Rethink Modern Mobility

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ADC Graduation Studio
Research Paper
30 June 2023 [P5]

(This document is best read in two-page view with front page.)

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Presentations

P1:	10 November 2022
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Abstract – This research paper is the research that will be complementary to the mobility hub design made for Architectural Design Crossovers Graduation studio. The aim of this research is to find out which urban design interventions are needed to move the city of London out of the car and get them to walk, cycle and use public transport. First several concepts are discussed that form the theoretical framework. Then the research starts with positioning within literature about design handles for implementing cycle infrastructure. After, the future of mobility is discussed and several precedents where the car was removed in favour of pedestrians and cyclist are analysed. The findings are then bundled and implemented at the design site in Ilford, London. The result is an urban proposal for the area, with a focus on slow traffic and the transfer to public transport, which the design of the graduation studio will build further on.

Front photo by author

Photo by author

Preface

In the news you constantly read alarming items about climate change. Our cities contribute a lot to this. To meet the climate goals, they must change. London is no exception to this. The city is filled with big multilane car roads, which cross through every single neighbourhood of the city. As a result, the car is a convenient, and flexible mode of transport. This is not true for people that do not drive a car.

The effects of this car-centric urban design have not only led to accelerated climate change, but it has also drastically shifted the atmosphere, safety and functioning of the cities. Where now the car takes up most of the space in the street, with little space to walk, this used to be much different, the street was full of people. The contemporary streets are dominated by pollution and noise, this will have to change.

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Introduction

Before the rise of the motorised vehicles, the streets of cities used to be a space to reside, to meet, to see and to move. The whole street was accessible by all. The car changed all of this, because it introduced an inhumanly fast and heavy vehicle to the street. All the sudden there was a predominance of one mode of transport, if you were not in the car you had to watch out. Because the car was seen as the next step forward, the street had to be refit for the car. The once accessible street became a place of rules, with the priority to faster traffic. Although it was believed at the time, it did not at all lead to a safer, more pleasant, or even faster street (Verkade, 2020). This is no different in the city of London, the use-case city of the graduation studio.

Cars result in high levels of pollution, both in emissions and noise, as well as deaths. The car is one of the most cost inefficient ways of travel for the city (Ortúzar, 2019). Removing the car out of the city as the primary mode of transport, will dissipate the disproportion of power in the street. By removing the car, the streets can once again be this place of more than just movement. But, up until very recently, the city of London has done remarkable little to remove the car out of the streets (Transport for London, 2022).

London is known to be quite dangerous for cyclists (Business Insider, 2017), the other users of the street are not well prepared for cyclists. The potential becomes even bigger if you combine the short-distance efficiency of the bike, with the longer distance factor of public transport. This is a concept already widely implemented in the Netherlands (Rongen et al., 2022). Unlike the cycling infrastructure in London, the public transport is already highly developed.

To change the city will take decades, but it is important to improve the lives of the inhabitants and the carbon footprint of the city. Architecture, urbanism, and infrastructure will have to be used together. Finding out what urban design, infrastructure and architecture is needed to accommodate the new slow-traffic city will be the goal of this paper.

The research done in this paper is complementary with the design done in the Architectural Design Crossovers Graduation Studio, which is be situated in London. The design will be a mobility hub next to an infrastructure node.

The following research question will be answered: *how can cycling and public transport best be used to connect London's outer neighbourhoods to the rest of the city?* To further zoom in on the topic, there are three sub questions: what *is the current situation in London on the shift to sustainable transport, and how does that relate to the literature? Which urban and architectural design can be used to implement cycling with a complementary public transport network?* And: *how can these design handles be implemented on the design site?*

Theoretical Framework

To answer the research question, several concepts need to be discussed first. These concepts are at the core of urban transportation design. The concepts itself might be even an elaboration of earlier ideas or other notions.

The 15-minutes city

Since the pandemic, a new view on urban planning arose: the 15-minutes city concept, which "advocates for an urban set-up where locals are able to access all of their basic essentials at distances that would not take them more than 15 min by foot or by bicycle." (Moreno et al., 2021) In the concept four different dimensions are stated, that will help to create the 15-minutes city. These four dimensions in the framework are density, proximity, diversity, and digitalisation.

In essence the concept is an elaboration *The Death and Life of Great American Cities* of Jane Jacobs (1961), who was one of the first to criticise the modernist car-centric urban design. The modernist design, which Moreno says, made the COVID-19 pandemic more difficult than needed. In practice, cities are nowadays, especially in the US, focused on urban sprawl, which is car dependent. It is noteworthy that 60 years after the publication of Jacobs book, cities are still designed that way (Moreno et al., 2021), although its contents are seen as common sense.

One of the dimensions described in the 15-minutes city concept is *proximity*. The concept of functions being close by, those functions include "living, working, commerce, healthcare, education, and entertainment". Proximity is described in time, not distance. So, what is within 15 minutes for a pedestrian is radically different to what's within that radius for a cyclist.

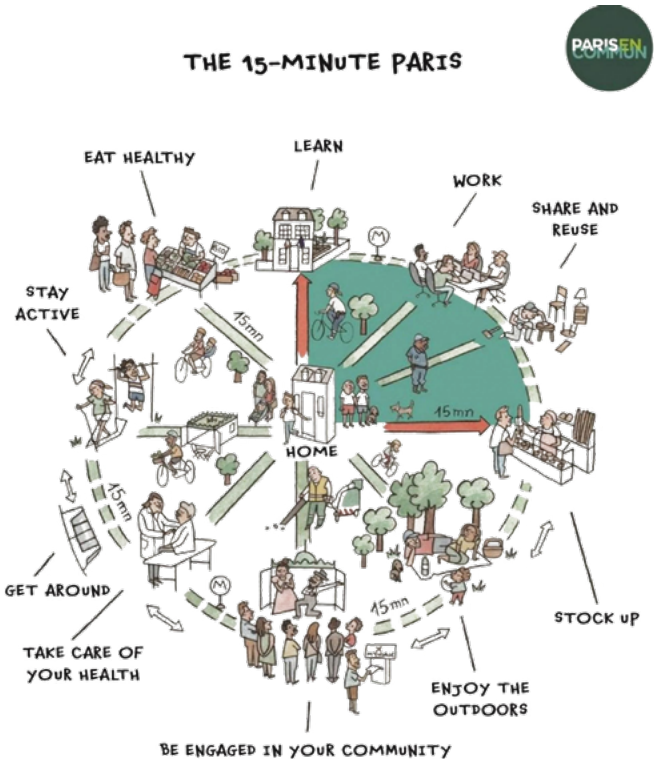


Figure 1: The 15-minutes city concept by (Moreno et al., 2021).

Transit-oriented development

The term transit-oriented development (*TOD*) is used to describe urban developments around public transport lines (BNA, 2014). A feature of it is a linear urban fabric, where the developments are done around an infrastructure line. In London, this resulted in a chain of satellite towns radiating out of the city centre, connected via a train line.

In the 19th century, outer London grew with this linear urban typology. In some parts extensions ran next to streets, in others along rail lines. The latter can even better be described as a series of islands, that exist around the stations, running along the (linear) rail line. These stations were at first built at settlements that already existed, those settlements then boomed after the new connection came, making them far bigger than the surrounding towns. Later, these towns grew so much they have merged into one big urban area (OldMapsOnline, n.d.). The old linear city has evolved: a chain of more developed islands is very well interconnected, with a high level of densification and gentrification (Ibraeva et al., 2020). The areas further away of the stations are left out of 'upgrade' and behave differently.

