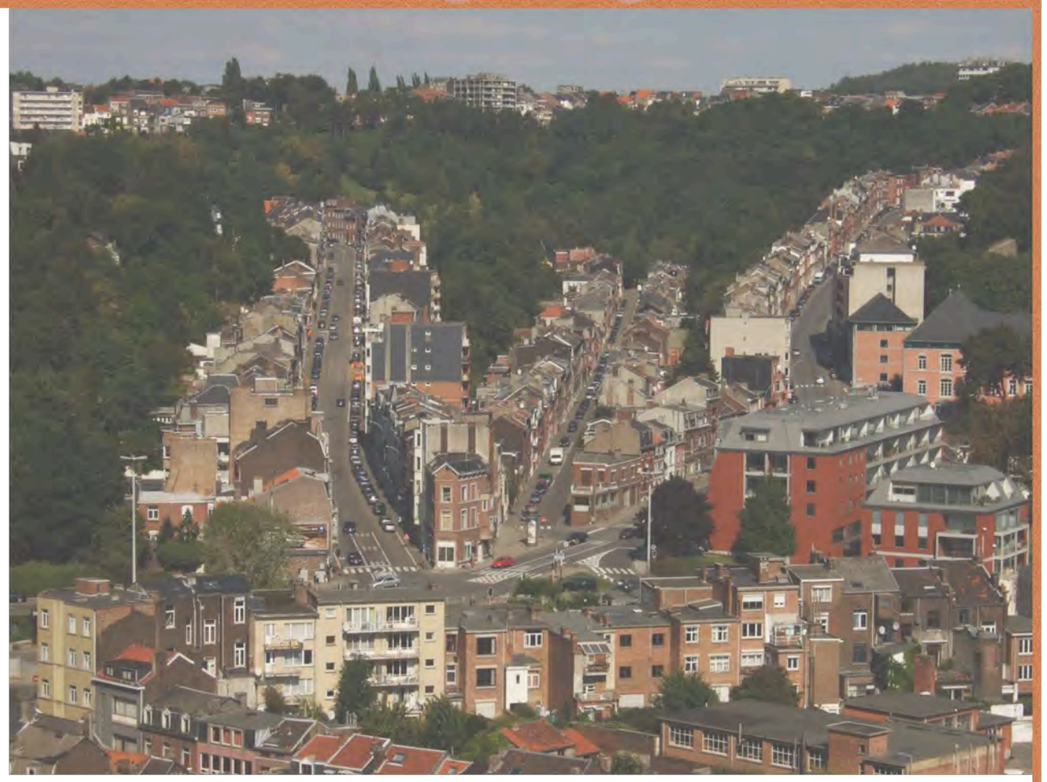
Urban Planning and Transportation

SAINTE-WALBURGE : towards a vibrant living neighborhood



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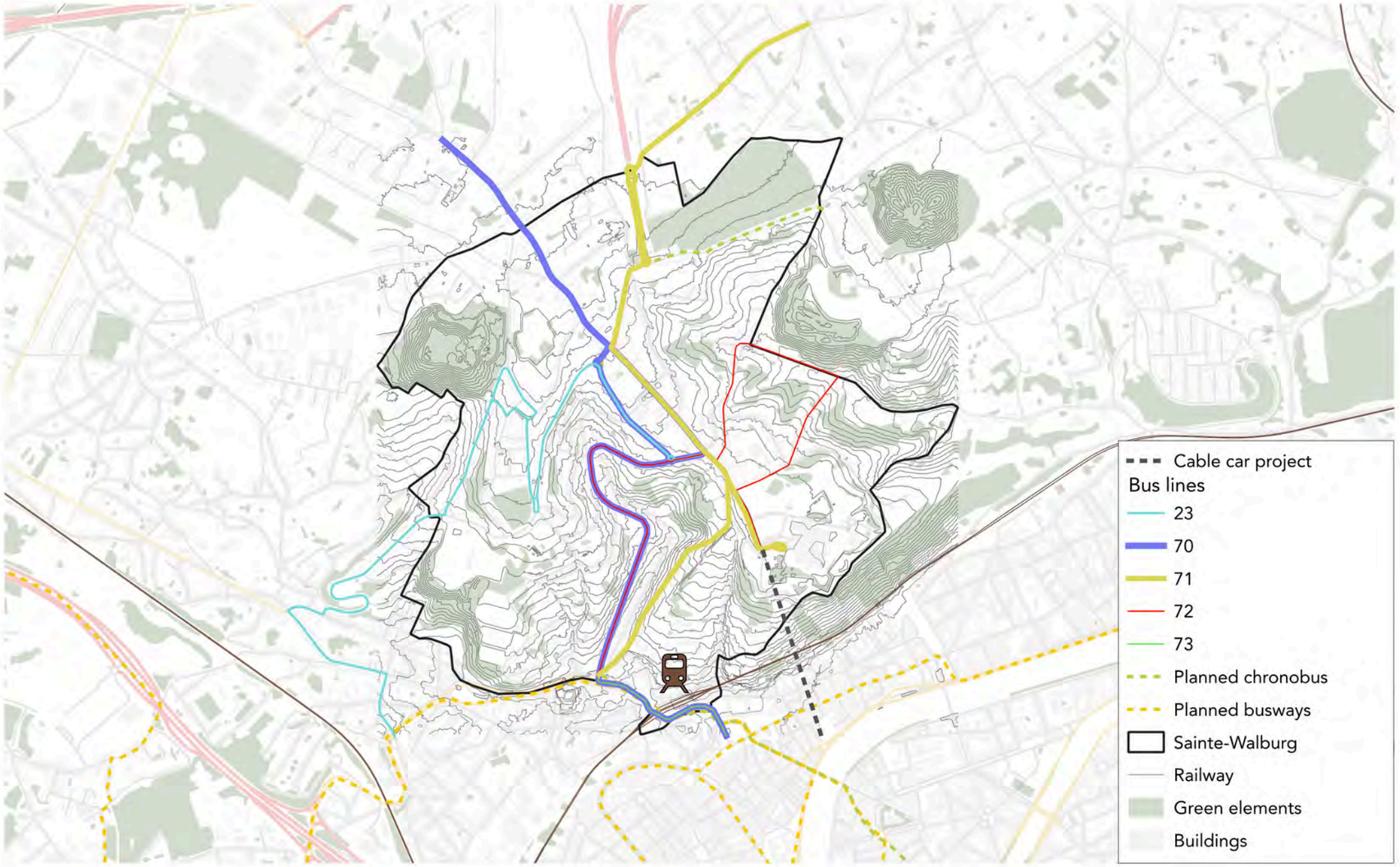
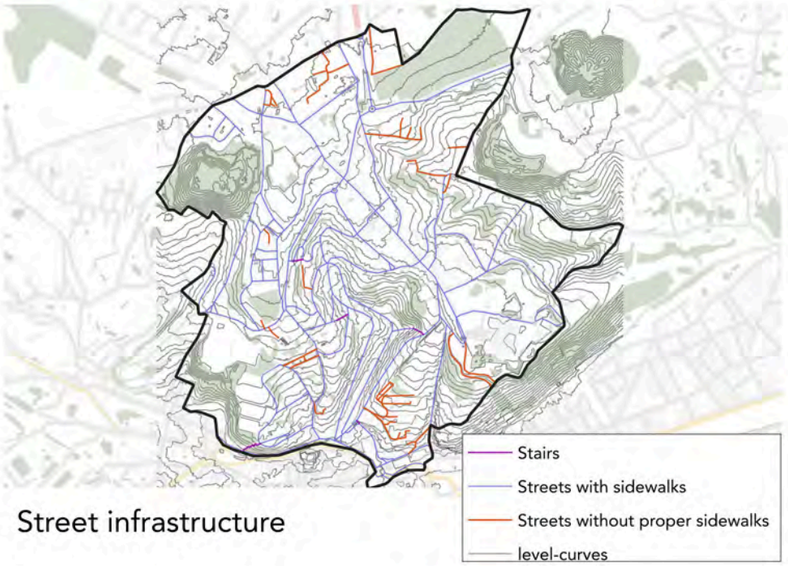
Existing and planned infrastructures and mobility



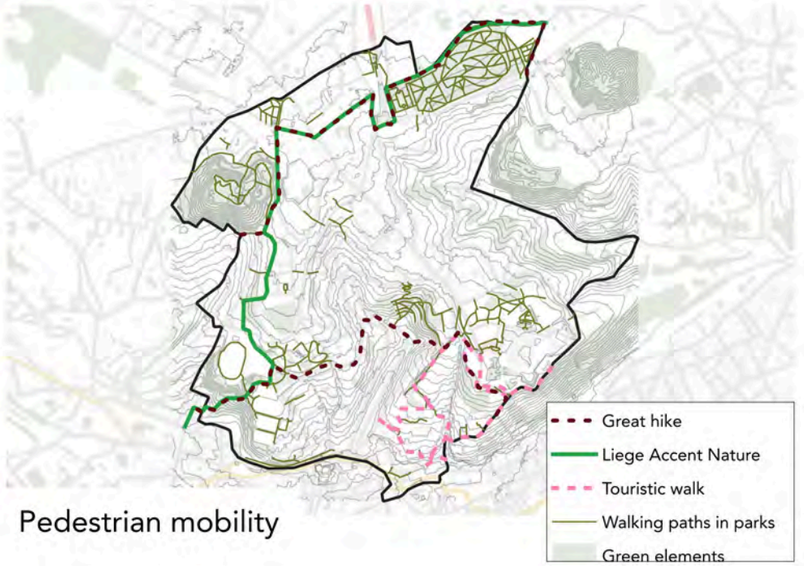
Planned infrastructure and mobility

Level curves in the neighbourhood

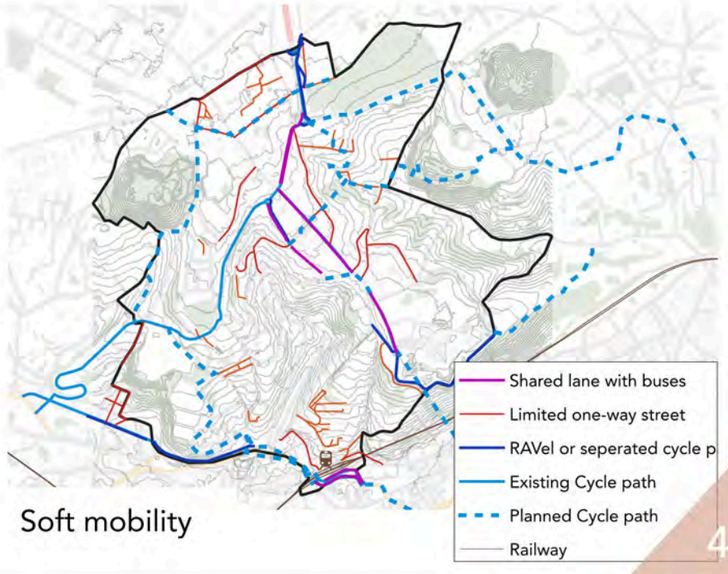
Existing road networks



Street infrastructure



Pedestrian mobility



Soft mobility

This task sheet summarizes the existing and planned infrastructures and mobility devices. Those points give a general overview and understanding of the mobility in the neighbourhood.

Level curves

The neighbourhood of St. Walburge is characterised by its relief. The neighbourhood is connected to the rest of the city by several streets with strong slopes. However, most of the neighbourhood is located on a plateau. By its particular topography, the mobility toward the neighbourhood is made more difficult than on flat terrain. Still, in the neighbourhood itself the terrain remains quite flat and more practicable.

Existing road network

There is a distinction to be made between the car network and the railway. The railway does not pass through the neighbourhood directly but the railway station of Liège St.Lambert is located right next to the neighbourhood. By this, St.Walburge has access to the train as a mobility device. The road network of St.Walburge is diverse and hierarchised. There are two main axes heading from the bottom to the upper part of the neighbourhood: the Montagne St.Walburge and the Rue de Campine. On the plateau, the Rue St-Walburge is the main axis to head toward the north and the highway leading to the entrance of the northern ring of Liège on which are located many activities and jobs.

Street infrastructures

The pedestrian infrastructures in the neighbourhood are well developed. All of the main axes of the neighbourhood are equipped with a proper sidewalk. Still, there are some streets among the smaller ones that are not equipped with sidewalks. This lack of sidewalks can be explained with the narrowness of some streets. For example, the Rue George Rem, is too narrow to allow the circulation of cars and the presence of a proper site for pedestrians. Many other streets are in this case. In addition to the sidewalks, there are also some stairs to connect some streets separated by the height difference provoked by the particular relief of the neighbourhood. This shows that infrastructure wise the neighbourhoud is well equipped.

Public transport

In Sainte-Walburge, public transport is mainly focused on bus TEC services. It is said in the Urban Mobility Plan (PUM) for the Liège agglomeration, that the TEC network's line 70 is a main structural route (PUM 2019). Other lines also serve the neighborhood, including lines 23, 24, 39, 71, 72, 73, 74, and 174. The most frequented are 70, 71 and 23. Most of these routes run through the neighborhood from north to south, connecting it to the city center via the CHR Citadelle. Notably, line 23 connects the hospital to Boulevard d'Avroy while bypassing the city center entirely.

A chronobus line is planned to pass through the neighborhood. It's planned to follow the current route of line 71, but instead of heading to the P+R in Vottem, it'll turn east and go along Boulevard Fosse-Crahay. The PUM also mentions a busway line, but that one won't go through St.Walburge (PUM 2019). It'll just pass south of the neighborhood. Right now, public transport is accessible mostly everywhere in the area, as stated by M. Petitjean, it's overcrowded, which makes it inefficient.

Soft mobility

The soft mobility and especially the cycling mobility is structured by two main axes. An axis from the south-west to the north, from the bottom of boulevard Théodore Radoux to the north and the highway, and an axis from the south-east to the north, from the citadel toward this same highway. However, the south-west - north axis is the only one presenting bicycle lanes separated from the main road while the south-east - north axis presents a shared lane between bus and bike.

At the Walloon scale, there is an objective of promoting soft mobility via the FAST vision (Plan régional de Mobilité, 2019). This objective applies to Liège and is translated in the previously cited PUM which promotes a better cyclability in the agglomeration (PUM 2019). At the neighbourhood scale, there is some new cycle path planned to connect some new areas to the two main axes.

The cycling mobility at the neighbourhood scale is currently polarised through two axes but a densification of the cycling lane network is planned. A dense grid of bicycle infrastructure is still to come

Pedestrian mobility

The neighbourhood is crossed by several pedestrian networks on various scales. The neighbourhood is in fact crossed by the network Liège accent nature. It is a green network supported by the city in order to create an ecological grid. This grid can be used as a support to develop a pedestrian network across the neighbourhood. In addition to this green network, St.Walburge is also crossed by a network of hiking routes. Those hiking routes are also at the scale of the city providing the neighbourhoods other structuring pedestrian axis. Finally, there is a network of touristics and park walks in the neighbourhood as its scale. There is already in St.Walburge some form of pedestrian network by those networks previously cited. However, by looking at the map, this network is located on the "periphery" of the neighbourhood, on the surrounding of the citadel, on the north-eastern part of St.Walburge and on the woods surrounding the Naimette stadium and the boulevard Théodore Radoux.

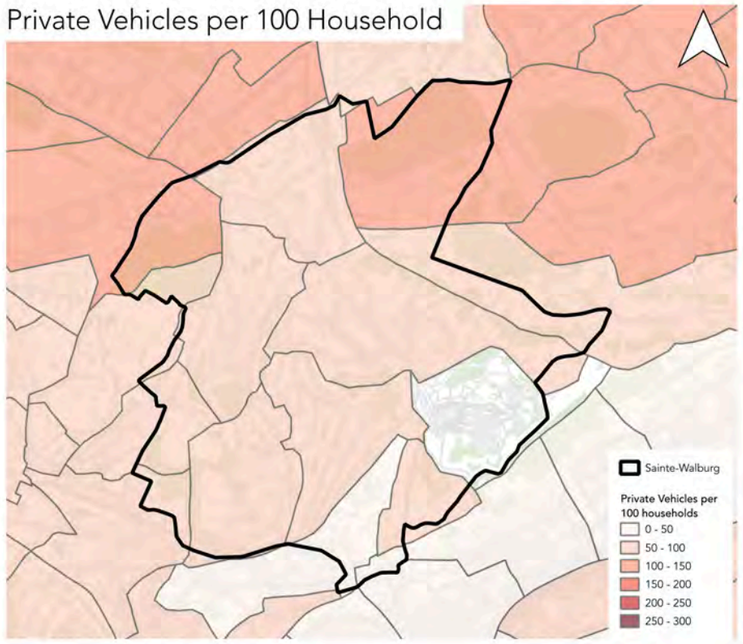
Planned infrastructures

There is not a proper map of the planned infrastructures in the neighbourhood but those are important to take into account to plan on intervention. As already mentioned, a lot of the infrastructures planned are linked with cycling mobility. Those planned infrastructures are mainly the densification of the bike lane grid. Those new lanes can be used to plan a better cycling network in the intervention . The other infrastructures planned in the neighbourhood are the new buslines, the chronobus and the busway line planned in the PUM (PUM 2019). As said, the chronobus takes nearly the same line as the already existing bus lines and the busway will pass near the neighbourhood and not through it. If those lines will have an impact on the neighbourhood, those will not change much in the mobility structure of the neighbourhood.

