for superblocks [36].

One challenge that Madrid faced at the beginning of the crisis was that the streets were not wide enough for pedestrians to maintain social distances. To ensure that social distancing rules were kept, the municipality temporarily pedestrianised some streets during the weekend [37; 38]. Extensions were also made to the terraces of some businesses [39]. The city implemented subsidies for public transport tickets, and adapted rush hour fares in pace with new mobility habits at the beginning of lockdown [40;41]. Furthermore, 45km of new bus lanes were added, representing a 30% increase of the existing network [42; 43]. In 2020 Madrid also opened their first car park exclusively for use by car-sharing companies, hoping to encourage car-sharing over the use of private vehicles [44].

In 2021, the city of Madrid showed its continued commitment to improving mobility by announcing an almost 2000 million euro investment in the public transport network. This was around a 20% increase in budget compared to 2019, and was mainly allocated to an expansion of the metro line to reduce congestion on particularly busy routes. The municipal government also approved a 40% increase in budget for the maintenance and improvement of the roads, some of which was specifically allotted to the development of 137km of new bike lanes [40].

In September 2022, the Spanish government announced a complete subsidy on season tickets for all suburban and regional rail transport until the end of the year to alleviate reliance on private cars and reduce fuel costs for citizens. Residents of Barcelona and Madrid, who account for 80% of the country's suburban railway passengers, are receiving the greatest benefit from this measure [45].

Munich

At a Glance

City and mobility statistics (2020)

Population: 1.562.128

Pollution (PM density): 9.5

Modal share (%):

- » Car: 34
- » Bike: 18
- » Walking: 24
- » Public Transport: 24

Congestion index: 26

Covid response

Munich responded to the challenges of the pandemic with

- » Pop-up bike lanes
- » Parkmeilen (green corridors that connect the city's parks and recreational areas)

Before the crisis

Guiding principles

In 2018, Munich adopted the "Vision Zero": the objective of zero traffic fatalities [46]. In 2019, the city council took the decision to free the old town from motorised traffic, and to create a bike ring lane surrounding it. Already for the year 2019, the council announced the first closures of on-street parking in the old town to create space for pedestrians. In January 2020, the city presented its "Concept for Munich's mobility of the future", with the objectives of reducing motorised traffic and fostering alternative forms of mobility. The concept notably contained the intention to develop 12 cycling freeways connecting the centre with the outskirts, the extension of the subway and tram network, and the creation of high occupancy lanes. However, plans exist for only one of the 12 cycling freeways, and for one subway line [47]. Road work for the bike ring has started but as of 2022, only a few hundred metres have been completed.

Main challenges

Munich has been struggling with the oversaturation of its mobility system: road congestion, overcrowded public transport at peak times, and sidewalks and cycling lanes that are increasingly too narrow to absorb the number of people using them. The increasing use of e-bikes and corresponding higher speed of some cyclists further accentuates this last issue. The "Vision Zero" is also not achieved yet. Unless action is taken, Munich's mobility issues might get worse, because Munich, an already dense metropolitan area, is growing rapidly. Whereas the

electrification of mobility may contribute to reducing noise and air pollution as well as greenhouse gas emissions, it does not solve the city's issue of limited road and parking capacity [46].

Measures implemented in response to Covid-19

In reaction to the Covid-19 pandemic, Munich developed pop-up bike lanes and created some extensions of restaurant terraces on parking lots. Though the pop-up bike lanes were retracted after the summer months, the city reinstated them in 2021, taking into account feedback from different sides. The city affirmed that these newly painted pop-up bike lanes were to remain in place until the construction of permanent bike lanes in the same locations [48]. After the immediate urgency of the pandemic had passed, the city set up a participatory process to prepare the "Parkmeilen", a concept to connect Munich's many urban parks to the recreational areas in its outskirts through green spaces and that are attractive for pedestrians and cyclists [49]. With the "Parkmeilen" [50], Munich aims to create "sufficient space for the population to spend time and move around", and thus to respond to a need that the pandemic had accentuated [51].