The challenge of the future will be to also include these peripheric areas, without resorting back to the car. One obvious solution is the implementation of cycle infrastructure to overcome the last mile, so that there can be a fast connection to the stations without having to build expensive extra public transport lines. This phenomenon of bigger service areas is visualised in figure 1. Good TOD involves a good involvement of what is already there. The existing functions contributing to TOD might not what one might expect first. The developments should be an addition which respect the existing (BNA, 2014).

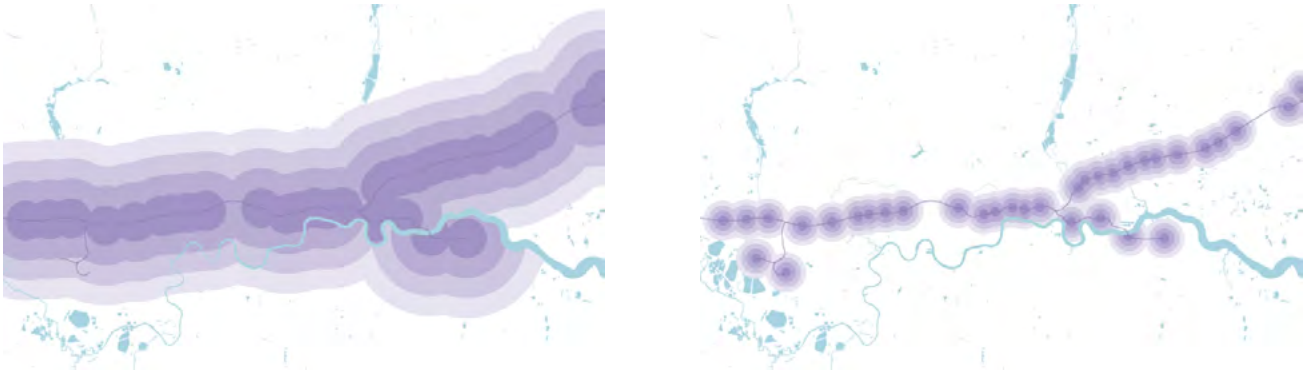


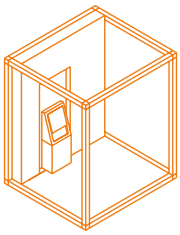
Figure 2: each tint represents 5 minutes of (extra) travel time. Left is walking time and right is cycle time, each starting from the stations of the Elizabeth Line. The speed that is used is respectively 5 km/h and 20 km/h (illustration by author).

Transport networks and nodes

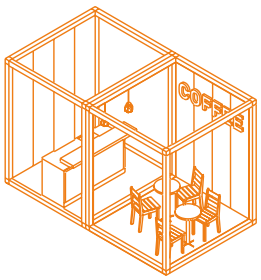
The transport node is the place where different infrastructural lines and modes of transport meet. Infrastructure networks heavily rely on nodes. This is true for all sorts of infrastructure. The public transport node is more than just a place transfer, it is also a place to change to a complementary mode of transport and a place of (public) functions (Rongen et al., 2022). This requires a lot more of architectural thinking than other modes of transport.

When people transfer from one mode of transport to the other, they might want to do something else in the meantime, such as getting a coffee, going to the shops or wait for the next train. This space should be a place of interactions and encounters (RISE & Arup, 2020). This all requires architecture, which infrastructure cannot exist without.

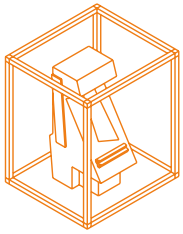
The infrastructure itself is an ever-changing process, it consists of structures that are evolving (Allen, 1999). The architecture will have to adapt to in time. The research on networks and nodes will especially rely on precedent projects. The final design that follows out of this research will also be a variety of the transport node itself. The mobility hub is a subject mostly architecturally researched, in the design complementary to this paper. For that reason, it is not further discussed.



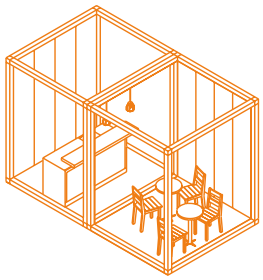
Bank/post/dry-cleaner



Café/kiosk



Event/exhibition



Food/restaurant

Figure 3: Examples of additional functions that can be added to a mobility hub (RISE & Arup, 2020)

Cycling

To get people out of their car, and move to other, less impacting modes of transport, there should be a shift towards cycling. In Europe, there are two countries that are way ahead in cycling culture, usage, and infrastructure: the Netherlands and Denmark. The cycling infrastructure of those countries can be used as a precedent.

In the Netherlands, people mostly seek to leave their car at home when travelling. For shorter trips, this means walking or cycling, for longer trips, they use the national rail network. The car will only be used when the other options are not satisfactory (Bruntlett & Bruntlett, 2018). This way, people use their bikes to get around the city, but also to get to the nearest public transport station, after which they can take the train to their destination. The train station they go to, has bikes (OV-fietsen) for rental, which can cover the last mile of the travel. This coexistence of bikes and trains increased the usage of the railways in the country (Villwock-Witte & van Grol, 2015).

Photo: NS, (n.d.), OV-fietsen are rentable with the general Dutch OV card, it is all about making it easy.

Methodology and position

This research will aid the design of the ADC Graduation Project. The project will be a transfer hub from walking and mostly bicycle to other sustainable modes of public transport. The goal is to find out what is needed to support such a hub, what is needed at that place and what is its position within the urban fabric of outer London, where the cycle infrastructure is scarce. To justify the choices, it is needed to position this research in the larger discourse.

The research and design theme are twofold: urban and architectural. First it is needed to research the existing infrastructure and urban landscape and design the implementation of new sustainable interventions in it. First existing discourse is discussed, focussed on literature and street design that is prevalent in the Netherlands.

Cartographic research of London is done to map the existing infrastructure, focussed on cycling and public transport. From here a design site is chosen. Then some precedent projects within the Netherlands are analysed. The difference between the 'before' and 'after' state in relation to the area and routes designated to different functions. This will lead to a set of design handles, which can then be implemented at the design site. The current state of it will be analysed the same way as the precedent projects, after which the design handles are implemented. When implementing, the 15-minutes city and sustainable TOD are also considered. The resulting urban concept will be the base of the architectural design of the design studio.

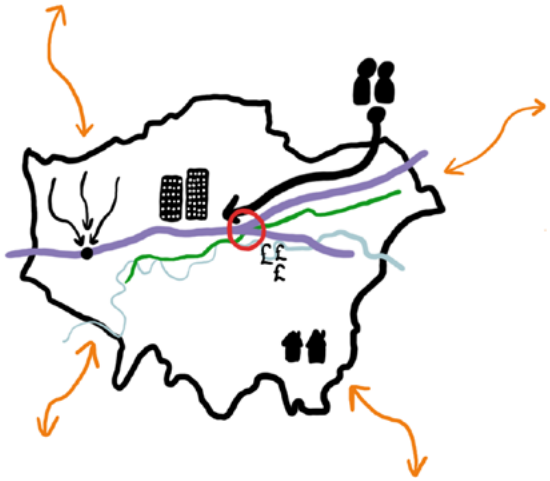
Design scales

The research will include different design scales. Infrastructure is an essential part of the city, that has macro and micro effects. The city can profit from infrastructure, whilst smaller neighbourhood could deteriorate. Because of this broad effect of infrastructure, it is needed to understand the different scales to research them.