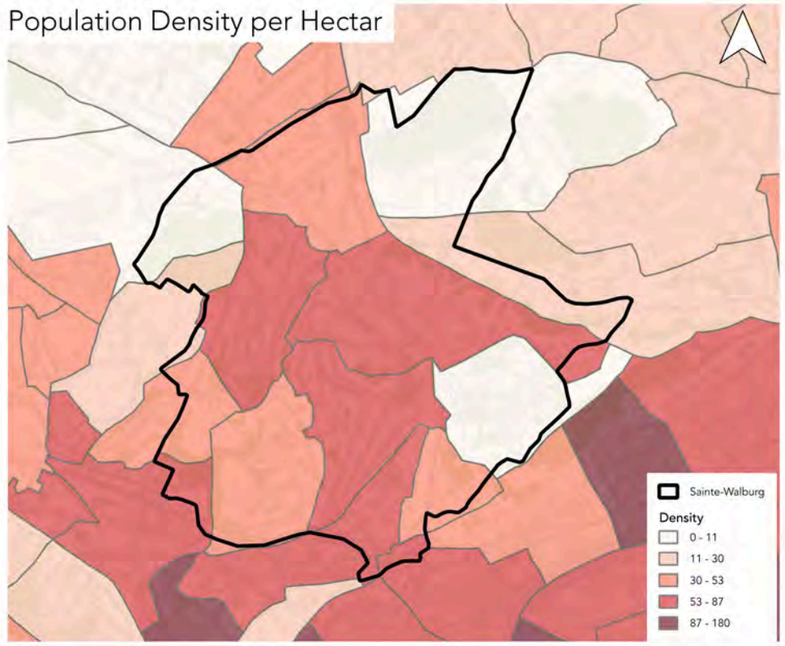
Mobility Demand

Graphics for the Existing and Future Mobility Demand

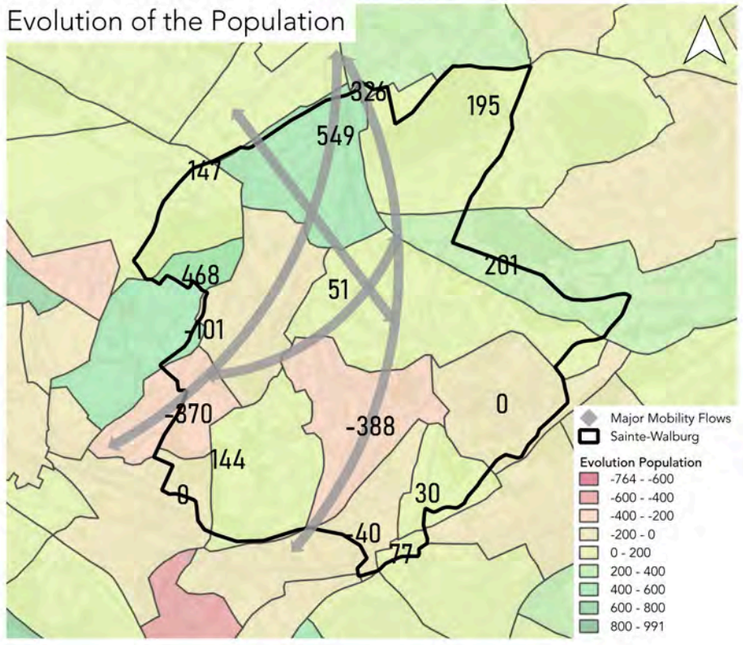
Private Vehicles per 100 Household



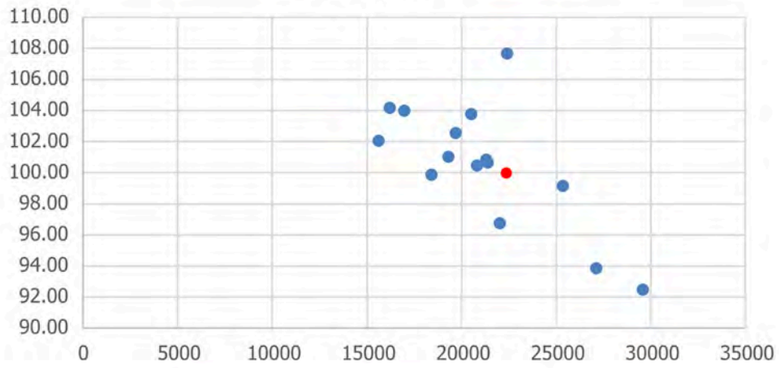
Population Density per Hectar



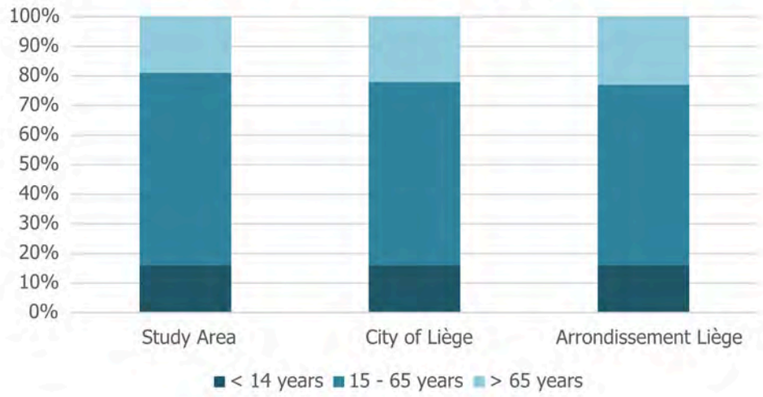
Evolution of the Population



Distribution of Private Vehicle Ownership by Income

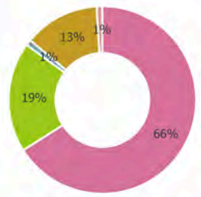


Population distribution by age group

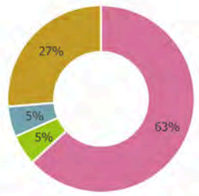


Modal Share: Present Trends and Future Ambitions

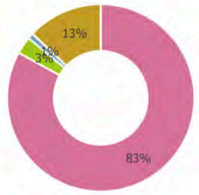
Modal Share Liège
(BELdam 2012)



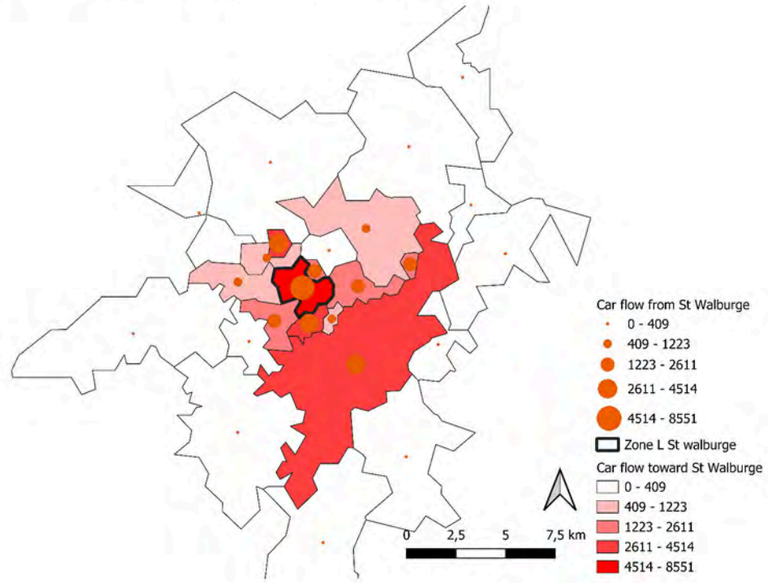
Future Modal Share
(FAST 2030)



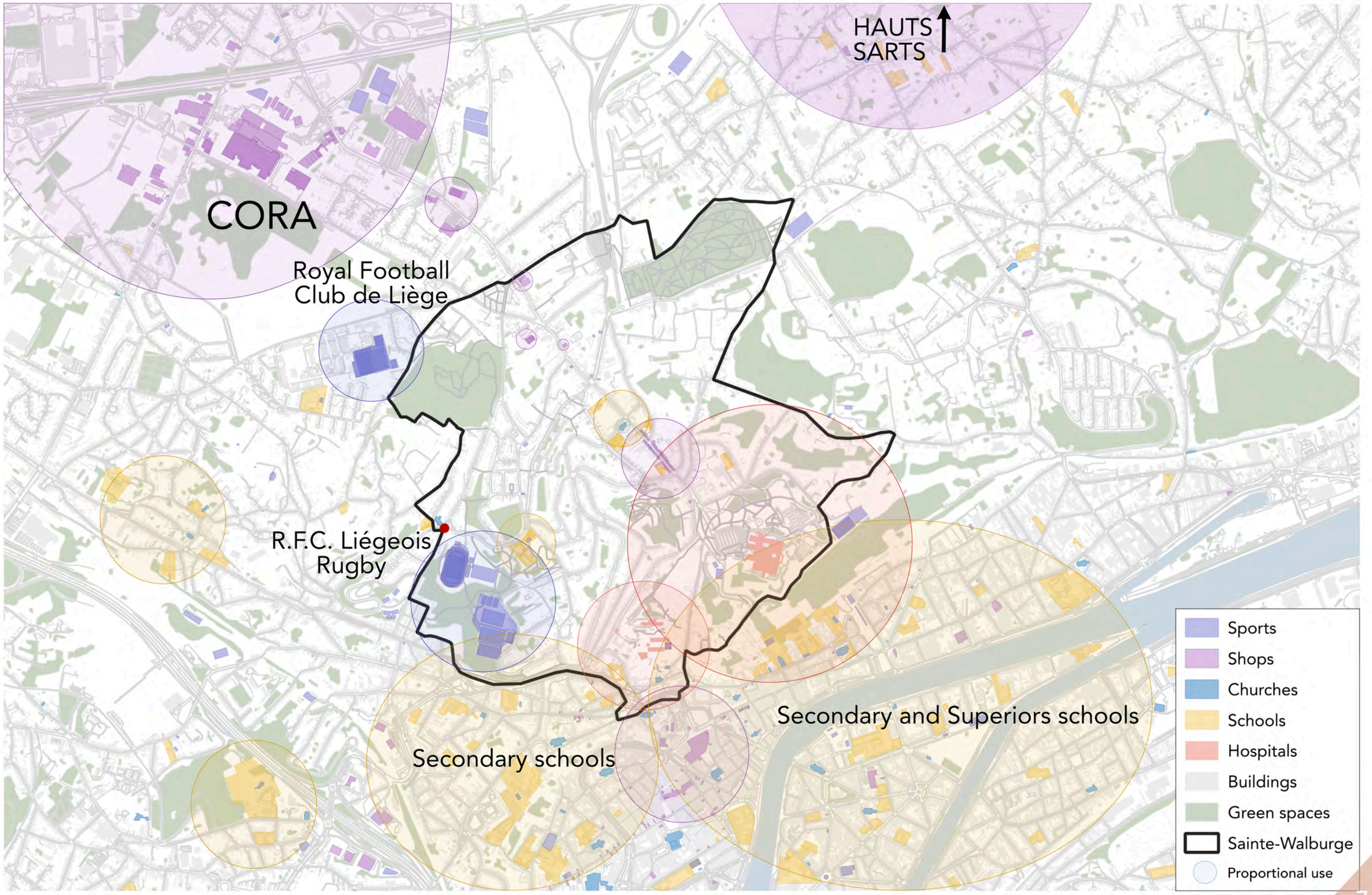
Modal Share Wallonia
(PUM 2019, Data from 2017)



Origin destination matrix for St Walburge during week days



Main attractors in and around the neighborhood



MOBILITY DEMAND :

The analysis of mobility demand in St. Walburge includes the analysis of the existing demand and future projections to understand how the transportation needs are evolving. Current data on the modal share, the socio-economic status and traffic dynamics were used and evaluated to represent the current mobility demand.

The future mobility demand is estimated based on the evolution of the population in the Study Area and the policy objectives that are outlined in the FAST 2030 plan.

The age distribution in St. Walburge largely reflects the age distribution of the entire city and the arrondissement of Liège. One exception is the slightly lower proportion of inhabitants over the age of 65. Most of the population of St. Walburge is between 15 and 65 years old.

St. Walburge has a relatively high population density, which is partly due to its proximity to the city center. The most densely populated parts of the neighbourhood are in the central areas near Rue de Campine, Montagne St. Walburge and Boulevard des Hauteurs. The population density decreases with increasing distance from the city center.

In terms of the mobility demand, St. Walburge reflects the dependence on the car that applies to the Liège region in general. According to the 2012 Beldam report, 66% of journeys in Liège are made by car, 19% on foot, 13% by public transport and only 1% by bicycle. The proportion of journeys made on foot in Liège is slightly higher than the Walloon average (PUM 2019). However, the proportion of car use is significantly higher with 83% in Wallonia. In contrast, the bicycle plays only 1% of journeys, an almost marginal role in the entire region.

The car dominance in St.Walburge is also seen in the number of cars per household and in the car traffic flows toward and from St.Walburge. In the study area, most households own at least one car, and the car ownership increases significantly with distance from the city center. This trend is partly due to higher incomes in the suburbs and greater dependency on private vehicles in less central locations. Furthermore, this pattern also illustrates the strong dependence on the car, even in a neighborhood that is relatively close to the city center.

It is important to note that the area around the hospital is excluded from this analysis due to the high volume of through traffic and the lack of residential population.

The analysis of the traffic flows - shown with inflows (graduated colors) and outflows (orange circles) - shows that traffic toward the neighbourhood has a significant share of the total volume. Most of the traffic volume is due to transit traffic that flows through the neighborhood without stopping. These transit flows are primarily caused by the strategic location of the area as a connecting route between the city and surrounding regions. The neighborhood is used as a thoroughfare and this leads to high traffic volumes and congestion, which further highlights the challenges of reducing car dependency in St. Walburge.

To overcome these challenges, the city of Liege has drawn up a mobility plan and developed a future modal share in the FAST 2030 plan. The goal is to reduce the share of car traffic in Liege to 63% while increasing the share of public transport to 27% and that of active modes of transport, including cycling and walking, to 5% each. To achieve these ambitious goals, changes are needed in neighborhoods like St. Walburge. The revitalisation of central areas with better public and pedestrian-friendly spaces and the expansion of public transport and cycling infrastructure can help promote a more sustainable urban environment and create viable alternatives to car use. Residents can be encouraged to use more sustainable modes of transportation, especially for shorter everyday trips.

A look at the population development in St. Walburge shows a decline in the number of inhabitants near the city center, with the greatest losses along the main traffic axes such as Montagne St. Walburge/Rue de Campine and Boulevard Léon Philippet/Boulevard Bd Jean-Théodore Radoux. In contrast, the outskirts of the district are experiencing population growth, which in turn highlights the preference for living in often suburban areas in Belgium.

Based on population trends, it can be assumed that dependence on cars will either remain the same or increase. This is due to the fact that as the residential population moves away from city centers, it tends to rely more heavily on private vehicles, as the analysis of car ownership per household shows. Currently, alternative modes of transportation such as public transport, walking or cycling are less preferred for daily trips. However, this trend will need to change in the future in order to meet broader sustainability and transportation goals.

MAIN ATTRACTORS :

There are many attractors in the neighbourhood and its surroundings. Being located on the slope between the city center of Liege and the city of Rocourt, it makes it the perfect traversant neighborhood. Up north the neighbourhood, the hypermarket of Cora Rocourt and, further on the highway, the industrial park of the Haut Sart are major attracting poles. Those have the potential to generate a lot of traffic through the neighbourhood because it is the main connection between the city center and the highway.

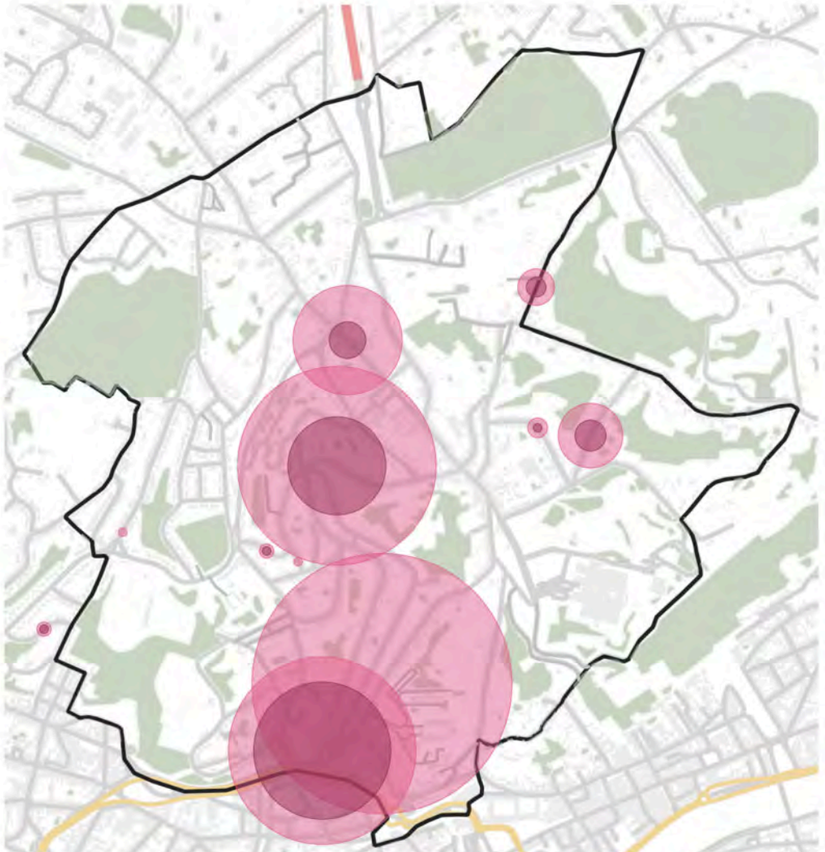
The Citadel CHR hospital and the ISOSL Hospital du Péri/Agora are the other biggest reasons people go through the neighbourhood. Another reason would be the schools in the city center. Most known secondary and superior schools are in Liege. So, it would explain the flux coming in and out during the day.

Beside those major attractors, there are some that are more locals. An example would be The Province Naimette Arena with the RFC Liégois rugby and the Royal football club of Liège. They will attract more people on event days but not on a day-to-day basis.

The last and smaller attractors would be in the neighbourhood, and they are represented by a few primary schools and a few shops.

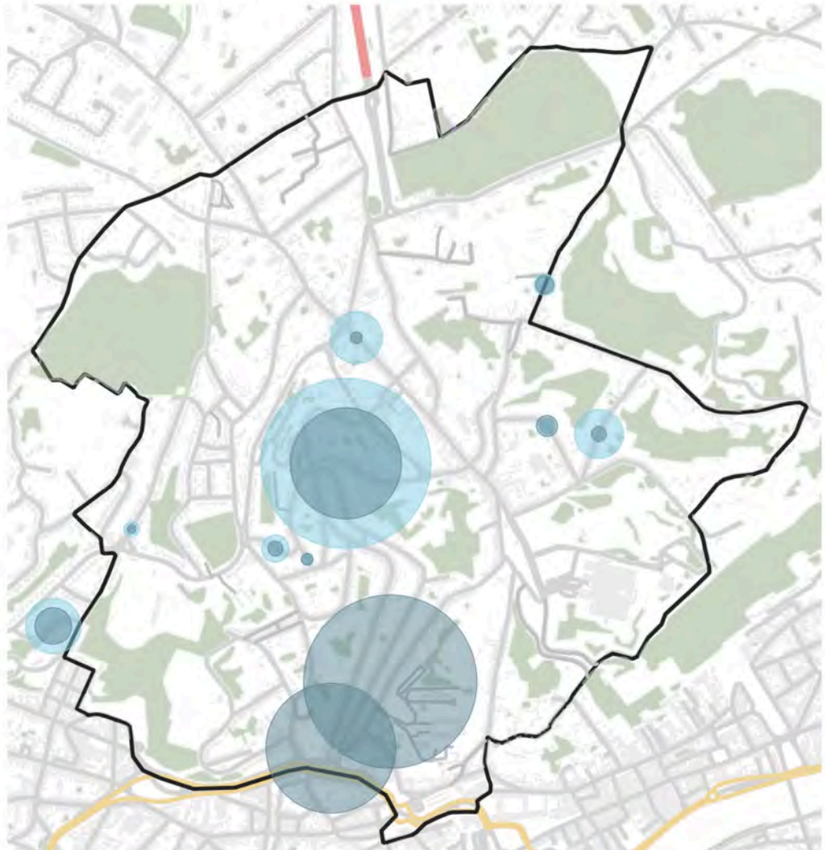
On this map, it’s clearly represented by the size of circles around the poles.