In 2022, Munich presented its "Mobility strategy for 2035", which outlines the main objectives of the city until 2035. This strategy aims to ensure that Munich reaches its climate targets, that the city offers a high quality of life with many green spaces and little noise and air pollution, that Munich becomes a "city of short trips" [46, p. 25, translated by the authors] and that the city's mobility system guarantees fast and flexible travelling for everyone. The strategy also mentions objectives such as mobility justice and universal accessibility [46].

Paris

At a Glance

City and mobility statistics (2020)

Population: 2,187,526
Pollution (PM density): 10.52
Modal share (%):

- » Car: 13
- » Bike: 3
- » Walking: 52
- » Public Transport: 32

Congestion index: 36

Covid response

Paris responded to the challenges of the pandemic with

- » Temporary pedestrianisation of roads
- » Pop-up extensions of sidewalks
- » Pop-up bike lanes

Before the crisis

Guiding principles

Paris had been operating under a “Cycling Plan 2015-2020”, which focussed primarily on the development of infrastructure (bike lanes, bicycle parking), and which also proposed subsidies for electric bicycles and the construction of private bicycle shelters. To further increase cyclability, a speed limit of 30km/h was introduced on some roads, and some bus lanes were opened up for cyclists [52].

In early 2020, Anne Hidalgo, the exiting mayor of Paris, made the vision of Paris as a “15-minute city” a cornerstone of her electoral programme. The “15-minute city” describes an urbanistic vision in which all essential functions of a city (housing, working, healthcare, shopping, learning, leisure) are within walking distance. The concept had been developed in response to the increasing spatial extension of major cities [53].

Main challenges

Paris had been struggling with high levels of air pollution [52]. Paris is also among the most congested cities globally. Between 2019 and 2020, cycling experienced a record boom, notably in response to extended strikes by the public transport operators, which paralysed the city’s public transport network during the winter months of 2019 and 2020. Paris is furthermore characterised by large socio-economic disparities between neighbourhoods, and by increasing distances between places of work, housing, and leisure [53].

Measures implemented in response to Covid-19

Paris considered the concept of the “15-minute city” to be well-suited not just to address the problems of spatial expansion, but also to respond to the challenges presented by the Covid-19 pandemic, and to prepare the city for future health crises and the consequences of the climate catastrophe. The “15-minute city” was notably thought to be an appropriate response to sanitary crises because it aims to reduce the number of trips that people take. During the pandemic, to start working on becoming a “15-minute city”, Paris implemented pop-up bike lanes [53; 54], temporarily closed roads for car traffic, and extended sidewalks [55; 56]. These measures were also intended to facilitate the relaunch after the lockdown all while ensuring that social distances could be maintained. The pop-up infrastructure for cycling and walking was intended to provide people with an alternative to public transport and to avoid that they would shift to the car, thus exacerbating Paris’ already bad congestion and air pollution levels. After having reviewed all the pop-up infrastructure with regard to possible conflicts between different user groups and safety risks, they were declared permanent and integrated into the road infrastructure in the course of 2020 [56].

Since the Covid-19 pandemic, next to the concept of the “15-minute city”, two other visions for Paris’ urbanistic and mobility policy planning were adopted: The “Manifesto for the beauty of Paris”, and the “Bicycle Plan 2021 - 2026”. The Manifesto for the beauty of Paris aims to couple the ecological transition with the revalorisation of Paris’ heritage. It stresses the importance of creating extensive green spaces and of rethinking and revalorisation urban furniture [57]. The “Bicycle Plan 2021-2026” focusses on the extension of the bike lane network and available bicycle parking, and on improving the quality of the existing infrastructure [58]. The pop-up infrastructure that had been developed during the first lockdown and which was then perpetuated was deemed coherent with all of these political visions [57].

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