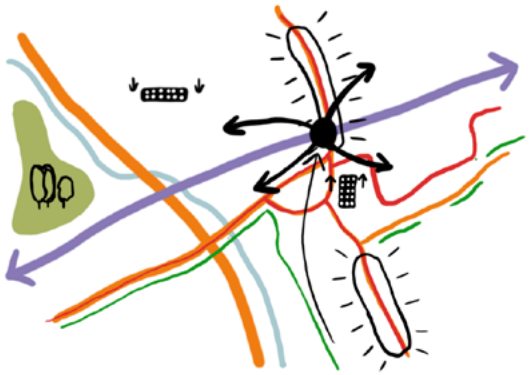
In short, the scales relevant to this research are the street, neighbourhood, and the city level. The level on the scale of the country or even international infrastructure, is not significant to this research, as it focusses on the public transport network of London

The **city scale** is mostly about the infrastructure network and the distribution of people and functions. Where do the public transport lines and roads go? Where do they meet? How do they interconnect? Are they overground or underground? The **neighbourhood scale** is mostly about the secondary infrastructure, such as roads, cycle lanes, and bus lines and the smaller scale urban distribution. Which streets are the most important? Where are the important parts of the neighbourhoods which will be most visited. Where do the people live? Where do they work? How do they get there? The **street scale** is about the human scale. About how you get across the streets or the stations. What do the actual users see? Where exactly do the people walk from one mode to the other, what do they want to do in the meantime? Where is the entrance of the building? What is the spatial effect needed for the intervention?

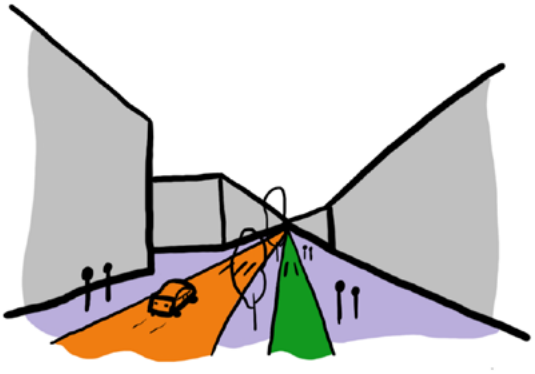
City scale



Neighbourhood scale



Street scale



Cycling (urban infrastructure)

Bruntlett and Bruntlett (2018) and Colville-Andersen (2018) describe a set of urban design handles to change the cities to sustainable traffic. These can be implemented in London, but with care. England is culturally not the same as the Netherlands and Denmark, and the urban fabric is different. Some design elements might be universal, but others might not work. London is at the level of the Netherlands and Denmark decades ago, some interventions that might seem common sense in those countries, can be implemented too soon. It is important to note that these solutions are technical and might not consider the sense of place and people as they're based on general problems (Verkade, 2020).

Both countries are geographically flat, so people don't have to cycle uphill, which also is the case in London. They also have a similar (rainy and windy) climate to the UK, so you cannot argue the Londoners will not cycle because of the weather. The basic environment for cycling is already there.

Both countries have a similar take on cycling usage and infrastructure, the differences are mostly details. Key elements described in the two countries are, based on Bruntlett and Bruntlett (2018) and Colville-Andersen (2018):

The separation of modes of traffic: not always only by visible lines on the street, but by physically separating the lanes (see figure 4).

A cycle and walking priority in street design: cycles are allowed to take the short route and cars must to drive around the city.

Implementations of dedicated cycle routes: both countries have a network of cycle highways, that connect different cities with each other.

Good connections to public transport: stations are integrated in the cycling network and there is more than enough space for bicycle parking.

This infrastructure is prevalent in countries that have a high level of cycling, and a developed culture surrounding cycling. Which means it will most likely not lead to increased cycle usage, when done without other measures. One such measure, although not the preferable option, were the health measures surrounding the corona pandemic. In those years, the number of people cycling, and walking went up, which stayed on a higher level even after the pandemic faded away (Transport for London, 2022). Such an event could turn into a turning point, marking the rise of cycling in London.

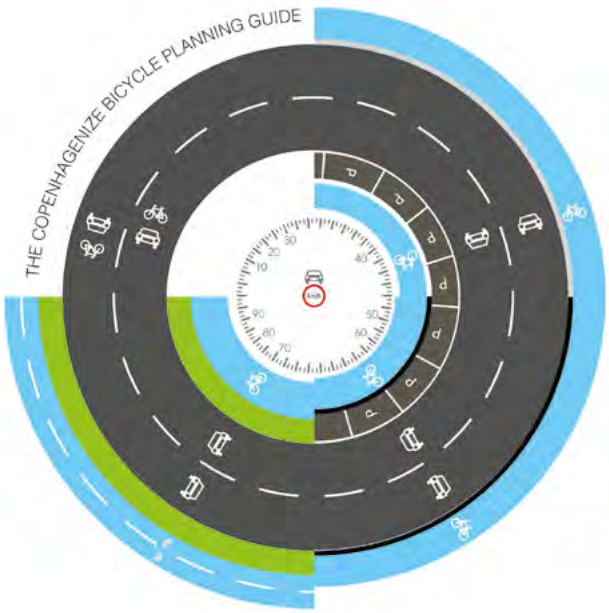


Figure 4: The cycle lane design per maximum speed guide based on Danish roads by Colville-Andersen (2018).

Mapping London

Design site

As discussed earlier, the research and design area of the ADC Graduation Studio is set in London in the United Kingdom. To constrain the city to a smaller area, public transport lines were inventoried, the following has the most potential.

The Elizabeth Line opened in May 2022, which makes it the newest addition to the rail network of London. It spans from outside of the Greater London Area (GLA) in the west, through the city centre, to the suburbs on the eastern side, all in one direct line. It is not an underground line, also not a train connection, but rather a combination of the two. The line follows mostly existing train tracks on the outer side of the city but connects the east and the west via a new underground tunnel under the city centre. None of the stations are new, although new platforms have been created. Such a line has never been built earlier within London (Transport for London, n.d.). This new connection will most likely lead to a shift in de-

Figure 5: The rail tracks in the GLA, the Elizabeth Line marked (illustration by author).

velopment in the already existing station areas, especially in the outer parts of it. The site will be very close to one station, becoming the epicentre of the development.

Each station was looked at independently. Some constraints were used to find the most interesting design site. It cannot be in the city centre, as the urban fabric is already highly developed there. It can also not be too far out of the city centre, as the cycle infrastructure test case will ideally be in an urban part of the city, as cycling becomes liable on that scale. Last, a bigger station with more connections will be representative. This is where Ilford station comes in. It is a station at a crossing of several modes of transport. It is next to an elevated highway which connects directly to the M25, 19 bus lines stop in Ilford (National Rail, n.d.), and a major local car route goes directly in front of the station. It is an area where there is already a degree of development directly around the station, but outside of the 5 minutes walking circle developments drop.

Figure 6: The location of Ilford within the GLA (illustration by author).

Current situation

Cycle infrastructure already exists in the GLA. However, it is not nearly as much as in cities in Denmark or the Netherlands. There are some major lines going through the city. There are some clear noticeable differences between neighbourhoods. Hackney for instance has a lot of infrastructure which is used, which is also seen in the 2021 census data. Hackney sees for instance an 8% share of bikes in modes of transport to get to work, which is quite high for the country's average of 2%. Abbey Wood is an area with quite a bit of cycle infrastructure, which is not used that much (1% share). In Ilford, the percentage even drops below 1% (OSN, 2021). This is very much in line with what was seen during the site visit.