TELRAAM data through Sainte-Walburg



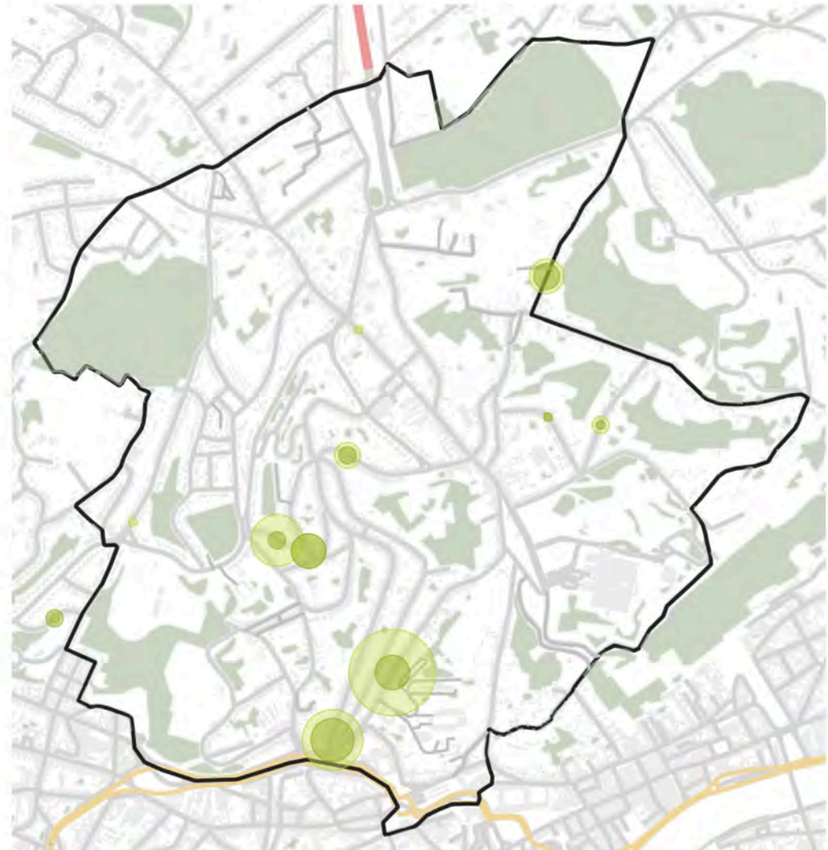
Cars Weekdays
- 204 - 354
- 354 - 504
- 504 - 654
- 954 - 1104
- 1704 - 1854
- 2904 - 3054
- 5004 - 5154
- 5304 - 5454
- 6954 - 7104

Cars Weekends
- 204 - 354
- 504 - 654
- 804 - 954
- 954 - 1104
- 2604 - 2754
- 3654 - 3804
- Streets
- Buildings
- Green spaces
- Sainte-Walburg



Cycling Weekdays
- 29 - 39
- 39 - 49
- 59 - 69
- 79 - 89
- 149 - 159
- 159 - 169
- 169 - 179
- 539 - 549

Cycling Weekends
- 19 - 29
- 29 - 39
- 39 - 49
- 49 - 59
- 59 - 69
- 109 - 119
- 349 - 359
- 409 - 419
- 549 - 559
- Streets
- Buildings
- Green spaces

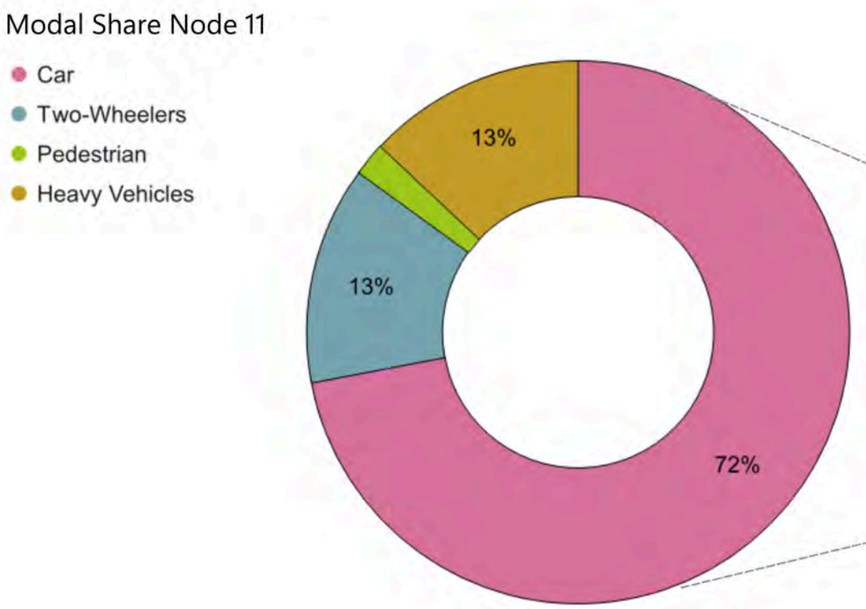


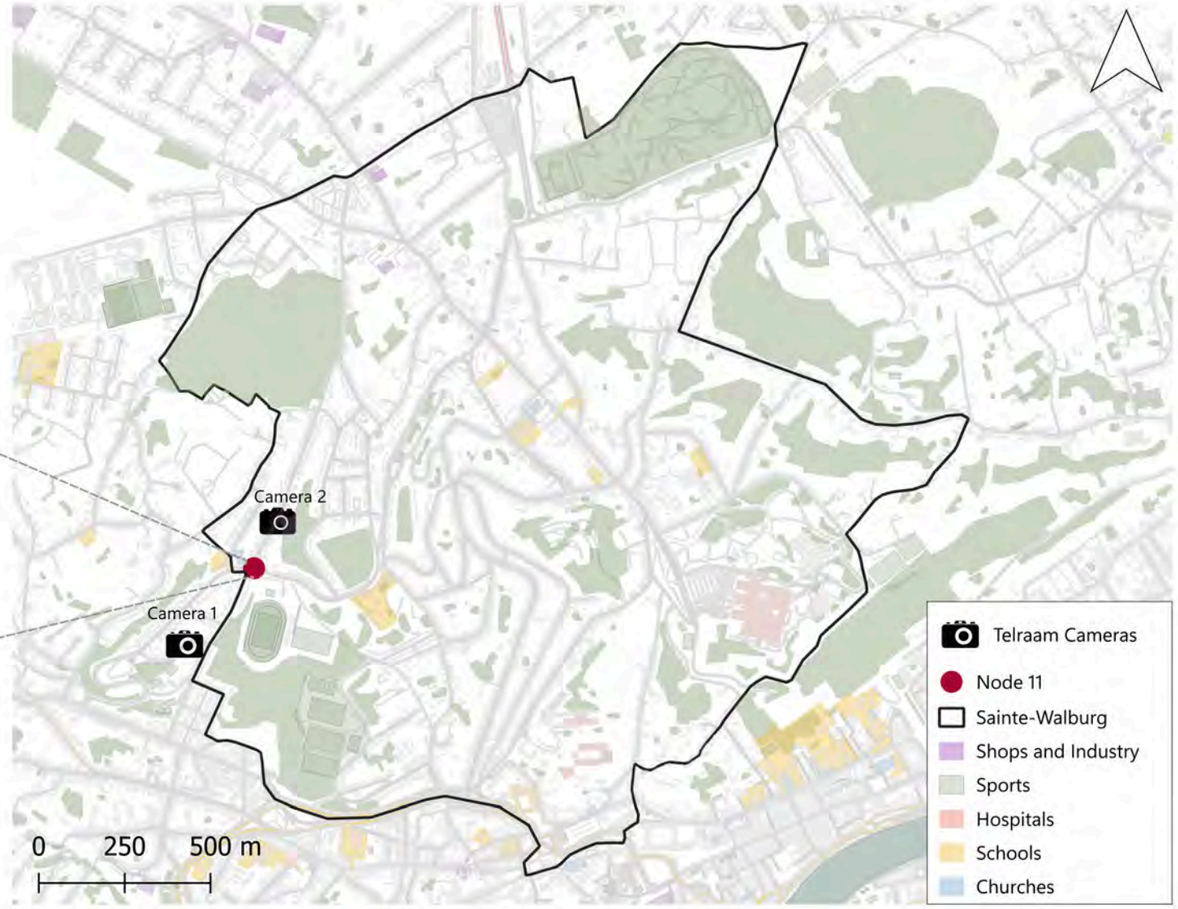
Pedestrian weekdays
- 4 - 14
- 14 - 24
- 24 - 34
- 34 - 44
- 54 - 64
- 64 - 74
- 94 - 104

Pedestrian weekends
- 4 - 14
- 14 - 24
- 24 - 34
- 34 - 44
- 44 - 54
- Streets
- Buildings
- Green spaces
- Sainte-Walburg

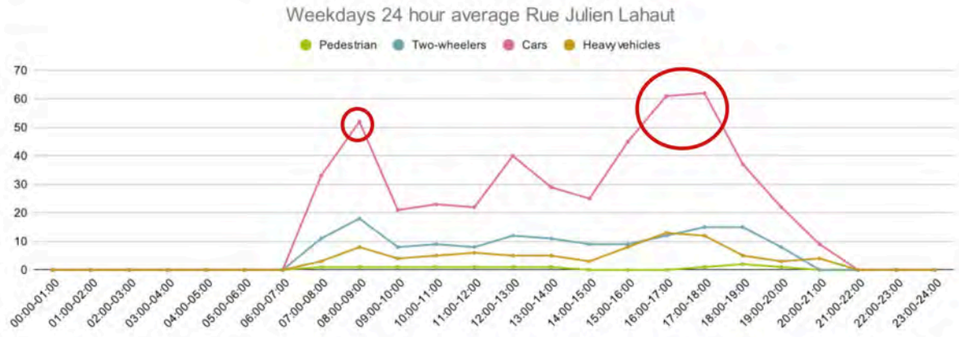
Mobility pattern in Node 11

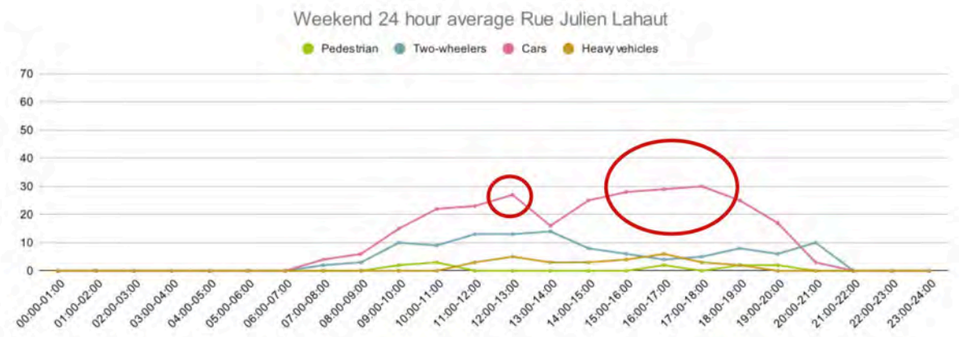
Intersection between Rue Naniot and Bd Léon Philippet/ Bd Jean-Théodore Radoux



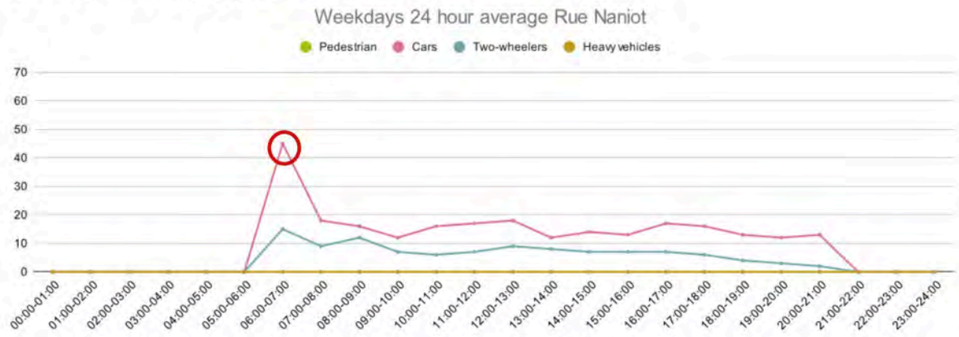


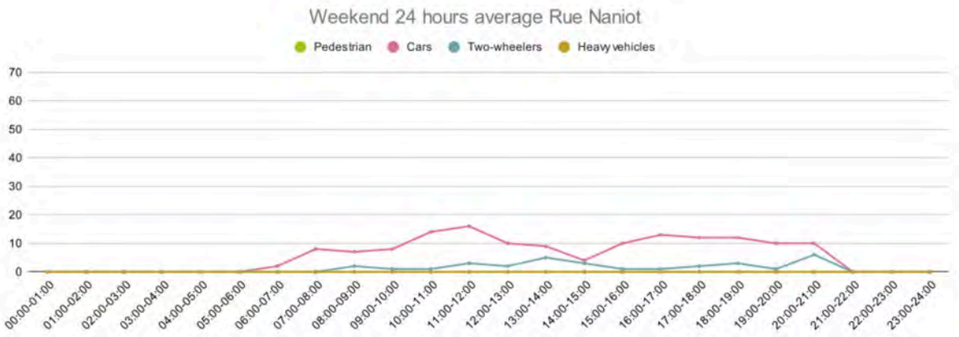
Camera 1 Rue Julien Lahaut September 2024





Camera 2 Rue Naniot September 2024





TELRAAM DATA ANALYSIS :

The volume of mobility and the share of modes of transport can be analyzed using Telraam data. Telraam is a network of cameras attached to the windows of private homes. The Telraam device counts the number of road users driving or walking past. A distinction is made between cars, bicycles, pedestrians and large vehicles. There are several residential buildings in the study area in St. Walburge that are equipped with the Telraam device. On this basis, initial estimations can be made of the proportion of road users and traffic flows. However, it must be taken into account that this is only an estimation and that there may be some inaccuracies in the Telraam data. The inaccuracies in the data result from obstacles such as cars, buses or trucks in the various lines of sight. In addition, the counting device does not always recognize road users accurately, which leads to occasional miscounts. While motorized traffic counts are generally more reliable, the data for bicycles and pedestrians is usually far less accurate. Even within motorized traffic, there are sometimes significant daily fluctuations. For example, certain count points report up to 15,000 vehicles on certain days, while the typical average is between 5,000 and 7,000 vehicles. Such unusually high numbers are probably due to incorrect counts. Another limitation of the Telraam data is the insufficient number of cameras in the district. Although St. Walburge already has a relatively high density of cameras, these do not cover the entire district. This leads to shortages in the data set. Nevertheless, the existing data can serve as a valuable basis for initial assessments and analysis, which can later be refined and categorized to increase accuracy. For the first estimation, reference is made to car, pedestrian and bicycle shares as shown in the A3 sheet

Car

The Telraam data can be used to indicate and compare the number of cars on weekdays and weekends. The data shows that the largest amount of cars on weekdays and the weekend is located along the biggest intersection at the southern end of Montagne St.Walburge and Rue de Campine as well as at the northern end of Rue de Campine. This is due to the fact that Montagne St.Walburge and Rue de Campine are one of the main routes that connect the city to the surrounding areas. On weekdays, the maximum traffic volume in this area reaches ~ 7,104 vehicles per day, which is below the originally forecast 15,000 vehicles per day. At weekends, the maximum amount of vehicles per day is 3804, which shows that the traffic flow is significantly higher on weekdays. This can be linked to transit traffic in the district, which was previously identified and confirmed in the mobility demand analysis. This result is also supported by the Telraam data, which shows significant work and transit traffic.

Bicycle

The data indicates that bicycle traffic is higher at weekends than on weekdays. This underlines the impact of the recreational function of the bicycle rather than its everyday use. The busiest intersections are the same for both bicycles and cars, even if the flow rates are different. The difference between the intersection at the northern end of Rue de Campine and the intersection at the southern end is particularly striking. At the northern end, the proportion of bicycles is higher on weekdays than at weekends with a maximum of 549 Bicycles per weekday and a maximum of 359 bicycles on the weekend. At the southern end is the proportion of bicycles higher at weekends with a maximum of 559 bicycles on the weekend. This observation illustrates a clear dichotomy: the upper area is predominantly characterized by commuter traffic, while the lower area is more likely to be attributed to leisure traffic. In addition, the northern end of Rue de Campine is centrally located in the district and in a residential area. Residents in this area use their bicycles for short trips, e.g. to reach the nearby stores in Rue St.Walburge or to take their children to school. Consequently, the observed traffic probably consists of both commuter traffic and trips within the neighborhood. The bicycle is therefore also used for everyday short journeys.

Pedestrian

The analysis of the amount of pedestrians indicates that the proportion of pedestrians is much higher on weekdays than on weekends. The busiest intersections are the intersection between Montagne St-Walburge and Rue de Campine (max. 104 pedestrians per weekday), the intersection between Montagne St-Walburge and Rue des Églantiers (max. 74 pedestrians per weekday) and the intersection between Boulevard Léon Philippet and Boulevard des hauteurs (max. 64 pedestrians per weekday). At the intersection of Boulevard Léon Philippet and Boulevard des Hauteurs, a clear correlation is observed between the presence of a nearby school and the pedestrian traffic volume.

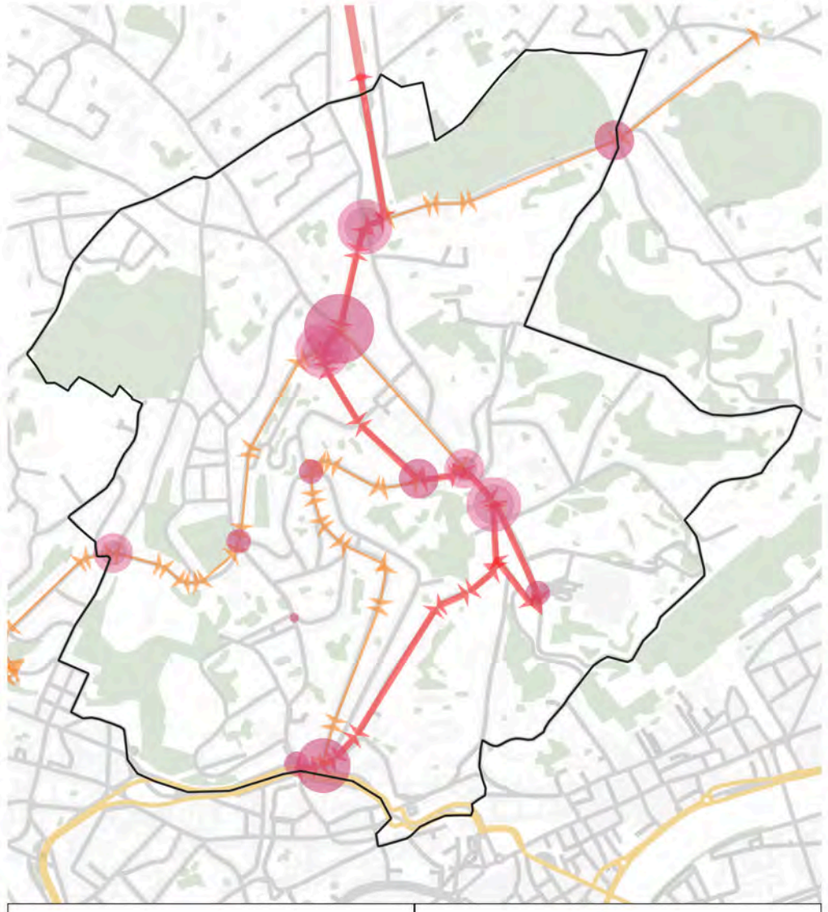
However, some cameras show that the traffic flow is almost as high at weekends as on weekdays. Some intersections show similar pedestrian traffic levels on weekends and weekdays due to recreational use of the area, while others are busy only on weekdays, driven by school and commuter-related activity.

Telraam Data for Node 11

The mobility pattern at node 11 was analyzed using Telraam data. Node 11 is located at the intersection of Rue Naniot and Boulevard Léon Philippet/Boulevard Jean-Théodore Radoux. Rue Naniot is the connection to Rocourt, while Boulevard Léon Philippet provides access to the center of St. Walburge and the highway. This makes Boulevard Leon Philippet one of the main traffic axes in the study area. In the proximity of Node 11 are two schools, a church, residential buildings and a nearby rugby stadium. Consequently, this intersection is heavily frequented. This traffic includes work and transit traffic as well as traffic from the school and rugby stadium. Initial estimations of the mobility patterns are derived based on Telraam data collected from two cameras near node 11. Camera 1 is located on Rue Julien Lahaut and Camera 2 on Rue Naniot. According to this data, the mode share at node 11 is composed of 72% cars, 13% two-wheelers, 13% trucks and 2% pedestrians. The share of two-wheelers at node 11 is, however, relatively high compared to the traffic shares in Liège. It is important to note that the two-wheeler category includes not only bicycles, but also mopeds and motorcycles. Therefore, this percentage is not directly comparable with the modal shares of the city, which refer specifically to the share of bicycles.

An analysis of the average 24-hour of the modal shares recorded on weekdays and weekends in September 2024 shows clear patterns in the number of road users at certain times of the day. Two traffic peaks are observed at the camera in Rue Julien Lahaut for all traffic types, especially cars, at around 7-8 am and 4-5 pm. A similar morning peak can be seen at the second camera in Rue Naniot, while no significant afternoon peak can be seen. These peaks clearly correspond to morning and afternoon commuter traffic. At weekends, the 24-hour average modal share shows a slight increase in car traffic between 10-11am and 5-6pm on both cameras. The morning increase could be a result of people starting their day later, while the afternoon increase could be related to events at the rugby stadium and the return of residents from leisure activities. Overall car traffic is significantly lower at weekends than during the week, as the data around node 11 shows. This underlines that traffic on weekdays is definitely related to work and school.

Main flows in St Walburge

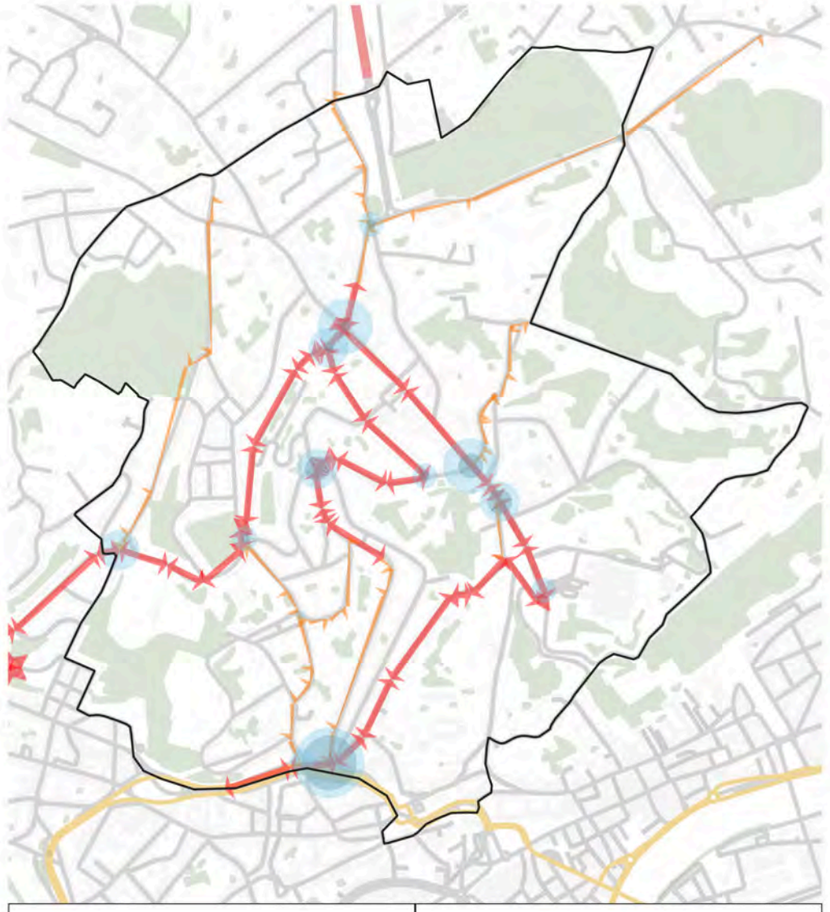


Average car flow per hour during weekdays

- 0 - 55
- 55 - 355
- 355 - 552
- 552 - 778
- 778 - 991

main car flows

- primary
- secondary



Average car flow per hour during the week end

- 0 - 55
- 55 - 355
- 355 - 552
- 552 - 778
- 778 - 991

Average Bycicle flow per hou during weekdays

- 4,5 - 6
- 6 - 12,5
- 12,5 - 17,5
- 17,5 - 24
- 24 - 37

main bycicle flows

- primary
- Secondary

Average bycicle flow per hou during weekend

- 4,5 - 6
- 6 - 12,5
- 17,5 - 24

Average pedestrian flow per hour during weekdays

- 7,5 - 12,5
- 12,5 - 39
- 39 - 60
- 60 - 89,5
- 89,5 - 161

main pedestrian flows

- primary
- Secondary

Average pedestrian flow per hour during weekend

- 12,5 - 39
- 39 - 60
- 60 - 89,5
- 89,5 - 161

FLOW SURVEYS :

The report distinguishes between three types of mobility flows: Pedestrian, bicycle and car. The data for these flows were collected on three different days and at three different times:

- Half an hour on weekday mornings during school days: between 8.15 am and 8.45am;
- Half an hour on Wednesday 16/10 : between 4.15pm and 4.45pm;
- Half an hour on Saturday afternoons: between 3.15pm and 3.45pm

The collected data provides valuable insights into the movement of pedestrians, cyclists, motorcycles, cars and other modes of transport. All observations were conducted in good weather conditions (not rainy). This eliminates weather as a factor that might otherwise deter non-car modes. The average hourly traffic flow was then calculated on the basis of the collected data in order to illustrate the main traffic flows. The values at the various intersections were then analyzed and classified using Jenks' natural breaks classification method. The values were divided into three classes: primary, secondary, and low flow. Primary flows result from the highest class, while secondary flows represent the medium class. Values in the lowest class were not mapped, because of the insignificance for the analysis. A distinction was made between counts on weekdays and weekends.

A limitation of this methodology is that the data was only collected at specific nodes. Consequently, no data is available for the entire neighborhood and an interpolation was required to map the main flows. Nevertheless, the data provides a good overall view of the main flows in the neighborhood, because the counting groups cover a significant area of the neighborhood and provide a more comprehensive data set than the 11 Telraam cameras in the neighbourhood of St.Walburge.

Car Flow

The primary traffic flow in the St.Walburge flows in a north-south direction. This north-south axis starts at the Montagne St. Walburge in the south and ends at the highway in the north. An interesting observation is that Rue St. Walburge is not classified as a primary but as a secondary traffic flow. The primary traffic flow runs through Avenue Victor Hugo. This is possibly due to the fact that Rue St. Walburge is a one-way street. In addition, there are two axes for secondary flows. The first axis is a derivation of the main north-south axis and includes Rue de Campine and Rue St.Walburge, which go parallel to Montagne St.Walburge and Avenue Victor Hugo. The second axis stretches from south-west to north-east and is formed by several major boulevards of the neighbourhood. These are Boulevard Fosse-Crahay, Boulevard des Hauteurs, Boulevard Léon Philippet and Boulevard Jean-Léopold Radoux.

The most crowded nodes are:

- Node 1: Montagne St.Walburge, Rue de Campine, Rue Fond de Pirette and Rue de l'Académie with a maximum flow of 778 vehicles per hour.
- Node 5: Rue St.Walburge, Boulevard Jean de Wilde and Boulevard des Hauteurs with a maximum flow of 991 vehicles per hour.
- Node 4: Boulevard Jean de Wilde and Vieille Voie de Tongres, with a maximum flow of 778 vehicles per hour.

A comparison of these observations with Telraam data reveals that Telraam underestimates the actual traffic flow. In order to compare the data effectively, the counted values must be multiplied by 10. This factor takes into account the fact that the volume of traffic is not uniformly high over a 24-hour period. Instead, only the peak hours are taken into account to calculate the average daily traffic volume. For Node 1 the Telraam data reports a maximum daily car flow of 7,000 vehicles per weekday. If this value is compared with the observed hourly maximum value of 778 vehicles and multiplied by 10, an estimated daily traffic flow of 7,780 vehicles is obtained. Although this figure is close to the Telraam estimation, it still exceeds the reported value. For Node 5, Telraam indicates a maximum daily traffic flow of 1,800 vehicles on weekdays. If this is compared with the observed hourly maximum value of 991 vehicles and multiplied by 10, an estimated daily traffic flow of 9,910 vehicles is obtained. This is significantly higher than the Telraam estimation. This discrepancy underlines the need to critically examine the first observations with Telraam and to compare and analyze them with the data from the counts.

Bicycle Flow

There are two main bicycle flows that both start from Node 5 (Rue St.Walburge, Boulevard Jean de Wilde and Boulevard des Hauteurs). One main cycle flow heads south through Rue St.Walburge and Montagne St.Walburge, while the other main bicycle flow heads southwest towards Ans, past Boulevard Léon Philippet and Boulevard Théodore Radoux. There are also four secondary cycle axes. The first secondary axis runs through Rue de Campine, while the second runs along Rue Xhovémont. The axis through Rue Xhovémont splits towards the main axis of Boulevard Léon Philippet and towards the northern part of Rue de Campine. Additionally, there is also a secondary bicycle axis along Rue Naniot. The most crowded nodes are:

- Node 1: Montagne St.Walburge, Rue de Campine, Rue Fond de Pirette and Rue de l'Académie
- Node 3: Montagne St.Walburge and Rue St.Walburge
- Node 5: Rue St.Walburge, Boulevard Jean de Wilde and Boulevard des Hauteurs

Nodes 1 and 5, which are also ones of the most frequented by car traffic, have a high volume of bicycle traffic. Node 5 is an important intersection, where two large flows of bicycle traffic converge and provide a connection to the surrounding areas. Node 1 connects St.Walburge with the city center. Node 3 is close to the "center" of St.Walburge with the shops on Rue St. Walburge, as well as a connection to the hospital and other directions within the district. As a result, there is also some bicycle traffic there.

The comparison of the data on cycling volumes with the Telraam figures shows that Telraam apparently overestimates the number of cyclists. In particular, the Telraam data shows a higher number of cyclists than the data of the counting. In addition, the nodes with the highest traffic volumes identified by Telraam differ from those identified by the counting. This may be due to the fact that the Telraam data is based on camera measurements, whereas the manual counts are based on direct empirical observations. As a first approximation, the counting may be more accurate than the Telraam estimates. However, the Telraam data is collected daily, while the manual counts are conducted hourly, which means that the counting method may not match the actual numbers. But the counting covers a larger part of the district. For further analysis, it could be beneficial to use the counting data around the rush hour as it provides an accurate insight into the main commuter flows. Conversely, Telraam data could be more effective for capturing recreational activities, which often result in higher bicycle traffic outside of typical commuting hours. The combination of these datasets would provide a more comprehensive understanding of overall bicycle traffic flows.

Pedestrian Flow

Two primary pedestrian flows can be observed in St. Walburge. Both primary pedestrian flows originate at Node 5. The first flow heads south through Rue St. Walburge, Avenue Victor Hugo and Montagne St. Walburge. The second flow moves southwest along Boulevard Fosse-Crahay, Boulevard des Hauteurs, Boulevard Léon Philippet and Boulevard Jean-Léopold Radoux towards Ans. There are four secondary pedestrian flows through Rue de Campine, Rue Xhovémont, Rue des Buissons and Rue Naniot.

The most crowded nodes are:

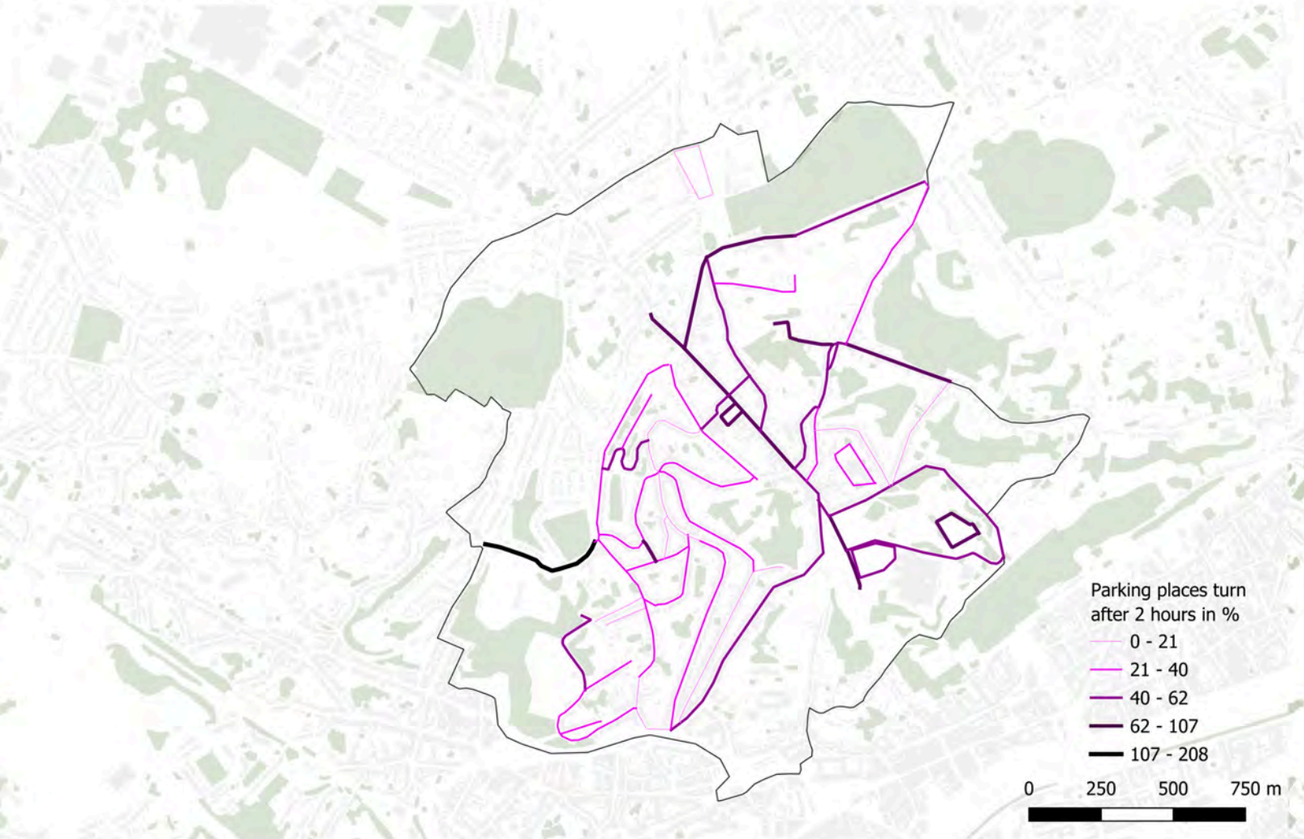
- Node 1: Montagne St.Walburge, Rue de Campine, Rue Fond de Pirette and Rue de l'Académie
- Node 2: Rue Hocheporte and Rue de l'Académie
- Node 3: Montagne St.Walburge and Boulevard du Douzième de Ligne
- Node 8: Rue de Campine and Avenue Victor hugo
- Node 10: Boulevard des Hauteurs, Boulevard Léon Philippet, Rue Auguste Donnay and Rue Xhovémont
- Node 11: Rue Naniot and Boulevard Léon Philippet/Boulevard Jean-Léopold Radoux
- Node 14: Boulevard du Douzième de Ligne and CHR

Nodes 1 and 2 serve as important connections between the neighbourhood and the city center and act as transition points, which leads to a high volume of pedestrian traffic. Nodes 3 and 8 are located along the primary pedestrian flow near the "center" of St. Walburge, where various shops are located. This commercial activity likely contributes to the increased pedestrian presence. In addition, the nearby school and church further increases pedestrian traffic in this area. Node 10 connects several streets, especially those leading out of residential areas in the neighbourhood. A school near this node also contributes to the observed pedestrian flows. This is also the case with Node 11. Node 11 has two schools in the immediate proximity. In addition, there is some pedestrian traffic around the nearby rugby stadium. Node 14 is located close to the hospital, where pedestrian flows are likely to be generated by visitors and patients. In addition, this node may also be frequented by tourists or citizens as it provides access to the nearby green spaces around the Citadelle.

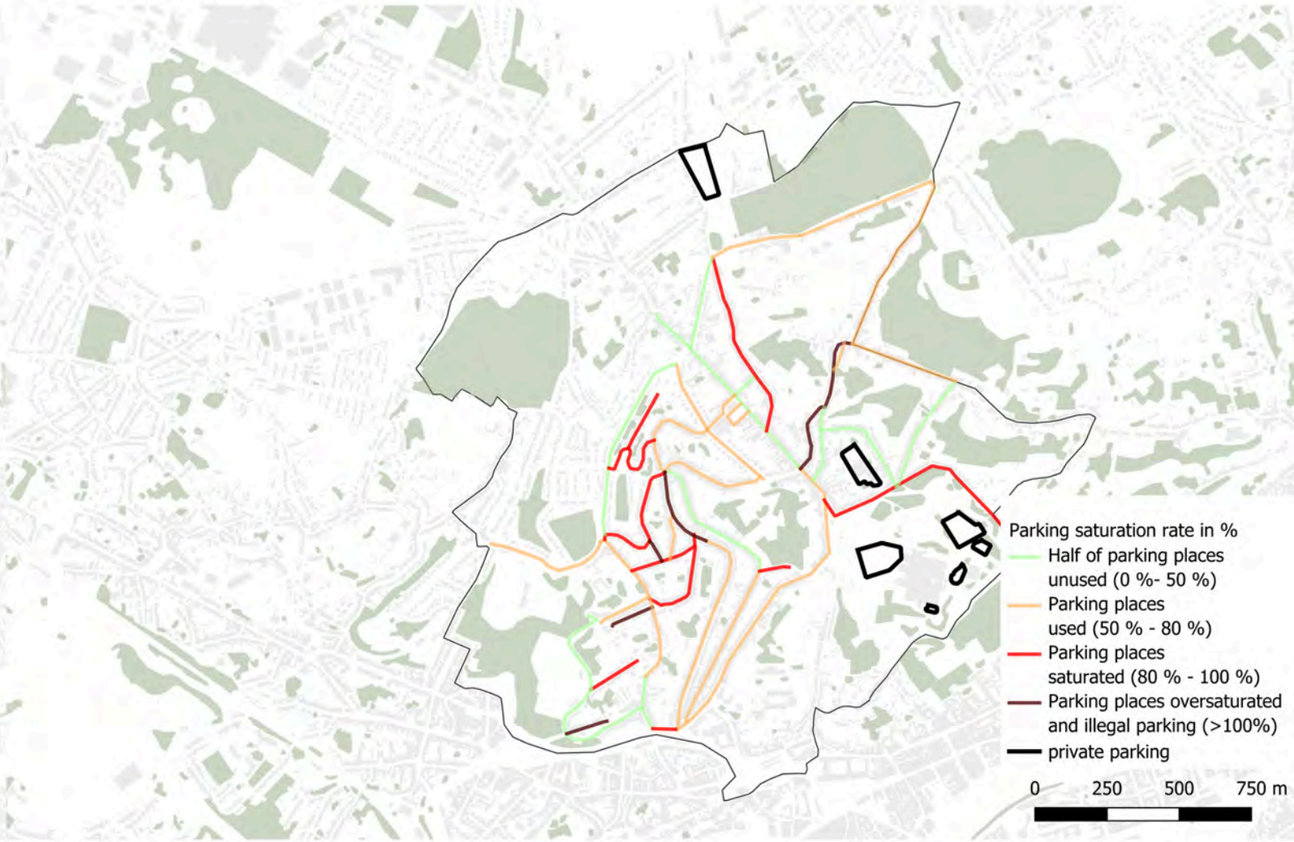
Compared to the Telraam data, the number of manually recorded pedestrians is significantly higher. A maximum of 74 pedestrians per day were recorded for node 1 according to Telraam, while the counting showed a peak value of 89.5 pedestrians per hour. This exceeds the Telraam figures by far when extrapolated to the day. The highest pedestrian numbers are observed at node 3 and 8, with a maximum of 161 people per hour. This can be attributed to the factors already mentioned, such as the proximity of stores, schools and other major attractions. Unfortunately, these values cannot be directly compared with the Telraam data due to the lack of information for these nodes. Despite the discrepancies in absolute numbers, Telraam and manual counts identify almost the same important pedestrian hotspots. It is important to note that the Telraam devices do not record pedestrian traffic as accurately as manual observation.