The photos in the collage are made during the field work in London. The goal of the fieldwork was to experience the current situation from a first-person perspective and find a suitable design site. The photos show the remarkable findings of the city. They were made around several stations of the Elizabeth line.

Ilford: no cycle infrastructure on major road

Romrord: road too busy, so the pedestrians are lead below and the fences will keep them of the road

Ilford: quiet neighbourhood road, where no additional infrastructure is needed

Romford: abruptly stopping cycle path

Forest Gate: cycle lane popping up out of nowhere

Earling: a temporal solution

Forest Gate: fences keep the road safe?

Abbey Wood: good cycle infrastructure does exist in London

Earling: not particularly bike friendly

If we look at the actual cycle infrastructure alone (figure 7), we can see that the density is unevenly distributed over the GLA. The city centre sees more lanes than the outer parts of the area. In Ilford this is particularly lower.

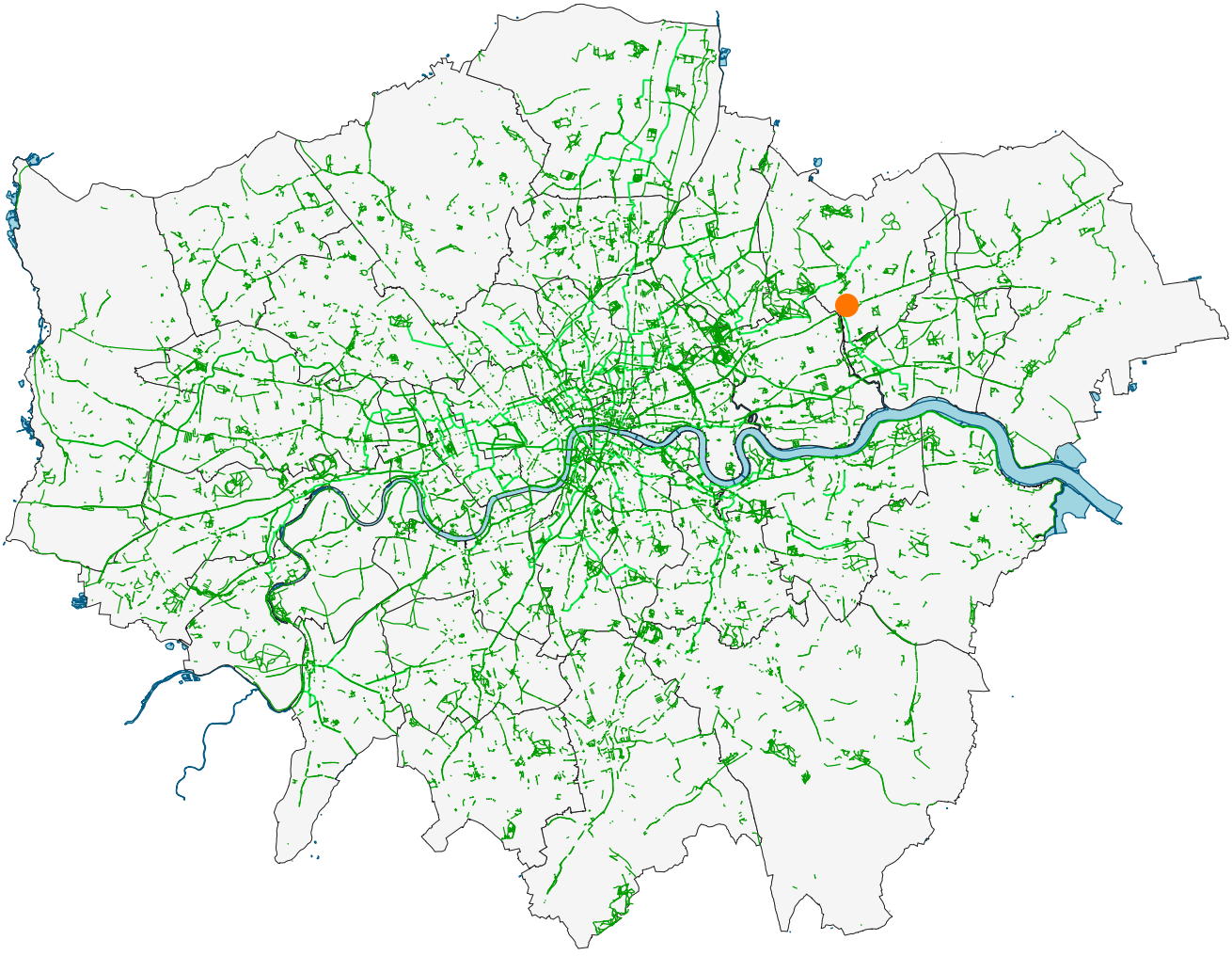


Figure 7: The GLA with all the cycle infrastructure (OpenStreetMap, 2022).

If we then add the layer (figure 8) with railway tracks, we can see that there is an overlapping density, with it being higher in the city centre and lower in the outer parts. This is of course a logical result of the population density in London.