Interestingly, unlike cars and bicycles, pedestrian hotspots show a clear correlation with major attractors, such as commercial areas or schools. This observation leads to the following hypothesis. There is a strong correlation between pedestrian flows and attractors. In contrast the bicycle flows do not align with attractors and may instead be linked to recreational activities or commuting routines. The Car flows, as revealed by the OD matrix, are primarily associated with transit flows. These patterns highlight behavioral and functional differences between pedestrians, cyclists and motorists.

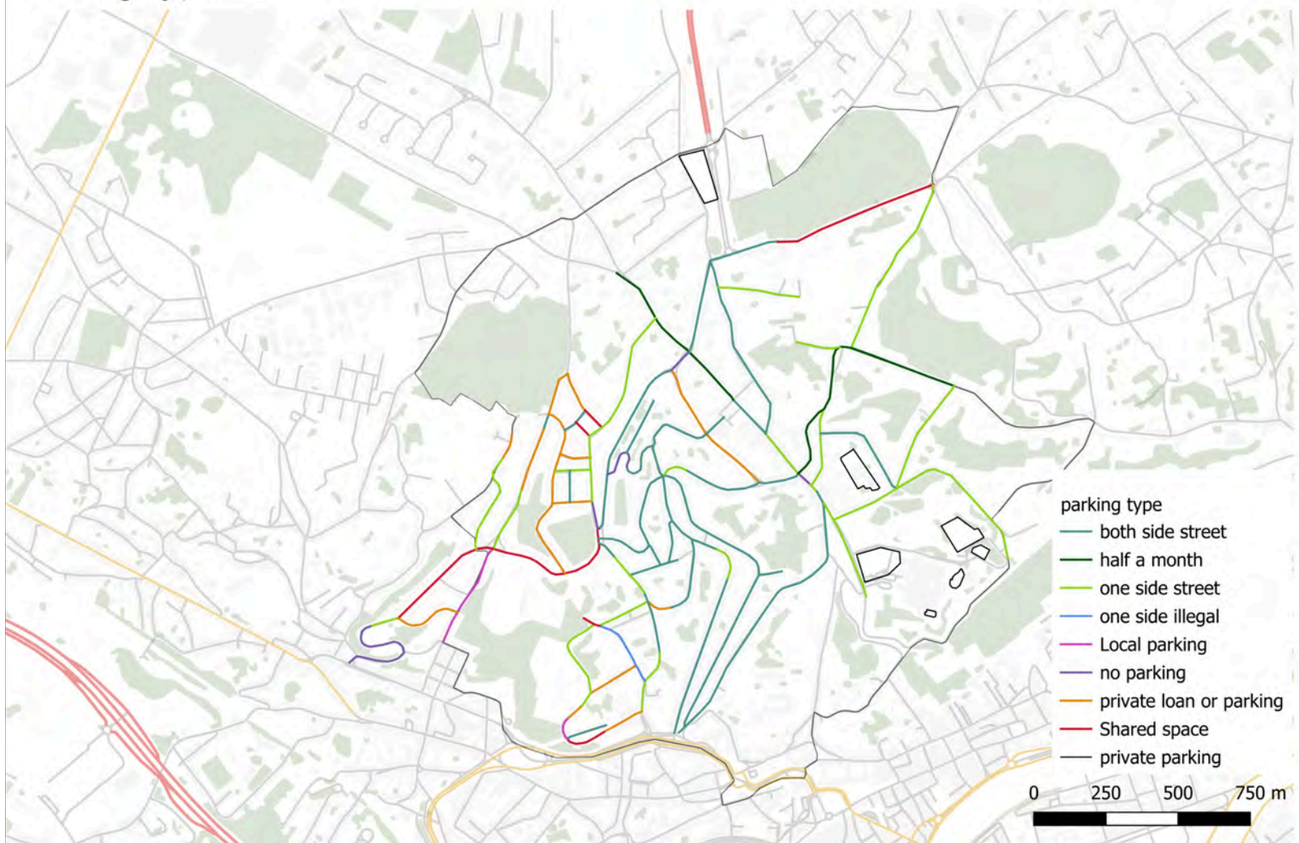
Parking places turn after 2 hour



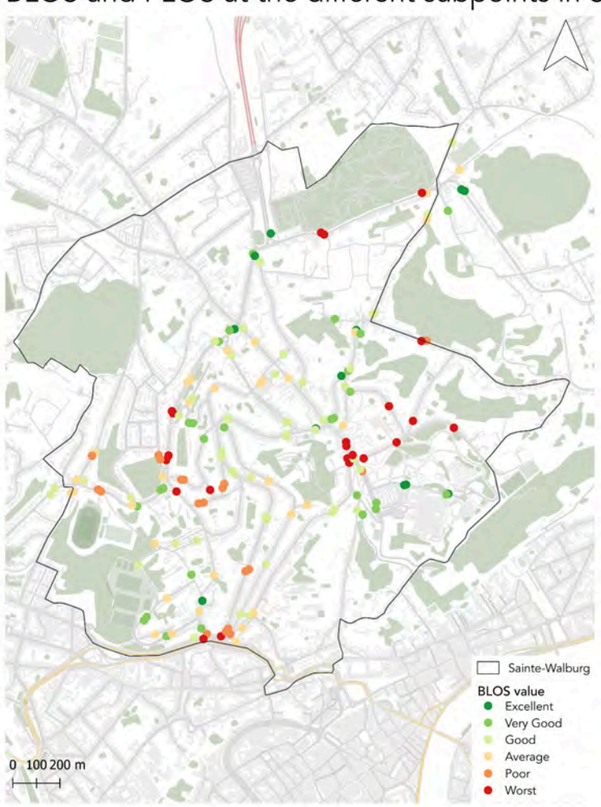
Parking saturation rate (in %)

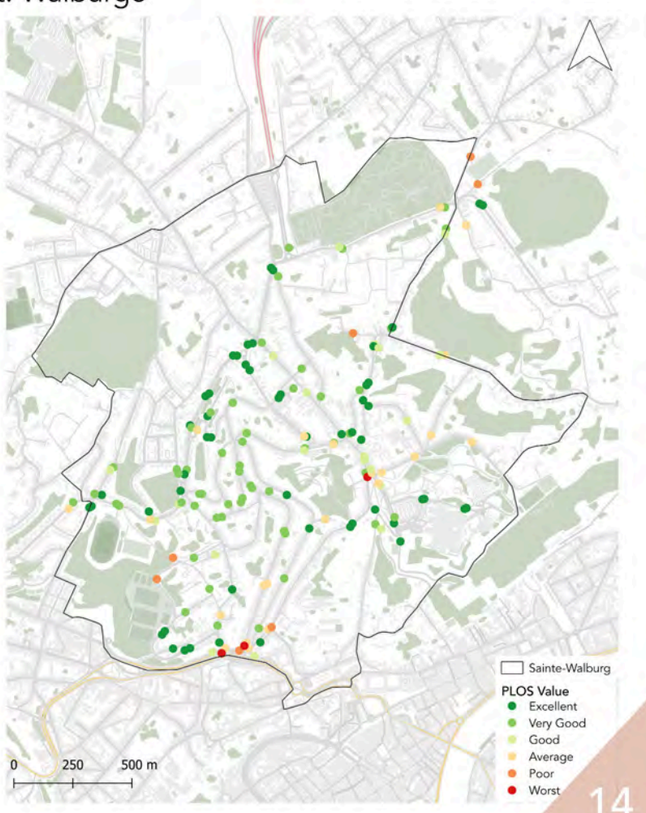


Parking type



BLOS and PLOS at the different subpoints in St. Walburge





A parking situation diversified :

The parking situation in the neighbourhood is very diversified. The different parameters that define the parking situation differ a lot between the different places. The A3 shows three different parameters : the parking turn rate in two hours, the saturation rate of the parking and the parking typology. Those data have been obtained by a counting realised on the field or by some observation made on google street view.

Parking turnover rate

The parking turn in the neighbourhood is as diverse as the other parameters. This turn over rate is higher on the boulevard Léon Philippet, the Rue St-Walburge and the surroundings of the citadel. Those axes are all linked with at least one attractor. The Boulevard Léon Philippet is surrounded by a church, a school and the sports field of the Naimette Arena. On the rue St-Walburge, there are several schools and the shopping cluster of the neighbourhood. Finally, the surroundings of the citadel are obviously linked with the hospital. The part of the neighbourhood presenting a low parking turn rate are the ones that are mostly residential and without any attractor. Those observations show a correlation between a high parking turn rate and an attractor in the surrounding of the street.

Parking saturation rate

The saturation rate determined for several streets of the neighbourhood has been calculated by the ratio between the number of car parked counted on site and the official parking places of each street. The streets that are presenting the highest saturation rate are the streets surrounding the citadel and the smaller residential streets mostly located in the west of the neighbourhood. The Montagne and rue St-Walburge does not seem to present a high saturation rate. However, on Rue de Campine situated next to Montagne St-Walburge presents a problematic saturation rate with some parts that are overly saturated and some illegal parking. On the axis of the great boulevards (Léon Philippet, Théodore Radoux, Boulevard des Hauteurs...), the saturation rate seems to be low. Meaning there is a correlation between the residential function and a high saturation rate. However, there are some exceptions to this rule like the Montagne St-Walburge already cited before or Rue Fond de Pirette.

Parking typology

The third parameter studied is the typology of parking observed. This parking typology has been established by the observation of the current situation through google street view. This typology distinguishes eight types of parking : both side streets, parking half of the month, one side street, one side street with illegal parking, local parking, no parking, private loan and shared spaces. This typology can explain some of the previous observations. Firstly, the typology “both side streets” seems to be the streets where the saturation rates are the lowest. On the Rue de Campine, there are two types of parking : one side and both sides. The “both sides part” tends to present a lower saturation part than the “one side part” on the upper part of the street. On the other side, the streets listed as “one side streets” tend to be more crowded than the others. The other typologies are much less represented, by this underrepresentation. Therefore, there is no correlation observed.

Conclusion on the parking

Those three parameters show that the parking problems are mostly observed in the residential area that are not linked with the different attractors. An exception to this rule is the citadel surroundings. The area linked with the attractors, are the ones presenting the highest turnover rate limiting the long-term carpark on the street. Also, the attractors are often located on the main axis listed as “both side streets” typology. Therefor, the areas linked with the attractors present the parking typology providing the most parking places limiting their saturation rate.

PLOS

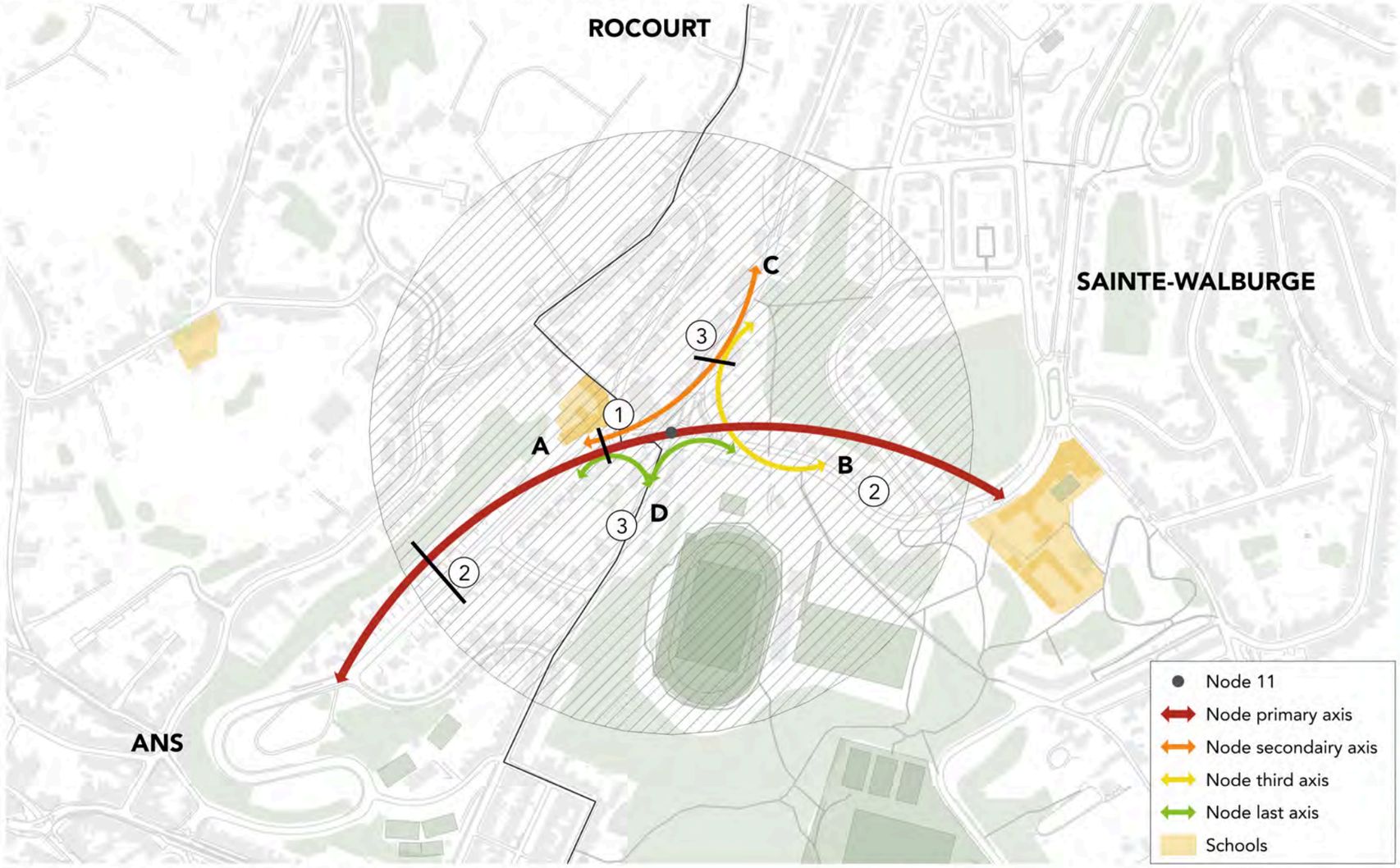
The Pedestrian Level of Service (PLOS) map for St. Walburge provides insights into the quality of the pedestrian infrastructure across the neighborhood of St. Walburge. The collected data was analysed based on Downing, R. (2008) Level of Service. Analysis for Urban Streets: Users Guide. Based on this, the neighborhood performs well overall for Pedestrian Level of Service (PLOS). The areas shown in dark green have an excellent Pedestrian Level of Service Score. These points are scattered throughout St.Walburge in residential or quieter areas as well as major traffic routes. Light green points indicate still very good PLOS scores. These areas are found in most parts of Saint Walburge providing reasonable but not excellent pedestrian conditions. Yellow and Orange points highlight areas with an average PLOS score. These points are clustered in specific sections, particularly along streets with higher traffic volumes and near large pedestrian crossings. But as well some areas without a sidewalk. The red and dark red points mark the locations with the worst pedestrian conditions. These areas are concentrated along major pedestrian crossings and busy roads. Conditions for pedestrians are particularly difficult where Rue Campine and Rue Montagne St. Walburge converge near the city center and meet Rue de l'Academie. With its heavy traffic and size, the intersection creates an additional obstacle for local pedestrians.

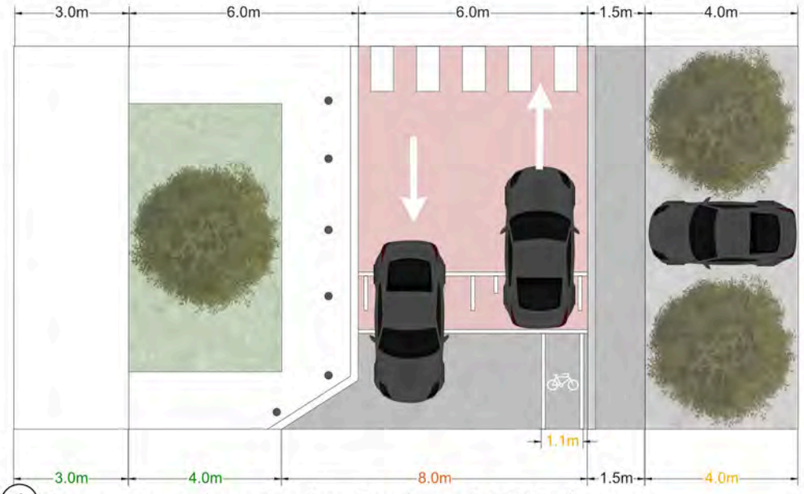
The map shows that St. Walburge offers excellent or very good pedestrian conditions. However, certain PLOS scores do not align with the conditions on the spot. For example, Boulevard Léon Philippet is an area where the reported PLOS score appears good but on one side of the boulevard there is virtually no sidewalk. It is a shared space with parked cars. Another example is Rue Naniot, the PLOS scores are good whereas in reality, the sidewalks are really narrow (less than 1m50) and the pavement and coating are really deteriorated. These conditions significantly detract the pedestrian experience. This discrepancy is due to limitations in the evaluation criteria and data collection method, which made it difficult to assign accurate scores in such areas. As a result, Boulevard Léon Philippet and Rue Naniot received an unrealistically favorable PLOS score despite their poor pedestrian infrastructures. This inaccuracy of the analysis method used should be taken into account when evaluating pedestrian infrastructure.

BLOS

The Bicycle Level of Service (BLOS) map for Sainte Walburge provides a clear picture of the cycling infrastructure quality across the whole neighborhood. The collected data was also analysed based on Downing, R. (2008) Level of Service. Analysis for Urban Streets: Users Guide. Based on this, the neighborhood performs average to worst overall for Bicycle Level of Service (BLOS). Some excellent cycling conditions based on the BLOS analysis are located primarily in the northern and northeastern parts of St. Walburge. Points with a good cycling level of service are spread throughout the central part of Saint Walburge. The conditions should be acceptable but they could be enhanced. The orange points indicate streets where the cycling conditions are poor, which are concentrated in the central and southern parts of St. Walburge. The red and dark red points represent the worst conditions for cyclists. These points are concentrated along the main traffic corridors in the southern and central parts of St. Walburge. The three main points with the worst BLOS are located at the nodes 1/2, 3 and 10. These intersections have extremely high traffic volumes and act as main axes for both car and bicycle traffic. However, there is a lack of dedicated cycling infrastructure at these locations to protect the cyclists. It is important to note that here too, an accurate representation of the reality was sometimes difficult due to limitations in the evaluation criteria and data collection method. For example, Boulevard Léon Philippet and Boulevard des Hauteurs have a marked cycle lane on one side, but there was no high rating for cycling comfort (BLOS). In general, the BLOS score is closer to reality than the PLOS (Pedestrian Level of Service) score. In particular, cycling infrastructure needs to be significantly expanded and improved, especially along major roads and intersections.