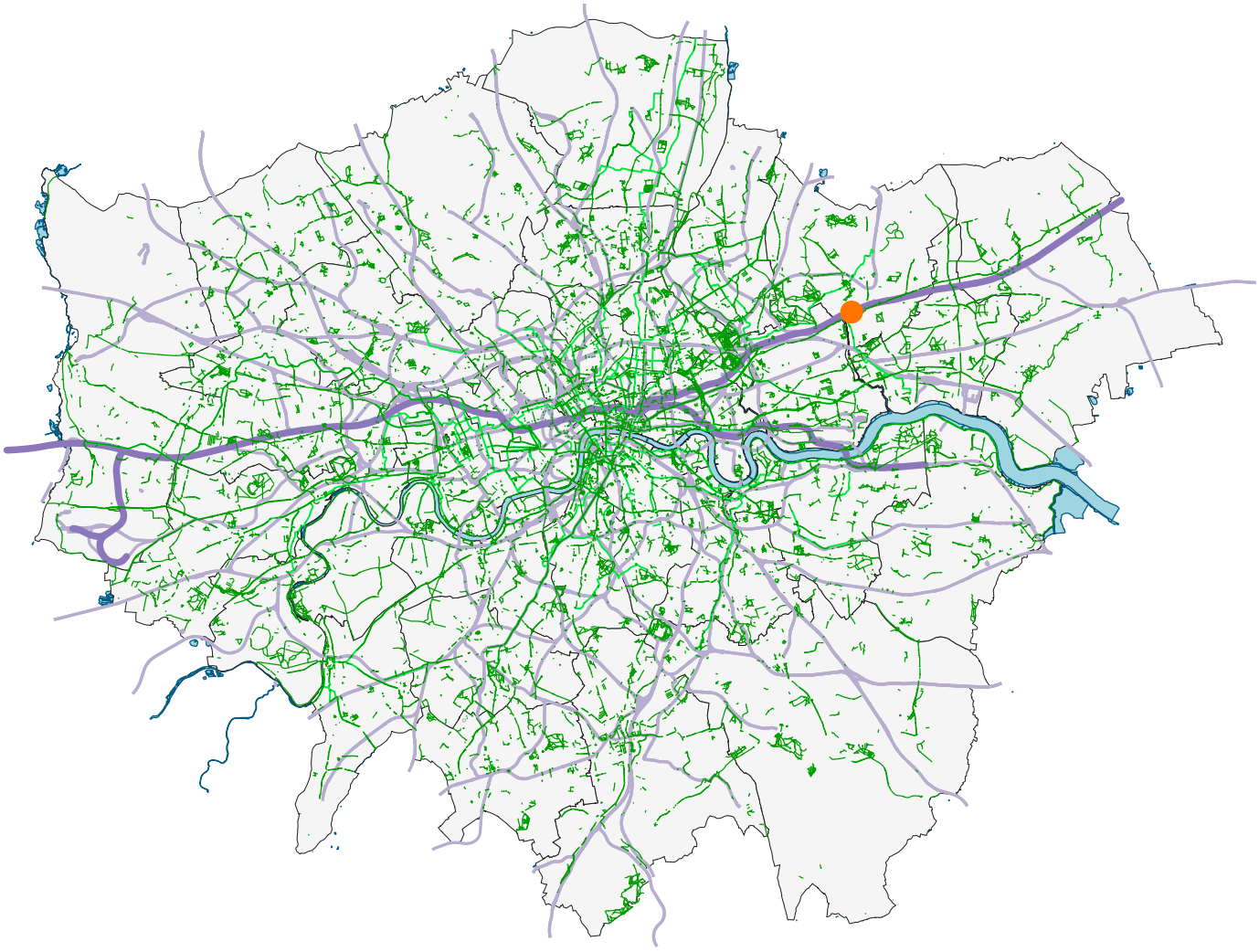


Figure 8: The GLA with cycle infrastructure and rail lines (OpenStreetMap, 2022).

Another layer (figure 9) which gives valuable information is the percentage of people that cycle to work, which seem to mostly overlap the amount of infrastructure, but not exclusively. So, other factors also play a role, although the amount of infrastructure plays a big part.

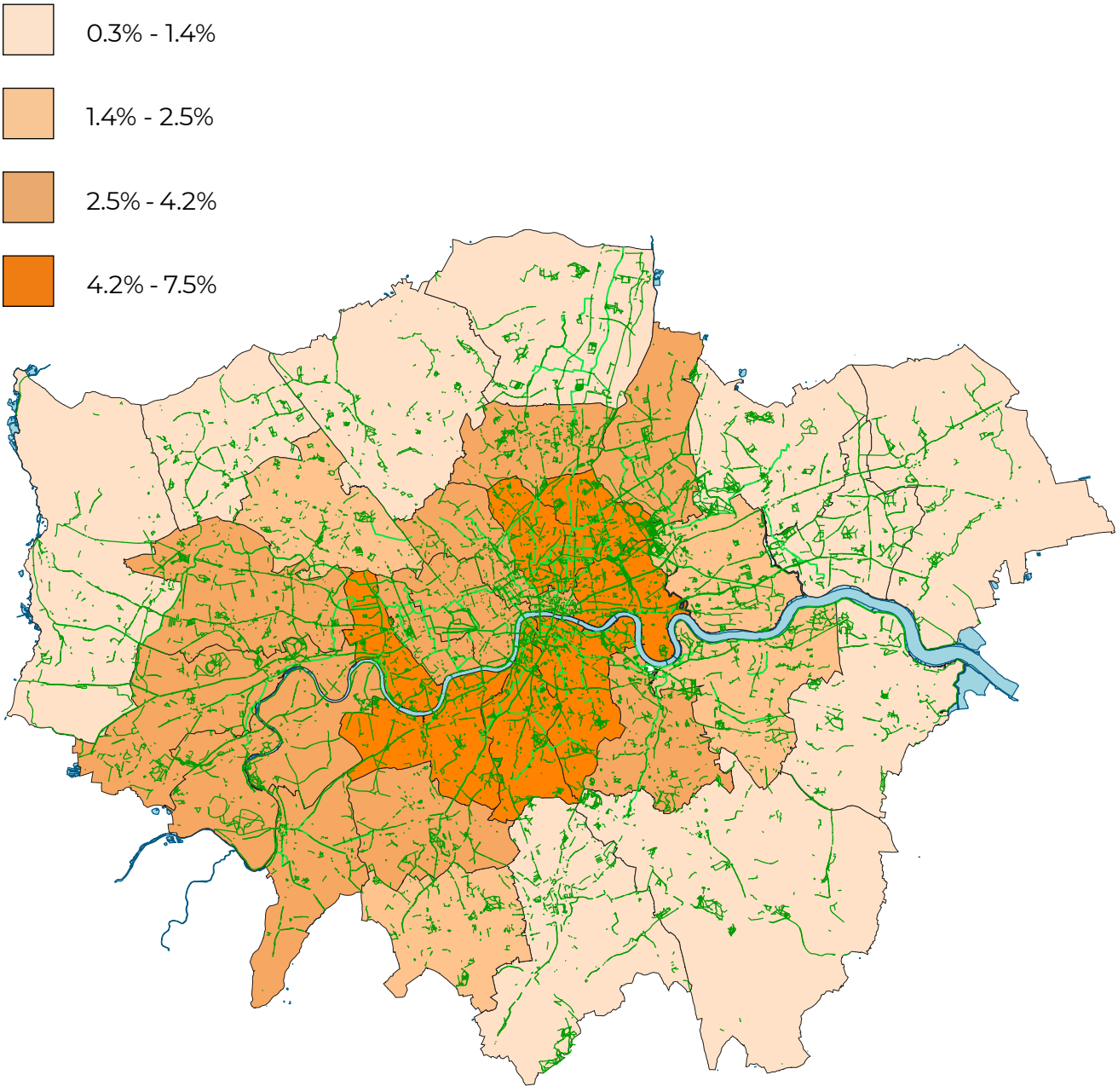


Figure 9: The percentage of people cycling to work per borough (OSN, 2021).

When we zoom in to Ilford (figure 10), we can see that the cycle lanes available are mostly in patches. These patches are public parks, where it is allowed to cycle. If you don't take the parks into account, what is left is a disconnected collection of bicycle paths. Connecting these paths into a network would already be an obvious improvement. When zooming in on this map, some additional oddities come up. Such as the bad east-west connection over the river Roding. There are only two connections, one of which in the north, leads to the park in the west, the other close to Ilford station runs next to a busy road with highway ramps, which poses the cyclists to a high level of danger.