Quality of pedestrian and cycling infrastuctures + mobility patterns in the node 11

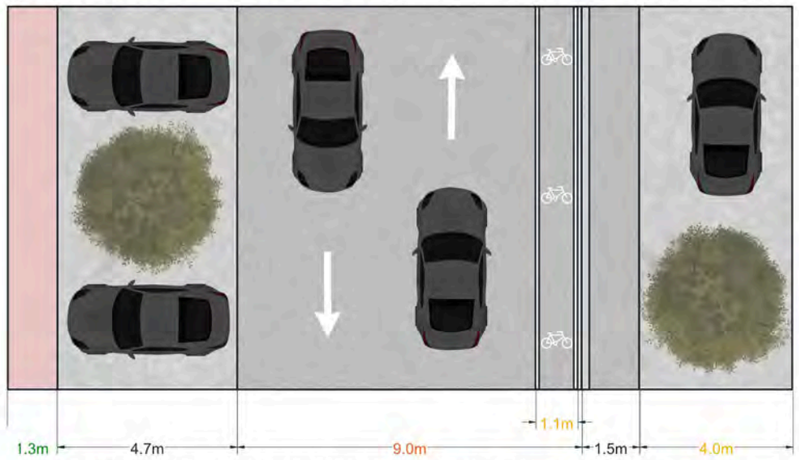




① Sequence at the school on Boulevard J-T Radoux

Only barrier of the node in front of the school, large sidewalk, two way street with bike lane on the road, shared space for parking and sidewalks

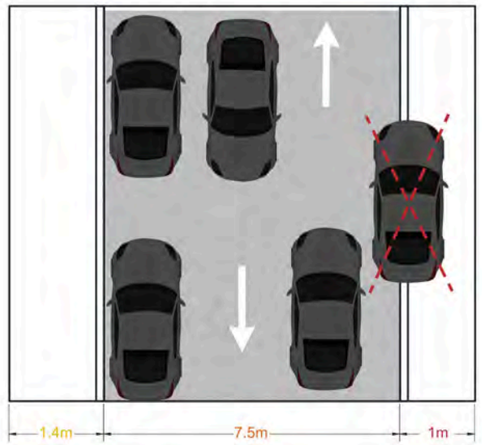
② Sequence of Boulevard J-T Radoux and Boulevard Léon Philippet



Good sidewalk with a good pavement, large space for parked cars, large two way street with bike lane on the road, shared space for parking and sidewalks

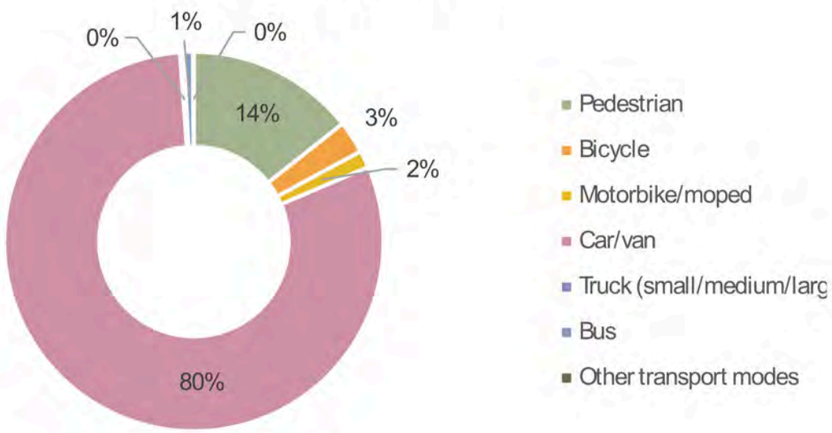
③ Sequence of Rue Naniot

Sidewalk with a bad pavement, two way street with parked cars on the road, illegal parking on the sidewalk

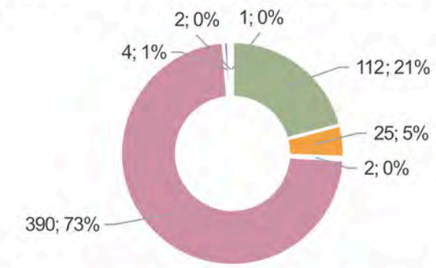


Mobility patterns in the node

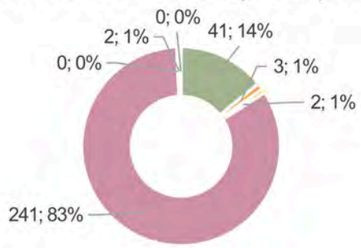
Modal Share Node 11



Modal Share Node 11 Weekday 8:15 am - 8:45 am



Modal Share Node 11 Saturday 3:15 pm - 3:45 pm



Based on the traffic counts a modal share for Node 11 could be created. The modal share in Node 11 is made up of 80% car, 14% pedestrian, 5% two-wheelers and 1% bus. The dominance of car traffic is even more pronounced than in the modal share for the node derived from the Telraam data. In addition, the share of car traffic clearly exceeds the car share of the City of Liège. The counts also highlighted variations in traffic flow at different times of day.

1. Weekday Morning (8:15 am - 8:45 am)

On weekday mornings, there is a significant amount of car traffic as well as a notable presence of pedestrians on the road. This is especially the case for the main traffic flows from A to B and from B to A. For example, 113 cars and 40 pedestrians were counted in the direction from B to A, which underlines the morning commuter flows. Traffic flows to and from points C and D also increase during this period. This pattern reflects typical morning commuter behavior, with both cars and pedestrians moving towards work and school. There are two schools near node 11, which probably explains the particularly high proportion of pedestrians observed in the morning compared to other count times, because parents bring their children to school. Bicycle use is consistently low even though the Node is part of the main bicycle flows in the neighbourhood. Only two buses were observed traveling from A to C and from C to A, which is the bus 23 that serves the Darchis-Ste-Walburge-Citadelle route twice per hour.

2. Wednesday Afternoon (4:15 pm - 4:45 pm)

On weekday afternoons, the volume of traffic around node 11 shifts significantly compared to the morning. During the time window from 4:15 pm to 4:45pm the car traffic is still high, especially in the direction from A to B, where 174 vehicles were counted. This peak reflects the after-work traffic. While car traffic continues to dominate, there is also a presence of motorcycles and bicycles. This increases slightly in the afternoon compared to the morning. Perhaps because people are taking alternative routes home or using these means of transport for errands. Pedestrian activity is still moderate, but lower than in the morning peak, because school traffic is no longer as present in the afternoon. Bus traffic is busier than in the morning, due to the frequency or delays of bus line 23 on the Darchis-Ste-Walburge-Citadelle route.

3. Saturday Afternoon (3:15 pm - 3:45 pm)

On Saturday afternoons, the traffic data around node 11 shows a significant decrease in traffic volumes for all modes of transport compared to weekdays. In the direction from A to B, for example, which has a high volume of traffic on weekdays, only 72 vehicles were counted and pedestrian traffic was similarly low. The low counts on Saturdays indicate that the high traffic flows on weekdays are largely due to the commuter traffic and transit traffic and certain local attractions, namely the two schools and the nearby rugby stadium. Both the schools and the rugby stadium generate an increased volume of traffic on weekdays. The nearby rugby stadium can increase the volume on the weekend as well if there are games.

PLOS

For node 11, the level of service for pedestrians (PLOS) is rated as very good/excellent. But the situation along Boulevard Leon Philippet is slightly different in reality. Here, there is a clearly marked sidewalk on one side, while the other side is characterized by a shared space with parking spaces. The shared space can make it difficult to identify a dedicated pedestrian path, as the width of the sidewalk depends on the length of the parked cars, especially in the area of the rugby stadium. In addition, the surface is not continuous, which can be a problem for some pedestrians. Also, the Sidewalk in Rue Naniot is less than a meter wide on one side, which does not provide a good level of service for pedestrians. This needs to be improved.

BLOS

For node 11, the level of service for cyclists (BLOS) is rated as average to poor. While there is a narrow bike lane along one side of Leon Philippet Boulevard, it is inadequate in terms of safety and comfort due to its narrow width and proximity to fast moving traffic with a speed limit of 50 km/h. This does not provide a safe and comfortable cycling experience, especially for less experienced cyclists or those looking for a safe, protected route. There is almost no dedicated cycling infrastructure in the surrounding streets. While the road surfaces are generally in good condition, sharing the roadway with cars continues to put cyclists at risk. As there are no separated cycle lanes, they are more exposed to car traffic, which can make cycling in this area uncomfortable and potentially unsafe. The cycling infrastructure needs to be improved to provide safer biking.

Overall, conditions for cyclists at the node 11 are moderate at best, with limited dedicated infrastructure and minimal protective measures. This provides cyclists with few safe options and forces them to divert to shared roads where traffic conditions can be unfavorable. Improvements such as wider, protected bike lanes and lower speed limits could significantly improve safety and accessibility for cyclists in this area.

Draft of intentions

ROCOURT

VOTTEM

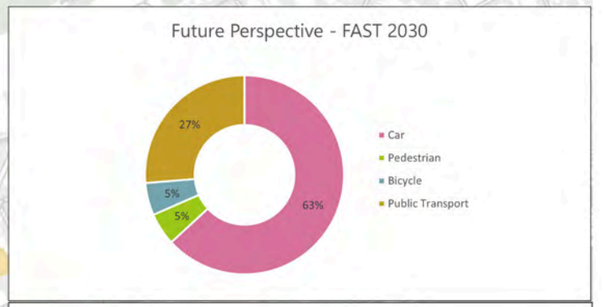
THIER A LIEGE

ANS

LIEGE

OBJECTIVES :

1. WIDER AND SAFER BIKING
2. WIDER AND SAFER SIDEWALKS
3. CYCLING DENSIFICATION ZONE
4. WALKABLE SITE
5. CONNECTIONS THROUGH GREEN SPACES



Shops
Schools
Hospitals
Buildings
Green spaces
Sainte-Walburge

0 250 500 m

Objectives:

1. Wider and Safer Biking

The cycling infrastructure in St. Walburge should be improved, with a focus on safety and usability. The current bicycle infrastructure lacks safety, existence and comfort. Key priorities include upgrading the existing cycle lanes and developing new cycle lanes to create a broader cycle network in the neighbourhood. To ensure a safe and stress-free experience for cyclists of all ages and abilities, lanes should be separated from car traffic wherever possible by barriers or dedicated buffers. In areas where physical separation is not possible, clear and highly visible markings should be installed to demarcate bike lanes and increase safety at critical points such as intersections and high-traffic zones. The existing infrastructure should be optimized, with particular focus on widening narrow lanes and modernizing outdated paths. This will ensure that cyclists can move comfortably and safely through the district.

This objective is represented on the map by the blue arrows connecting to form a network and the horizontal lines to show the enlargement.

2. Wider and Safer Sidewalks

Pedestrian routes in St. Walburge should be improved to ensure that they are safe and accessible for all users. This includes widening narrow sidewalks to allow for more comfortable and safer walking and creating new paths where there are gaps in connectivity. Damaged sidewalk surfaces will be repaired to create an accessible experience, especially for children, seniors and people with disabilities. To further enhance safety, protective measures such as curb widening and natural buffers such as trees could be introduced at strategic locations. These measures will not only create a barrier between pedestrians and vehicular traffic, but will also improve the aesthetics of the streetscape by prioritizing pedestrian comfort and safety, thereby promoting a walkable, inclusive and vibrant urban environment.

3. Cycling densification zone

The cycling infrastructure in St. Walburge should be densified in order to develop a coherent cycling network and promote a more bicycle-friendly district. The establishment of a cycling densification zone should increase the share of cycling in the neighborhood. This is in line with the city's future goals of increasing the cycling in the modal share and promoting active modes of transportation such as walking and cycling. The zone will focus on making active transportation more attractive and convenient, especially for short trips within St. Walburge and between the neighborhood and the city center. By reducing dependence on the car, sustainable mobility will be promoted and traffic congestion reduced.

This objective is represented on the map by the blue background in the neighbourhood.

4. Walkable Site

St. Walburge should become a pedestrian-friendly place by prioritizing the mobility and comfort of pedestrians. By promoting pedestrian traffic, the proportion of pedestrians should be increased. This is in line with the city's future goals of increasing the share of pedestrian traffic and promoting active modes of transportation such as walking and cycling. The aim is to reduce the dominance of cars, even for short distances in the neighborhood. In addition to widening and improving sidewalks, Pedestrian Zones or Shared Zones can be established to encourage pedestrian traffic. Furthermore, appealing public spaces can be created to improve the quality of life in the neighborhood.

This objective is represented on the map by the walking icons.

5. Connection through Green Spaces:

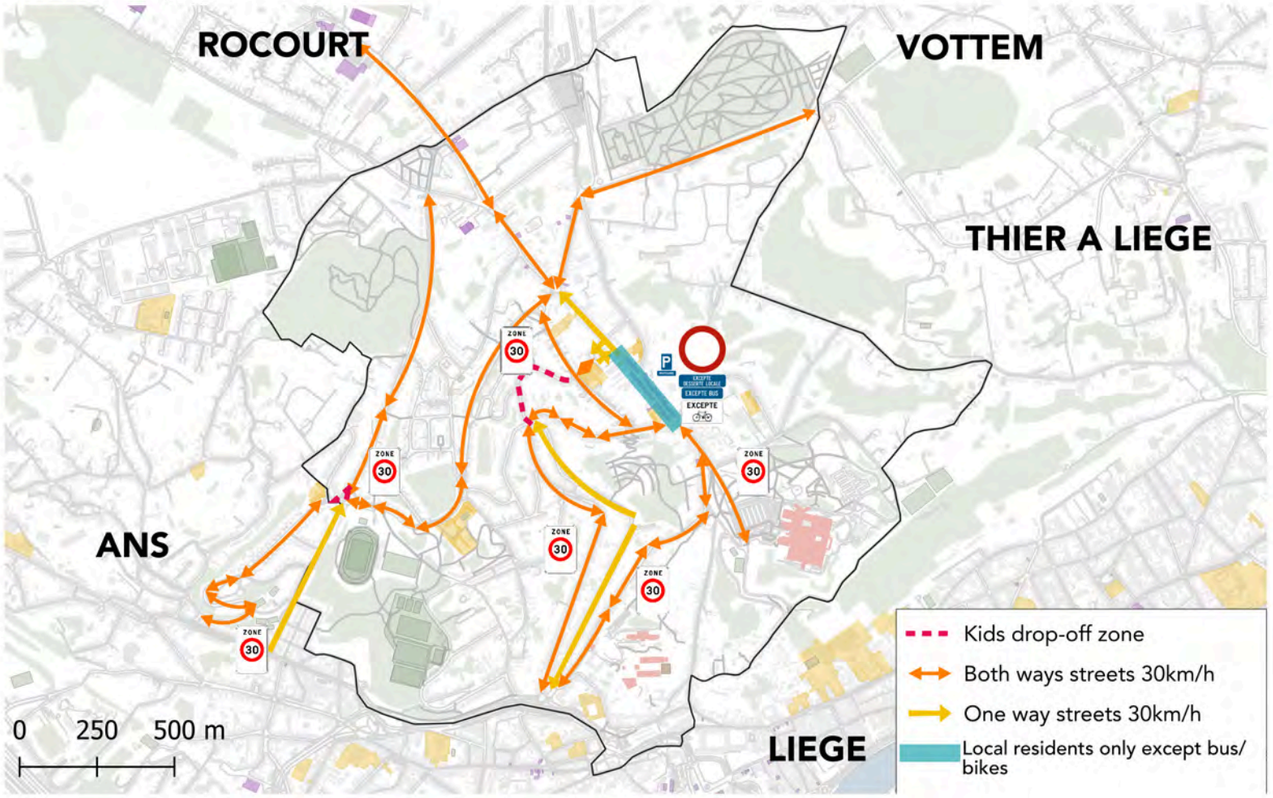
There are many green spaces in St. Walburge, including parks and green corridors, which are already heavily used. These areas should be highlighted and connected to create a coherent green network for visitors and residents of the district. A new hiking trail connects the green spaces. The new trail will take into account the existing footpaths around the Citadel and the steps, as well as the sections of the Route Naturelle that run through the area. In addition, new green spaces can be created in the form of public areas along streets or at key intersections to enhance the urban landscape. This will create a green network and will allow residents and visitors to explore the neighborhood from a new perspective.

This objective is represented on the map by the green double arrows crossing each green space such as Parc de la Paix, the St. Walburge Cemetery, Parc de la Citadelle...

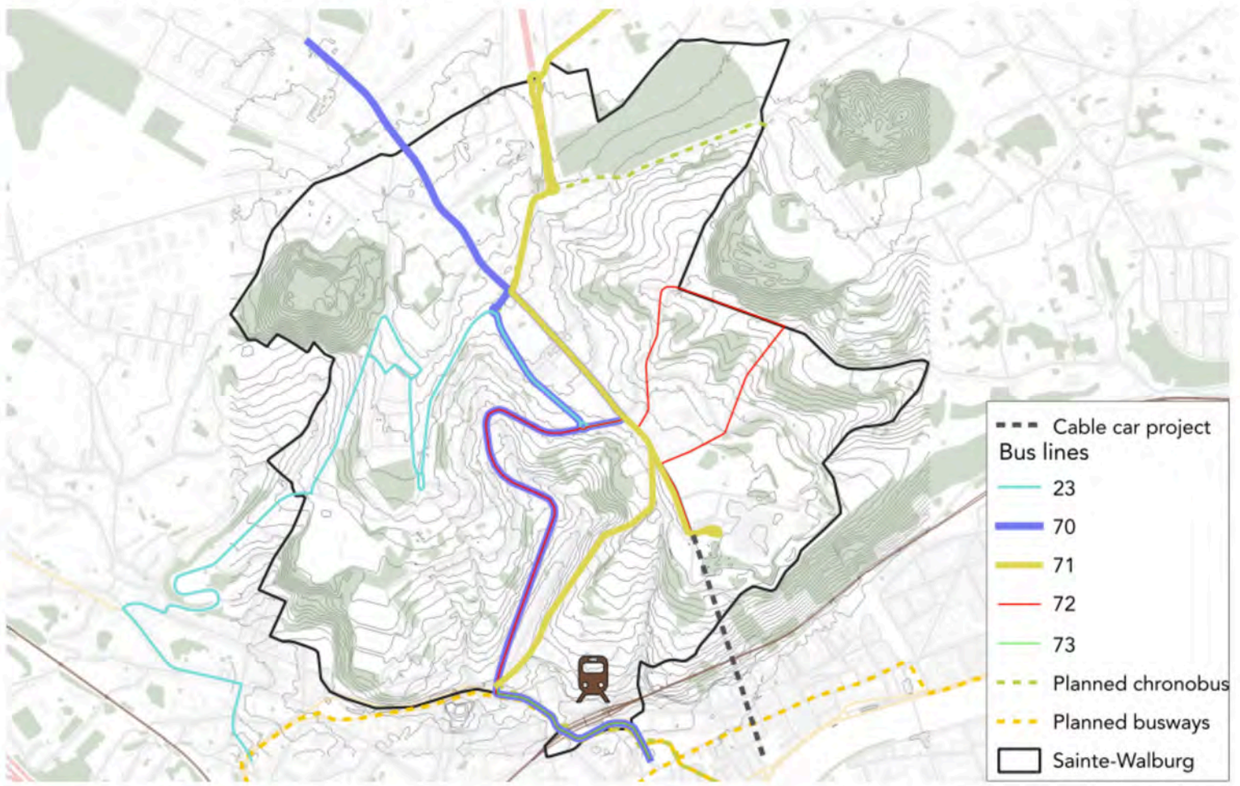
Through all those objectives, the point is to come closer to the FAST 2030 and to have less car users, more public transports and more soft mobility.

Mobility plan

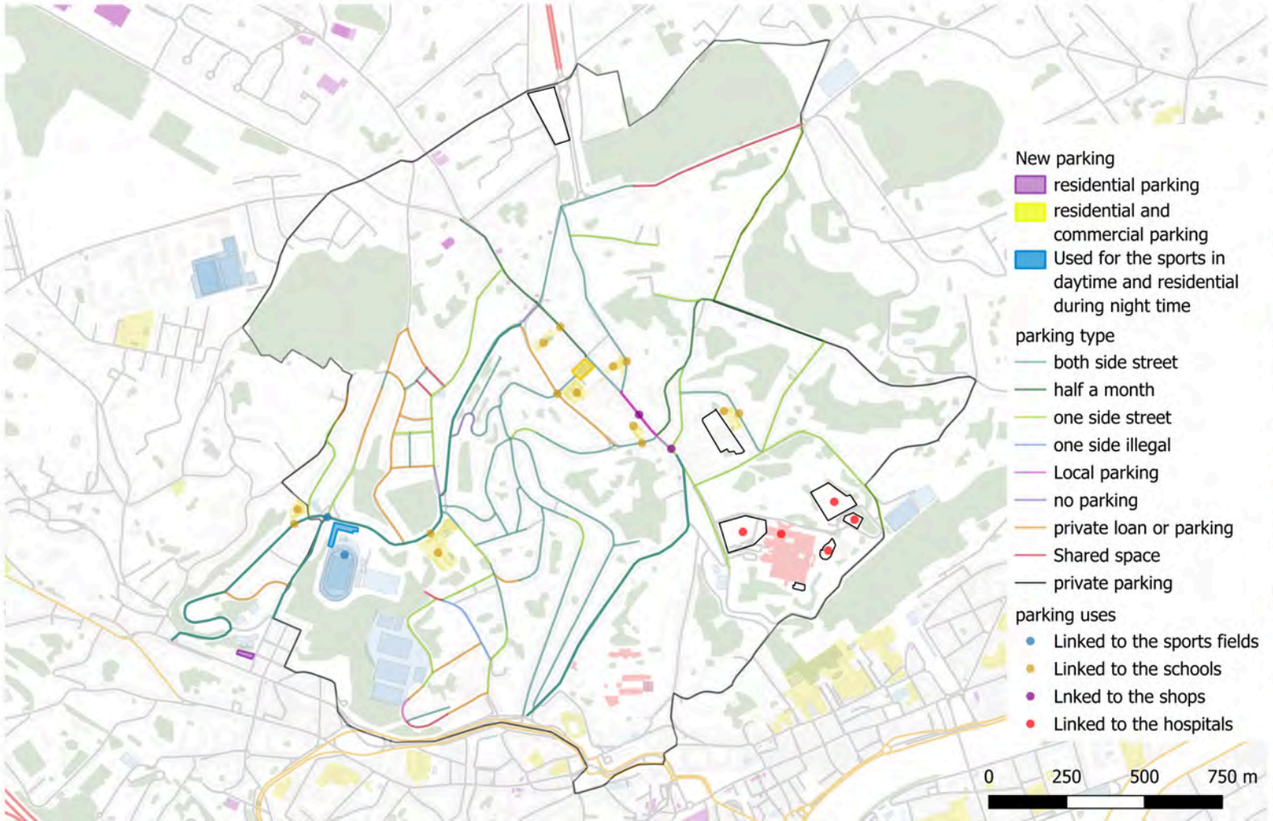
Car mobility



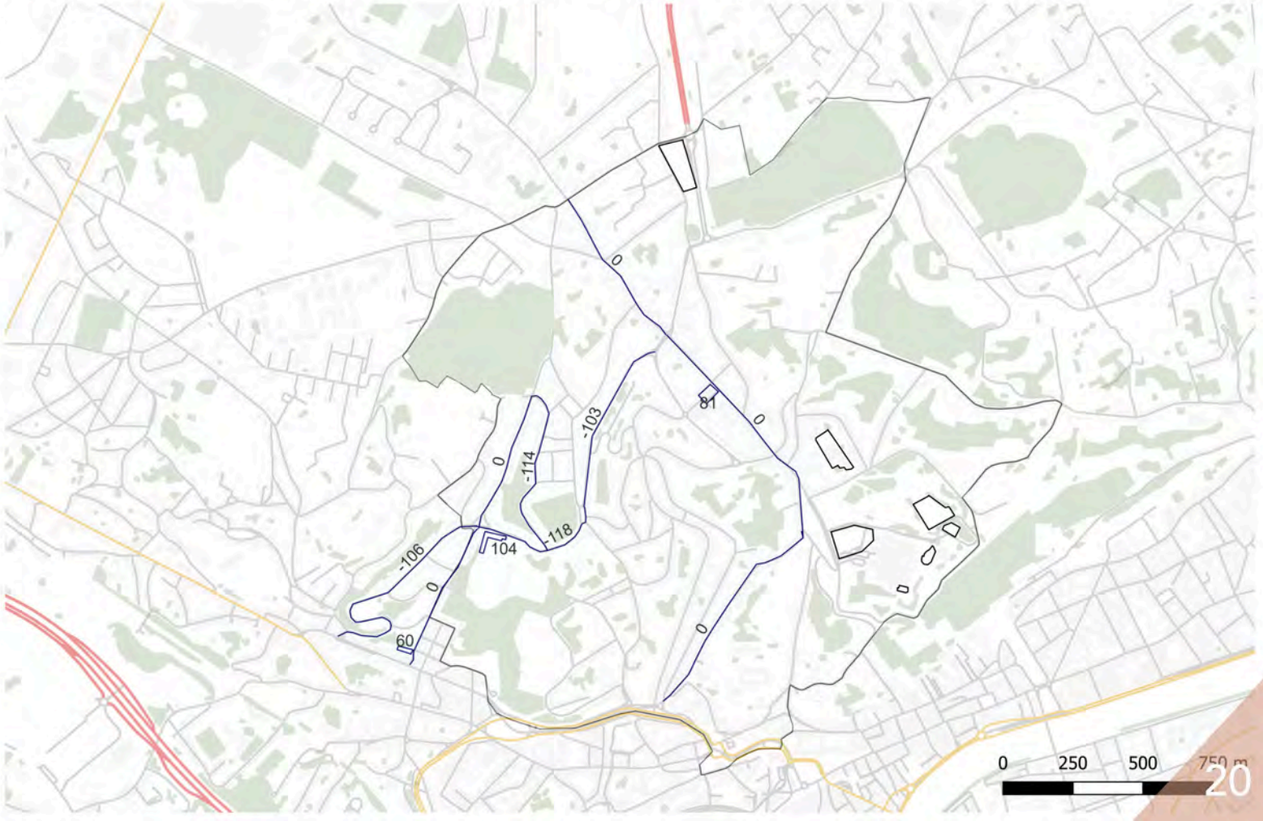
Unchanged transport mobility network



Parking structure after intervention



Modification of the number of parking places after intervention



The mobility plan would start with the redesign of the 4 wheelers mobility then the cycling mobility then pedestrian mobility.

Car mobility

First, the entire neighbourhood will become limited to 30km/h. This would discourage drivers in a hurry from using the area as a shortcut. Instead, they would be more likely to take alternative routes, such as highways. This reduced speed limit would also create a safer and more comfortable environment for pedestrians and cyclists.

Second, considering the amount of traffic on the main axis, they should stay two-street. It would be more efficient to improve infrastructure for cyclists and pedestrians so that people are encouraged not to take the car instead of blocking roads and diverting traffic (rather than to block streets and deviate the traffic.)

To alleviate congestion on the main roads and improve the traffic flow, the lower section of Rue Naniot can be reopened as a one-way street in an ascending direction. This will allow additional access from the city center to the district

The biggest addition of the car mobility plan is restricting the commercial part of the Rue St. Walburge (from n° 44 to 164) for local residents, buses, and cyclists. Rue St. Walburge being a major street for the buses. Out of the 8 identified bus lanes, 6 of them go through Rue St.Walburge. By setting up a shared zone in Rue St. Walburge, buses can travel directly to the bus stops without increasing traffic on the adjacent streets. This also means that the buses are not stuck in traffic jams in this section.

People will still be able to access the shopping area and park in the Sainte Walburge Square. To provide some parking spots for the shopping district, we requalified a parking lot on the St-Walburge square. This new parking lot has two roles, a commercial role during the day while the shops are open and a residential role when the shops are closed.

The last intervention for the car mobility is to tackle the problem of the schools. Every morning and afternoon, traffic jams often occur near schools as parents drop off and pick up their children, sometimes bringing entire streets to a standstill. To solve the problem, we introduced some « kids drop-off-zones ». Those areas are used to let the parents drop their kids in a secured area. This not only improves the safety of the children but also minimises disruption on the road and allows other users to continue their ride.

Unchanged transport mobility network

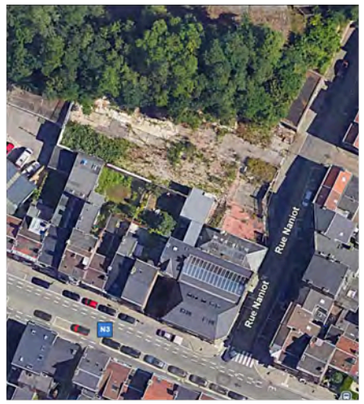
In this new mobility network, the public transport doesn't change. With the new addition of the restricted street in Rue Sainte Walburge, the bus rides will be smoother. However, as stated previously, the service is overcrowded making them inefficient. It is necessary to have more frequent and more buses for all the users and all those that will be encouraged to take the public transports instead of the car.

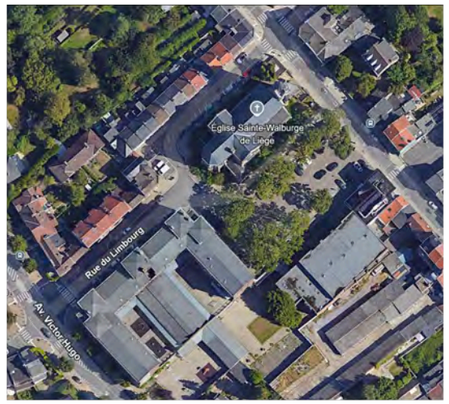
Change in parking typology and parking places

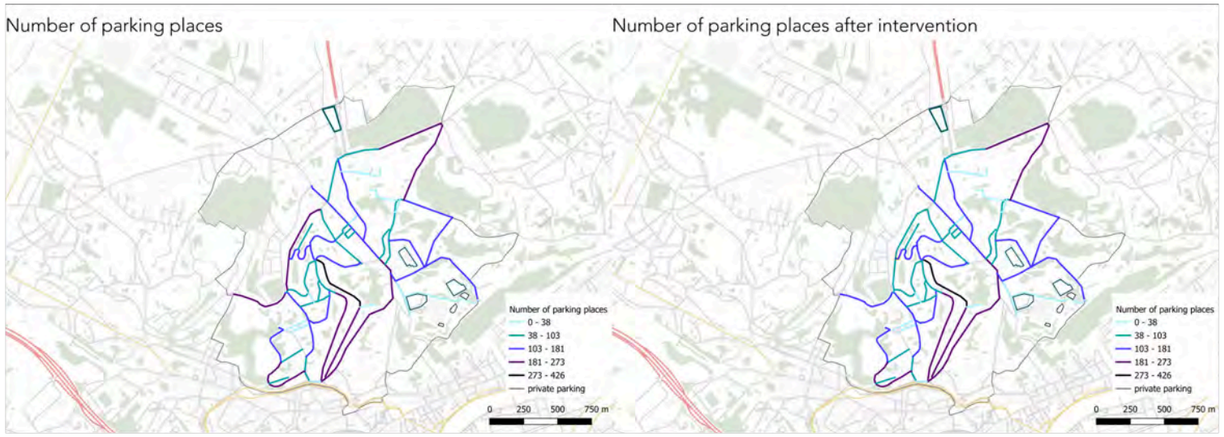
The intervention on the neighbourhood will have an impact on the it's parking structure. On the parking typology, the main change is the removal of the shared spaces to replace it by a "both side streets" typology on the Boulevards. There is also a typology change to Rue St-Walburge by changing it from "both side streets" to "local parking" by the addition of the residential part of the street. Those are the only typological changes on the neighbourhood after the intervention.

The intervention will also have an impact on the amount of parking places available in the neighbourhood. On the main boulevards, there is a loss of parking spaces, by the change of the parking direction from perpendicular to the road to parallel to it. This change divides the number of parking places by two. On the Boulevard Théodore Radoux there is a loss of 106 parking places, on the Boulevard Léon Philippet the loss is estimated to 118 and there is a loss of 103 places on the Boulevard des hauteurs. In addition to the great Boulevard there is a loss of 114 places on Rue des Neuves Brassines and Rue Fort de Loncin. Those parking losses need to be put into perspective. In fact, most of it happens on streets where the parking saturation is not a problem (the three boulevard). There is no parking count of the Rue des Neuves Brassines and Rue Fort de Loncin. Therefore, there is no possibility of estimating the parking saturation in those streets. However, those streets are cited in the "private loan" typology, meaning that the locals have their own parking places, or in a non saturated parking state limiting the impact of these losses on the local parking.

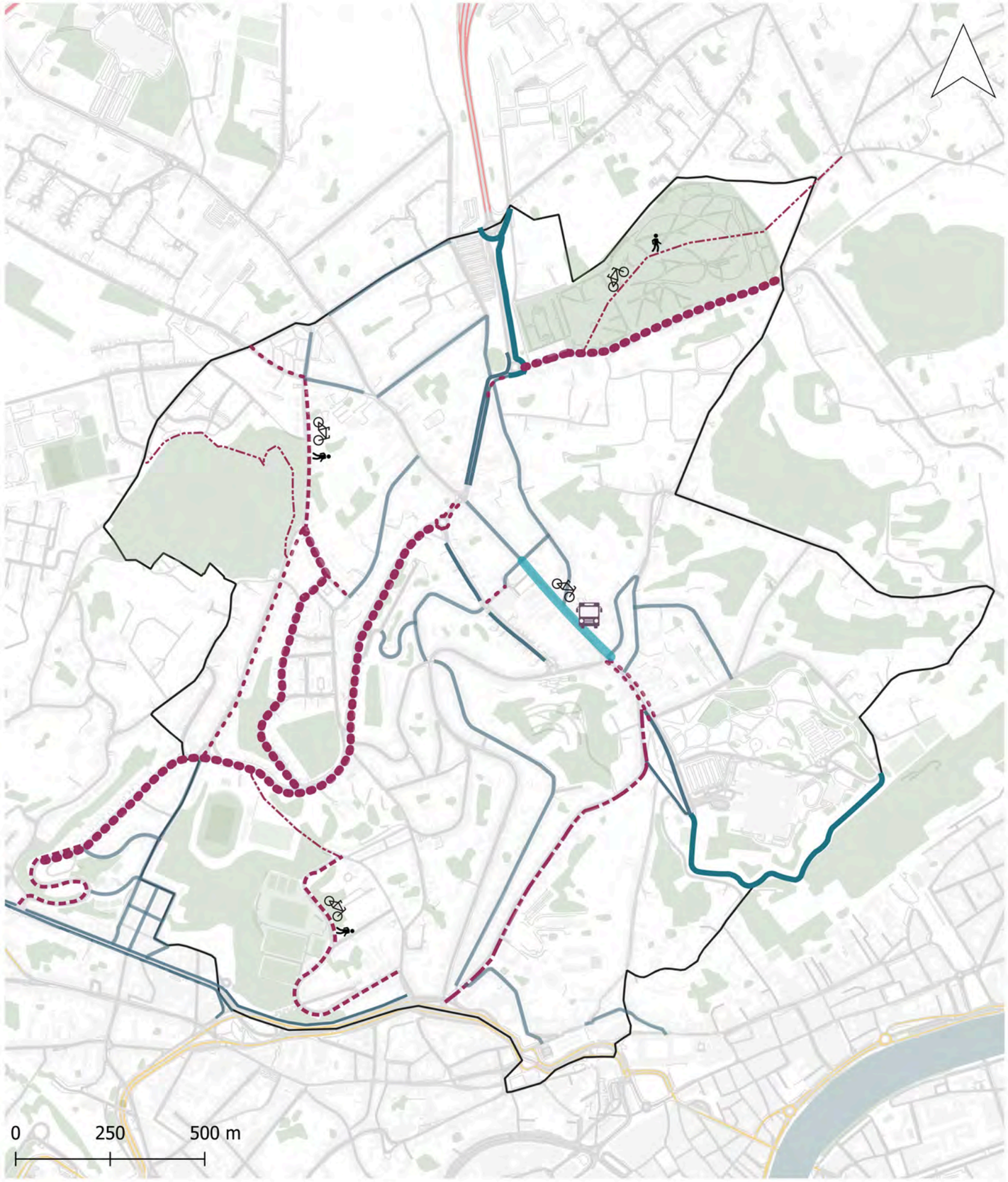
Also to tackle a part of the parking loss provoked by the intervention. The developments in the neighbourhood plans the addition of three new parking lots. The first one is located at the bottom of rue Naniot. The intervention plans a two-floor parking lot with 60 places. Close to the shopping area, there is a parking place St-Walburge. Those parking lots will provide place for the shopping spaces during daytime and some additional residential parking places during the night. Finally, there are parking places available in the Naimette stadium. Those will be used for the needs of the stadium during the day and for the needs of the locals during the night.

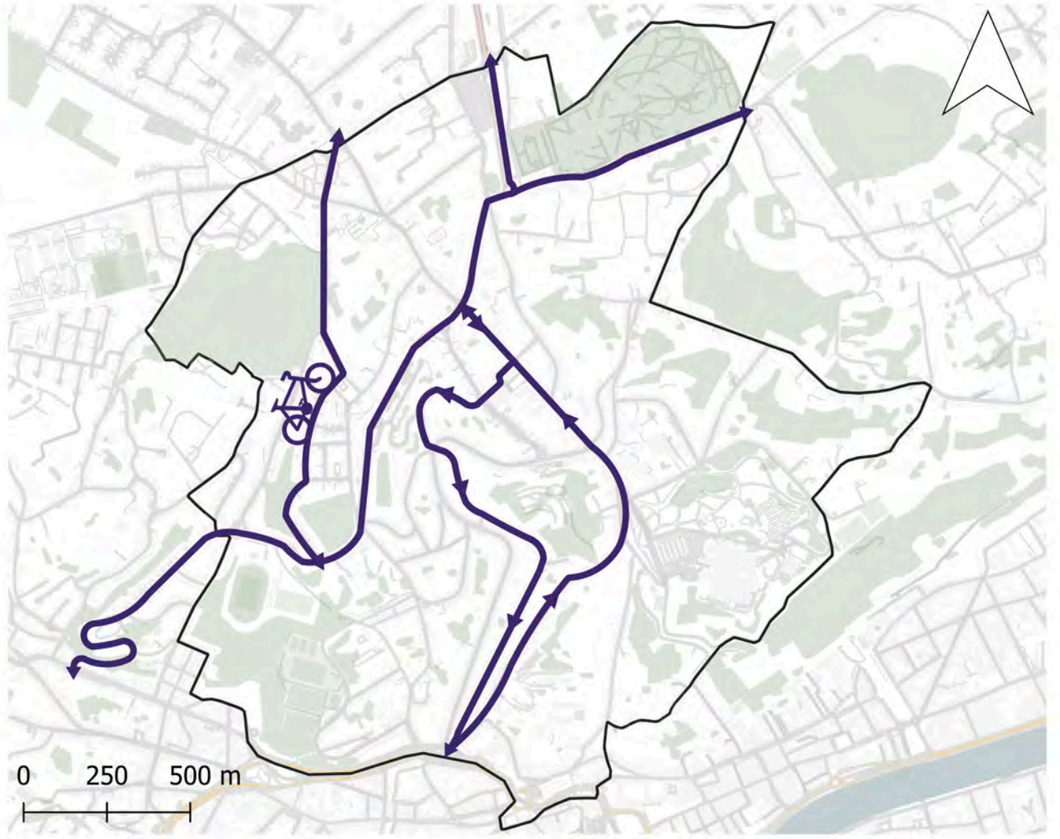






Cycling Mobility Plan





Cycling Mobility Plan

- Main Cycling Axes: These routes provide safe and dedicated bicycle lanes or facilitate smooth bicycle flow through the neighborhood.