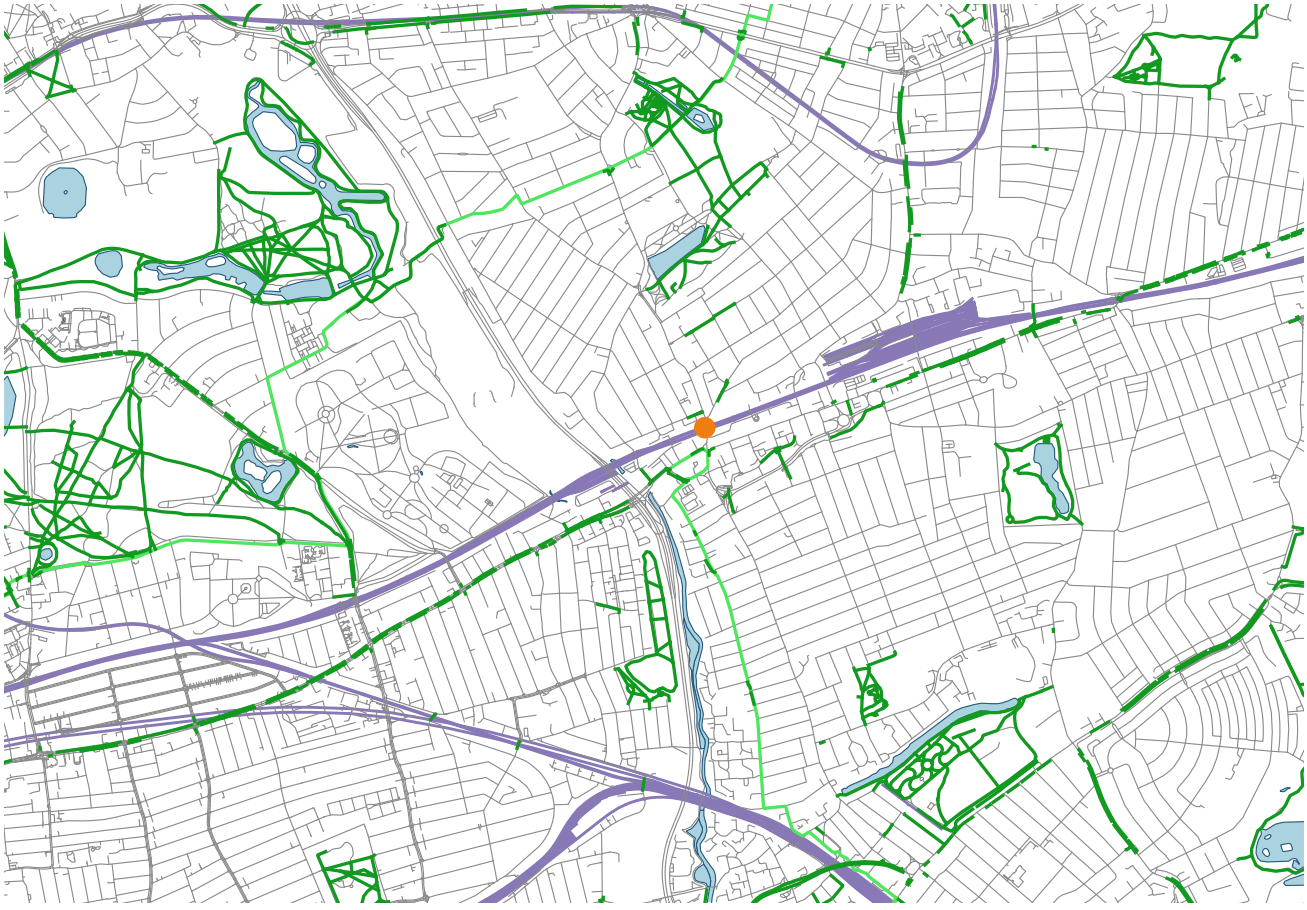


Figure 10: Figure 8, zoomed in to Ilford with streets in grey (OpenStreetMap, 2022), Ilford station is marked in orange.

Future of mobility

As mentioned earlier, infrastructure is ever-changing (Allen, 1999). It is difficult to say what the future will bring to mobility. However, we can make substantiated guesses. The following guesses are just an inventory for Ilford, there is not enough time and space in this paper to dive deeper in the matter. However, it will help understand and shape the urban and architectural design. The findings are based on external sources but influenced by a personal expectation.

The introduction of electrical self-driving vehicles will greatly decrease the combustion within cities. Nevertheless, the amount of private motorised vehicles will have to shrink, to retake the streets for the other users (Verkade, 2020). Furthermore, there is a threat of urban sprawl when people do not have to drive themselves anymore (Larco, 2018). Urban design will have to reflect the change, but also reflect the accessibility and priority of non-automated vehicle and users on the street. In Ilford, specifically the elevated motorway will become less of a burden to the surrounding areas.

Introduction of new public transport lines will improve the connection with other areas, but also bring in more people in the area. Travel times will decrease, however distances and ticket prices will most likely not (Wegener, 2013).

If implemented correctly, cycling will become a major factor within the mobility of cities. The rise of e-bikes might create even a separate one, that is too fast to integrate in the streets without further measures (Verkade, 2020). Solutions might be restricting speeds or creating new lanes. However, the latter could also pose a new threat to the accessibility of the streets, becoming yet another barrier.

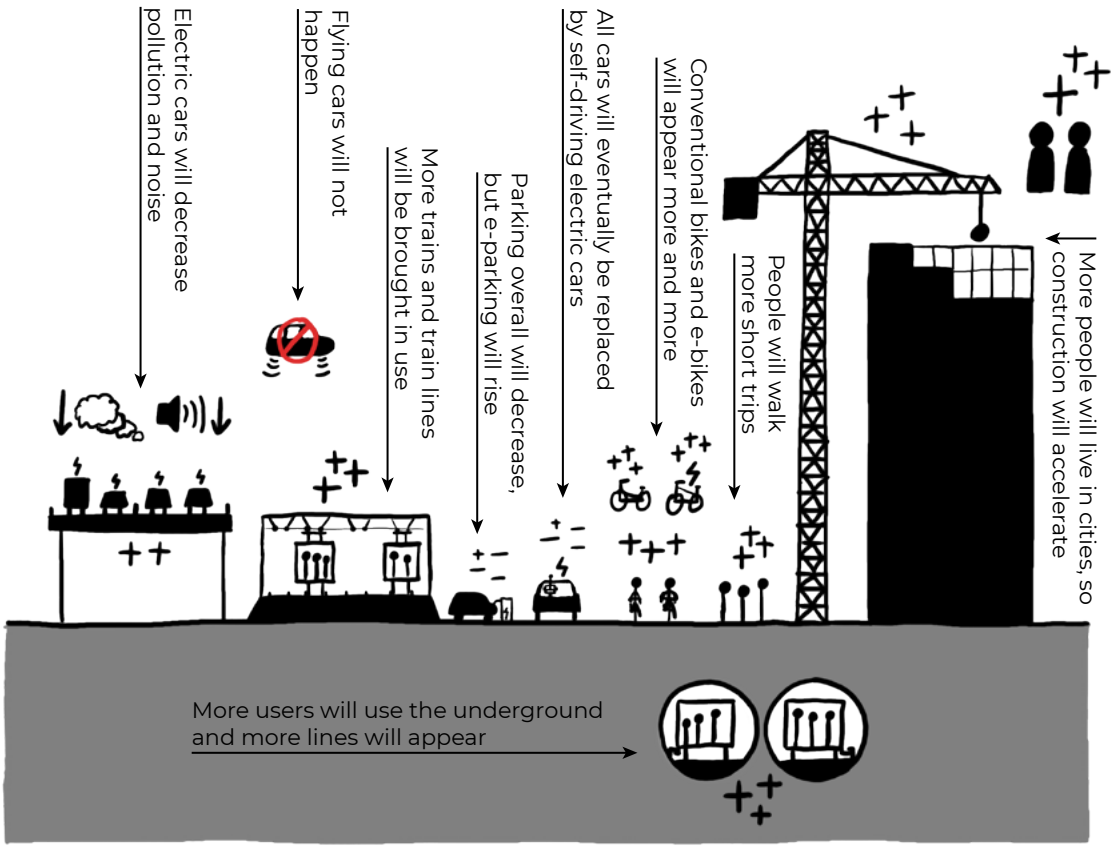


Figure 11: how the future might look like (illustration by author).

Precedent analysis

Legenda

Area for cars (roads and parking)

Low-traffic or reduced barrier

Green space

Non-accessible green space

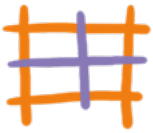
Buildings

Pedestrian areas

Cycle path

Rails (train and tram)

Icons



Removed cars from block

Changed to pedestrian zone

Changed road into low traffic

Added cycle paths

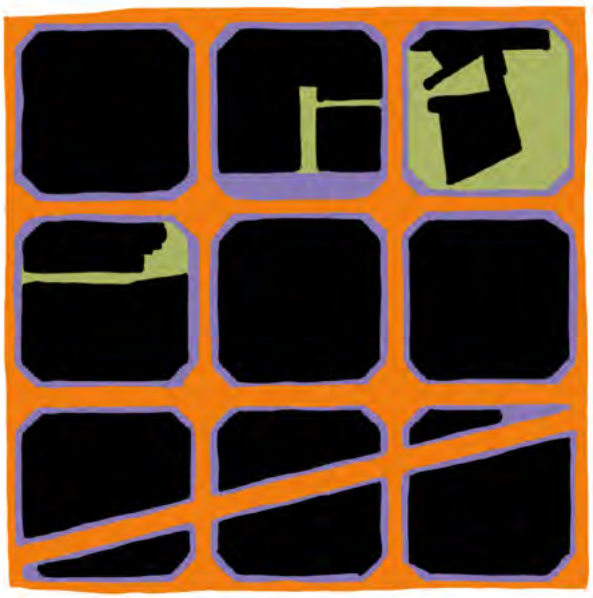
Removed lanes

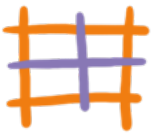
Added green

(Illustrations and maps by author)

The Barcelona Superblocks

The city centre of Barcelona was designed in the 19th century, long before the car. In the post-war period the car took over its famous city block grid. This resulted in a huge level of congestion, pollution, and noise, affecting the health and quality of life of the residents. To combat this, the city proposed a radical idea. Each 9 blocks were merged into a new 'superblock', within this block, only slow traffic (e.g., pedestrians and cyclists) are allowed, the cars mostly must drive around the block, only local traffic is allowed on a slow pace. This change created complete new public spaces in the city, where it has never been before. The amount of pollution and noise dropped, increasing the health and wellbeing of the users of the city (Mueller et al., 2020).





Merge blocks

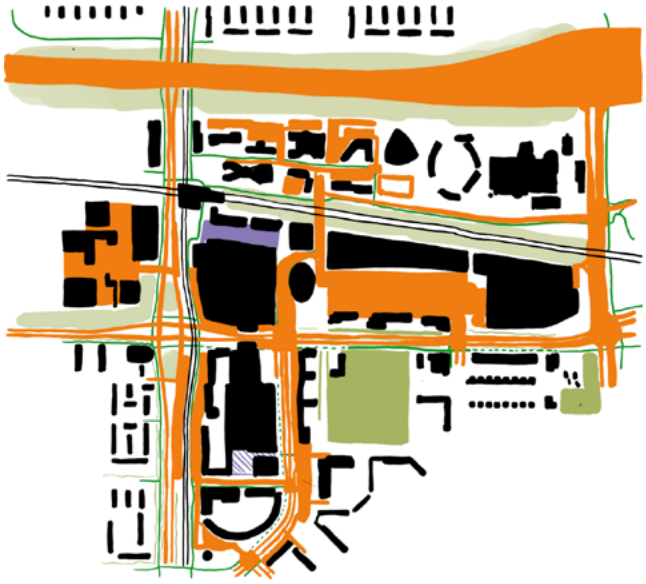
Change to low traffic

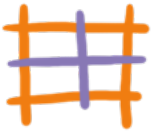
Pedestrian zones

Add green

This outer city part of Rotterdam shows striking similarities with Ilford. It is next to a major highway, has a train station, with a lot of options to transfer. It has a big shopping mall, with lots of parking spots, but most importantly, it is an island in an otherwise residential-only area. The borders between the different functions are abrupt. Prins Alexander is a frequently visited area, but people don't describe it as a pleasant one. The proposed plans are described in *City of the Future* by BNA, 2019.

The plan drawn below removed some major roads out of the area, so traffic is led around. This will create a bigger cohesion between the areas and the neighbourhoods around. Circular mobility hubs are proposed, to keep the industry of the area alive, whilst also connecting with the other functions. The pedestrian is put first, the design first must fit them, before thinking about other modes of transport (BNA, 2019).





Merge blocks

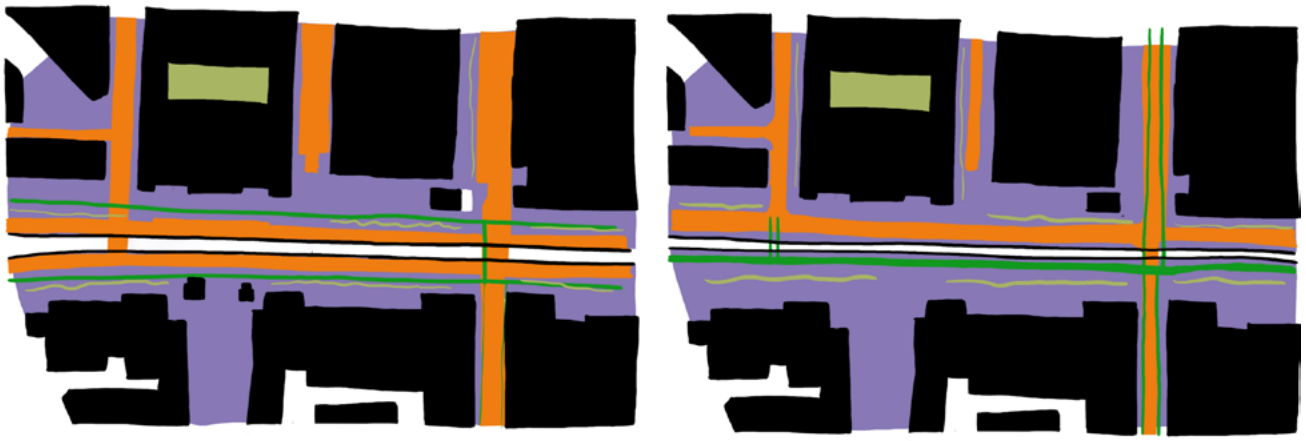
Pedestrian zones

New cycle lanes

Add green

Coolsingel, Rotterdam

This is a major road that leads through the city centre of Rotterdam. It used to be a four-lane road, with tram tracks in the middle. As the street profile is quite broad, there was already quite some space for pedestrians. The road was a major barrier though, split the street in two, and cars created a lot of noise. After the change, the road was changed to a two-lane road, the cycle path was consolidated, and the rest was given to pedestrians. The result is a street with far less barriers and less noise and pollution, in the heart of the city.

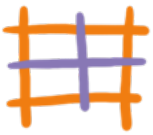


Remove lanes

Pedestian. zones

Station area, Delft

The city centre of Delft used to have a raised railway track, right through the centre of the city. This created a big barrier through the city, with the trains also contributing quite a bit to the noise pollution. The area was also filled with roads for cars, one could come to every building with their car, in line with the post-war view on urbanism. As the railway was put underground, the area on top got an overhaul. The area designated for cars was largely reduced, giving that area mostly to pedestrians and cyclists. At first, slow traffic was always located next to a car road, now it was separated. The result is a public station area, which is easily traversable by foot and bike. The number of cars is small enough to not form a barrier.



Merge blocks

Change to low traffic

Pedestrian zones

New cycle lanes

Application in Ilford

In all the precedents, the main factor of the change is the removal of lanes dedicated to cars. The Barcelona Superblock is the most straightforward example of this, as the city grid is uncomplicated. The other examples follow the same pattern, but in a more intricate city grid, which makes the interventions more complex.

The space that is freed up is mostly given to pedestrians and cyclists. Cycle paths are placed in a separate layer on top of the urban fabric, which means they do not always follow specific paths of the roads. If there is not enough space for future expansion, the path will be placed elsewhere. They run next to existing roads, most notably Ilford Hill which is the major east-west connection in the area, and they also run separately, as part of a new north-south connection, which leads next to the river Roding.

Cars can sometimes still access the area that is changed, but on a low-traffic and low-speed road, where pedestrians and cyclist have the priority. This is needed, as some commercial buildings need supplies, or some residents sometimes need to drive to their front door or a parking spot that is within the new low-traffic area. The number of barriers that slow traffic needs to cross, before entering the site has largely been reduced this way.

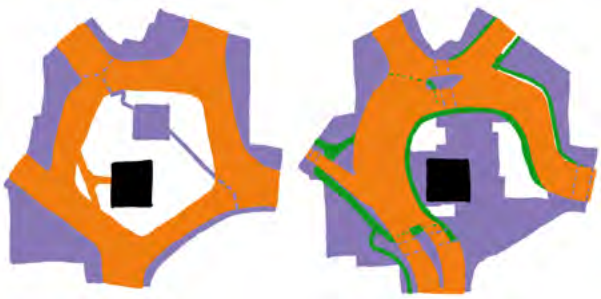
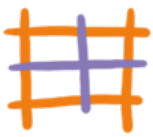


Figure 12: Elephant & The Castle in 2002 (left) and 2020 (right) (illustration by author)

Almost all interventions that are used in the precedents are proposed in the plan. With the specific routes, future changes are included, in the form of lager sizes. Marked within the dashed red line, is the design site. Some roads are removed completely, so traffic must drive around the block. That area is given to pedestrians. The most notable examples of this are the tunnel next to the site, which is now a cycle tunnel, and Ilford Hill, that was part of a big roundabout around the city block. Splitting up a roundabout like this is not new within London, it has also been done at large roundabouts near underground stations Elephant and the Castle and Highbury & Islington (Google, 2002).

Separate lanes | *Merge blocks* | *New cycle lanes* | *Pedestr. zones* | *Change to low traffic* | *Routes to stations* | *Shorter routes* | *Cycle highways* | *Add green*

The order of implementation is important, this scheme combines it with the design handles from the Netherlands and Denmark. At the start are the easy to implement interventions which can happen very fast, after which the more integral interventions take place over the years after.



Merge blocks

Change to low traffic

Pedestrian zones

New cycle lanes

Add green

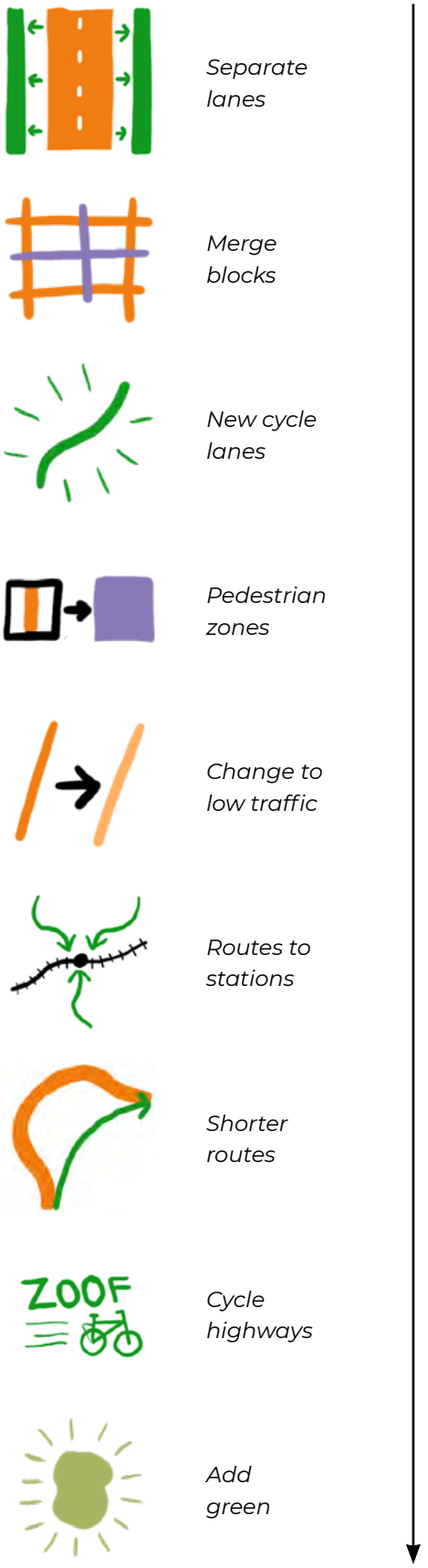
Conclusion

This paper reviewed several concepts that support the notion of removing the car out of the street. The 15-Minutes City proposes a plan where everything a resident might need in their daily life, is a maximum of 15 minutes away by foot or bike. Transit-oriented development proposes to cluster urban developments around stations, whilst creating better connections with the hinterlands of those stations. All to reduce the number of cars needed, to create a pedestrian and bicycle friendly city, with less pollution. To work, the infrastructure needs supporting buildings: the new travel hub will be an extension of the urban changes needed, it will be the architecture that will be intertwined with the infrastructure. Architecture and infrastructure need each other.

Then, to implement the new infrastructure, precedents and urban design manuals from Denmark and the Netherlands are discussed. What follows is a set of design rules, that can be implemented in London. The most important of which are separation of modes of traffic, rerouting car traffic with a new priority for slow traffic, and a good connection with public transport.

The implementation happens in Ilford, London, around the station of the Elizabeth Line. There the car is moved out of the city, in favour of the pedestrian and cyclist. This creates a safer street with less barriers, less pollution. Several new cycle paths are created, in a separate network that does not only follow the roads and gets priority over cars. Future changes in mobility are included in the plan.

The plans and design handles proposed in this paper can be exported to other parts of London. To move the car out of the city, it is required that changes happen all over the city, not only in Ilford. Only then one day London can be the cycling city the former major Boris Johnson wants it to be.



Discussion

The concepts that are used in this paper have a clear vision about urban design. They are largely thought of to be right, however it is still a vision about urbanism and architecture. An example of this is the 15-minutes City concept, which need a lot of urban planning. This might not be seen as desirable by everyone. On the other side of the spectrum is an approach to urbanism, or micro-urbanism, done in New Orleans, where the infrastructural works are not designed by the city, but rather the residents of the neighbourhood (Wendel, 2011). One might argue that this could be closer to the needs of the inhabitants. Implementing the 15-minutes City and cycling infrastructure needs a lot of city planning. It is important for policy makers and urban planners, to find a good balance in changing the streets without dictating too much how the inhabitants must live. Every step in the direction to the 15-minutes city and other concepts discussed in this paper is one to take, you do not have to take all steps. If only one take one, it is still an improvement. It is even better to take it slow, to allow the people to adapt. The order discussed in the conclusion can be guide in this process.

As said earlier, implementing cycling infrastructure is a slow process, which will take years. It is needed to have changes everywhere in the city. If only implemented on one place, cycling will stay obscure. Infrastructure is an ever-changing process. The amount of people that use infrastructure changes, but also how the people use it. The future of infrastructure was discussed in this paper. As said, it is nowhere near sure that this will happen. For that reason, it must be re-evaluated all the time. Cycling infrastructure is now an answer to the car-filled city, but this might change. That change will lead to additional research.

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