Current Infrastructure

- One-way street open for bicycle
- Current Cycle Infrastructure

Planned Infrastructure

- Seperated two-way cycle lane (Width ~3m)
- Shared Pathways (Pedestrian & Cycle) (Width ~2,5-3m)
- Seperated Cycle Lane (Width ~1,3m)
- Shared Pathways at Green Spaces
- Marked cycle lane (Width ~1,3m)
- Pedestrian Zone (Shared Zone)

CYCLING MOBILITY PLAN :

The Cycling Mobility Plan for St. Walburge focuses on improving safety and connectivity throughout the neighbourhood. It aims to create wider and safer bicycle lanes and a cycling densification zone. Based on the previously conducted analyses and counts of cycling flows, the most important mobility corridors and main cycling axes were identified. These main cycling axes are characterized by providing safe and dedicated bicycle lanes or facilitating smooth bicycle flow through the neighbourhood. The main cycling flows were observed along Montagne St. Walburge and Rue St. Walburge as well as on Boulevard des Hauteurs and Boulevard Léon Philippet. As a result, these are among the main cycling axes.

Montagne St. Walburge plays a dual role as a main traffic axis. The plan of the major axes envisages using Montagne St.Walburge as an opportunity to ride northwards from the city center towards the center of St.Walburge and further, because the Cycling Mobility Plan intends a separate narrow cycle path in this direction. This makes cycling uphill safer. For cyclists heading from St. Walburge towards the city center, one option is to use Rue Fond Pirette, which is already a one-way street heading south. This would allow cyclists to descend the hill via a quieter and less busy road. Alternatively, cyclists can also use Rue de Campine as another route. Part of Rue St. Walburge will be converted into a shared zone (see cross-sections). This shared zone, reserved for buses and cyclists only. This provides a safe axes through the center of the neighbourhood. Furthermore, the main cycling axes lead to Rocourt and Vottem. In addition, one of the main cycle routes to Rocourt runs through Rue des Neuves Brassines, Rue du Fort de Loncin and Rue Naniot. This offers another option of going north or going into the city center

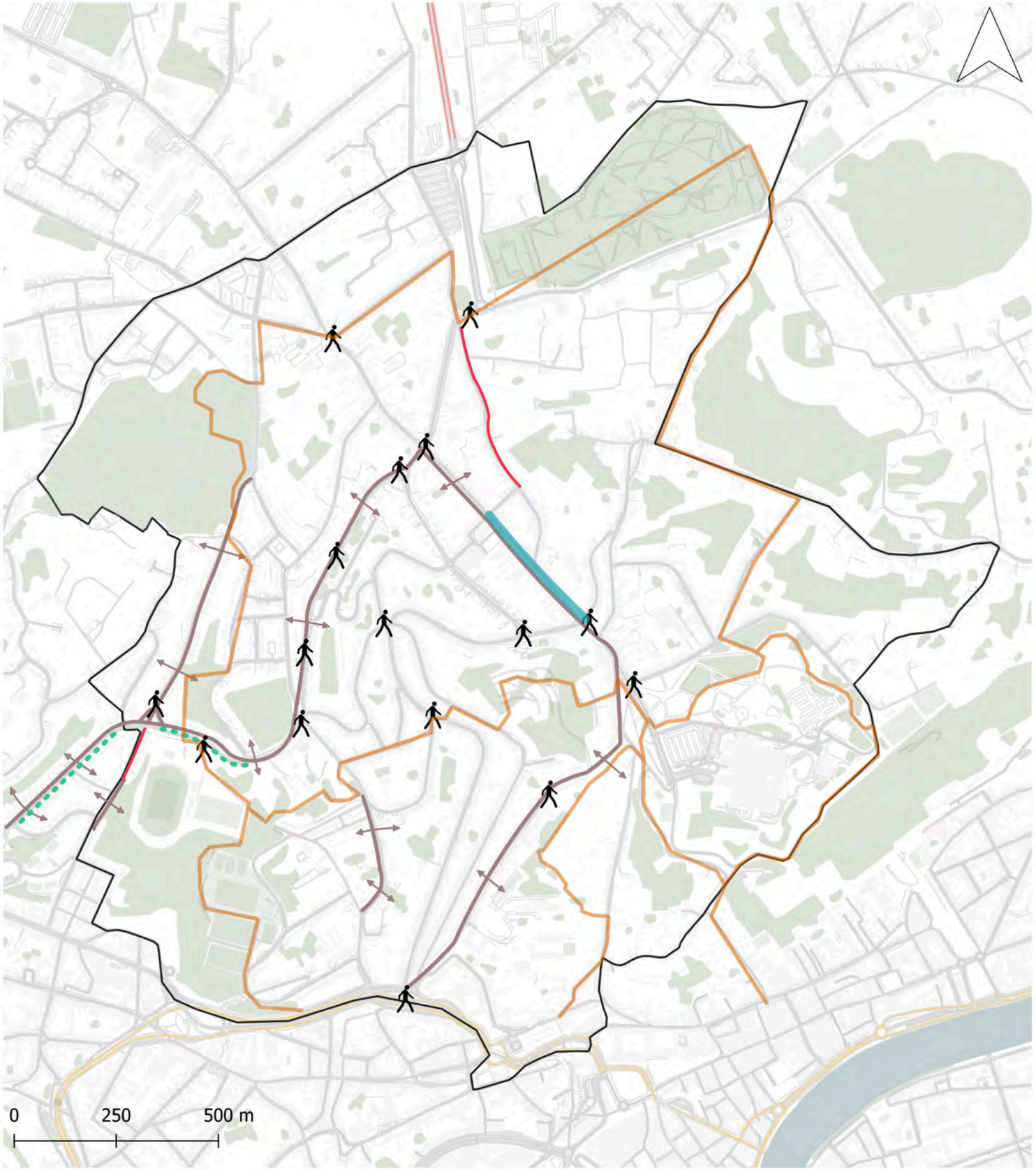
In addition to the main cycling axes, a comprehensive plan for cycling traffic has been developed. As mentioned above, part of Rue St. Walburge will be designated as a shared zone. This area will be accessible to buses, bicycles and residents who live there. It will be closed to transit traffic. This intervention should reduce the volume of traffic in the area with all the shops, increase the safety for cyclists and provide a faster way through the neighbourhood.

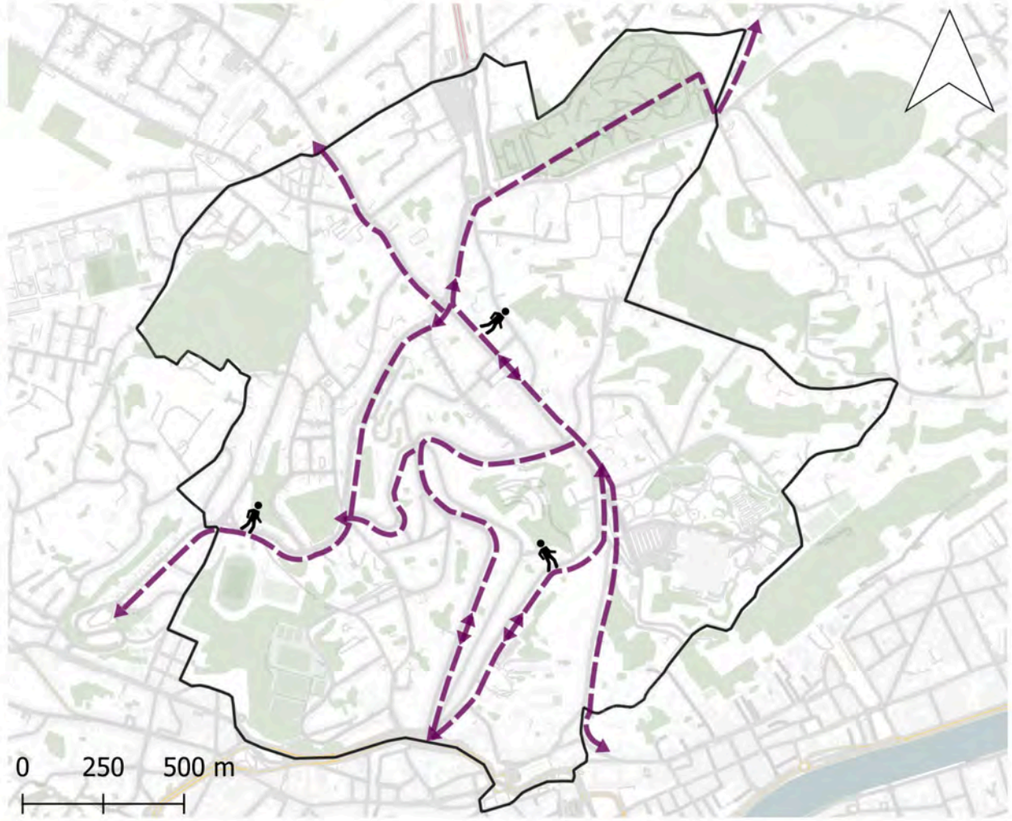
Most of the existing cycling infrastructure will remain unchanged, with the exception of the cycle path along the Boulevard des Hauteurs, Boulevard Leon Philippet, Boulevard Jean-Théodore Radoux. This cycle path will be extended and developed into a proper cycle axis. The one-way streets, which are open to cyclists, will also remain. A separate, 3 meter wide two-way cycle path will be created along the Boulevard des Hauteurs, Boulevard Leon Philippet, Boulevard Jean-Théodore Radoux and Boulevard Fosse-Crahay (see cross-sections). This will provide a safe and convenient cycle route through the district and continue along the Boulevard Fosse-Crahay towards Vottem. The shared Bus and Cycle lane on Boulevard Jean de Wilde will remain and complete this axis.

A separate, 3-metre-wide cycle path will also be created along Rue des Neuves Brassines and Rue du Fort de Loncin, which run through a residential area (see cross-sections). In this area, most homeowners have private driveways to park their vehicles. In order to facilitate the creation of the cycle path the parking will be restricted to one side of the road. In addition, the traffic volume in this area is lower and it does not serve as a main flow for car traffic. This makes it well suited for improved cycling infrastructure and connecting Rocourt.

A narrow and separated 1.3-metre-wide cycle path is being built to create a safe route for cyclists traveling from the city center to St. Walburge via Montagne St. Walburge (see cross sections). No parking spaces will be lost with the creation of this cycle path. This path will allow cyclists to drive up the hill safely and provides a connection between the neighbourhood and the city center. Another connection from the city center to the neighbourhood is via Rue Henri Vieuxtemps. There is already a shared path for pedestrians and cyclists. This path will be extended through Rue Naimette until the Park Naimette. Within the park, shared paths for pedestrians and cyclists will be created. These paths can also be integrated into other green spaces and corridors, such as the cemetery. This underlines the connectivity and densification of the bicycle infrastructure. A seamless connection will also be ensured at Boulevard Jean-Théodore Radoux, where the new cycling infrastructure will connect directly to the existing network. Furthermore, Cyclists can also use a marked, narrow cycle path along Rue Naniot as an additional way. At the northern end of Rue Naniot, the 3-metre-wide cycle path from Rue du Fort de Loncin meets the narrow cycle path of rue Naniot. This creates a continuous route towards Rocourt. With these developments, the cycle path network comprehensively covers the area and offers safe and convenient options for cyclists.

Pedestrian Mobility Plan





Pedestrian Mobility Plan

- Main Pedestrian Axes: The routes provide sufficient space, accessible surfaces for all users and an overall pleasant walking environment

Planned

- Wider Pathways (Width ~ 1,5-1,8 m)
- Only One Site parking
- Completely New Pathways
- Pedestrian Shared Zone
- Safe Pedestrian Crossings
- St. Walburge Green Circuit

PEDESTRIAN MOBILITY PLAN :

The Pedestrian Mobility Plan for St. Walburge focuses on improving walkability, accessibility and connectivity throughout the area. It aims to create wider and safer sidewalks, design a walkable area and improve connectivity through green spaces. Based on the previously conducted analyses and counts of pedestrian flows, the most important mobility corridors and main pedestrian axes were identified. These main pedestrian axes are characterized by sufficient space, accessible surfaces for all users and an overall pleasant pedestrian environment. The main pedestrian flows were observed along Montagne St. Walburge and Rue St. Walburge as well as on Boulevard des Hauteurs and Boulevard Léon Philippet. As a result, these are among the main pedestrian axes.

Montagne St. Walburge plays a dual role as a main traffic axis and pedestrian corridor. It connects the city center with the surrounding districts and provides an important link to the hospital. Part of Rue St. Walburge will be converted into a shared zone. This shared zone, reserved for buses and cyclists only, promotes pedestrian safety and is consequently part of the main pedestrian axes. In addition, Rue de Campine has become an important pedestrian axis due to its secondary pedestrian flows and its strong connection to the city center. Rue de Campine also serves as an important link for residents who live between Rue de Campine and Rue Xhovement. They can use Rue de Campine to walk to the city center or to the centre of St.Walburge. Another important link to the city center is Rue Pierreuse, which is often used by tourists because of its historic architecture. Furthermore, the main pedestrian axes lead to Rocourt and Vottem.

In addition to the main pedestrian axes, a comprehensive plan for pedestrian traffic has been developed. As mentioned above, part of Rue St. Walburge will be designated as a shared zone. This area will be accessible to buses, bicycles and residents who live there. It will be closed to transit traffic. This intervention should reduce the volume of traffic in the area with all the shops, increase pedestrian safety and create a quieter environment for shopping. There is convenient parking within walking distance of the church. The creation of a shared zone or pedestrian zone is in line with the objective of creating a walkable environment in which safety and accessibility for pedestrians are guaranteed.

Safety improvements for pedestrians are also being sought by widening pedestrian paths. The sidewalks in Rue Naniot are to be widened. Above the intersection with Boulevard Léon Philippet, the sidewalk of Rue Naniot narrows to a width of just 1 meter in a northerly direction. This is clearly inadequate, especially when cars are parked on the sidewalks. The problem is particularly critical because Rue Naniot serves as a school route for the nearby schools. Wider sidewalks would increase safety and provide a safer environment for all road users, especially children. In the lower section of Rue Naniot, cars often park on the sidewalks on the same side of the road. This reduces the sidewalk width from 1.8 to 1.3 meters. Although this is less significant than in the upper section, prohibited parking on the sidewalks in this area could significantly improve pedestrian access and safety. The lower section of Rue Naniot is a traffic-calmed one-way street that is mainly used by residents. Many of these residents also have private driveways, so parking on the sidewalk is not essential. Wider and completely new pedestrian paths are planned for Boulevard Léon Philippet. Currently, there are only footpaths on one side of Boulevard Léon Philippet and Boulevard Jean. The other side is a shared space dominated by parked cars, which forces pedestrians to walk around them. The existing footpaths leading to these shared spaces end abruptly and the surface quality in these area is sub-optimal. The creation of a dedicated footpath in this area would be a significant improvement for the accessibility, safety and overall usability for pedestrians.

A more difficult street is Montagne St. Walburge. There, the sidewalks can only be widened slightly. Additional widening would be possible if a dedicated cycle lane was excluded. However, the proposed cycling plan prescribes a narrow cycle lane, which limits the extent of sidewalk widening.

Another proposed measure is to allow parking on only one side of certain streets. As already mentioned, this is planned for a section of Rue Naniot. In addition, only one side parking is proposed for Vieille Voie de Tongres. Currently, this one-way street has narrow sidewalks as vehicles are parked on both sides. The implementation of one-way parking would create space for pedestrians and improve accessibility. To balance the availability of parking spaces, the assigned parking side could change monthly so that there is always a sufficiently wide sidewalk on one side of the street. This approach promotes pedestrian safety while maintaining reasonable parking options for residents.

Furthermore, safe crosswalks strategically distributed along the main pedestrian axes will be ensured to improve both safety and the overall pedestrian experience. These crossings should be designed with the following key features.

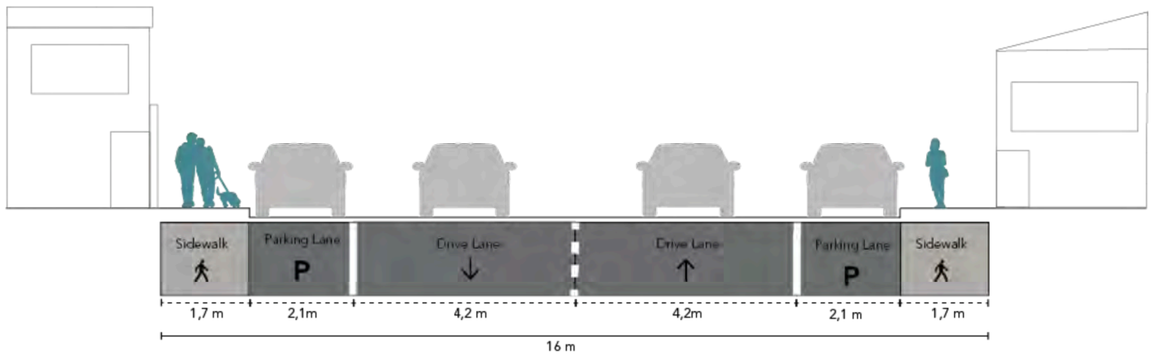
Crosswalks should be highly visible and pedestrians should always have priority. They will be marked with clear signage and pavement markings. In addition, traffic calming measures such as raised crossings or speed bumps can be installed near intersections to slow down vehicles.

The safe pedestrian crossings are an essential part of creating a pedestrian-friendly environment and are equipped with tactile paving, acoustic signals and kerb ramps to accommodate people with disabilities and ensure accessibility for all.

The objective of creating connections through green spaces is realized through an urban walking route known as the St. Walburge Green Circuit. This route connects all the green spaces and corridors in St. Walburge and offers the opportunity to explore the neighborhood on foot while enjoying greenspaces and viewpoints over the city of Liege. The Walburge Green Circuit connects seamlessly with the Liege Accent Nature and the tourist walking trail. The trail offers visitors and residents the opportunity to rediscover and enjoy the region's green spaces. This initiative not only promotes accessibility to nature, but also encourages active exploration of the district's landscape and recreational areas.

Montagne St. Walburge

Before



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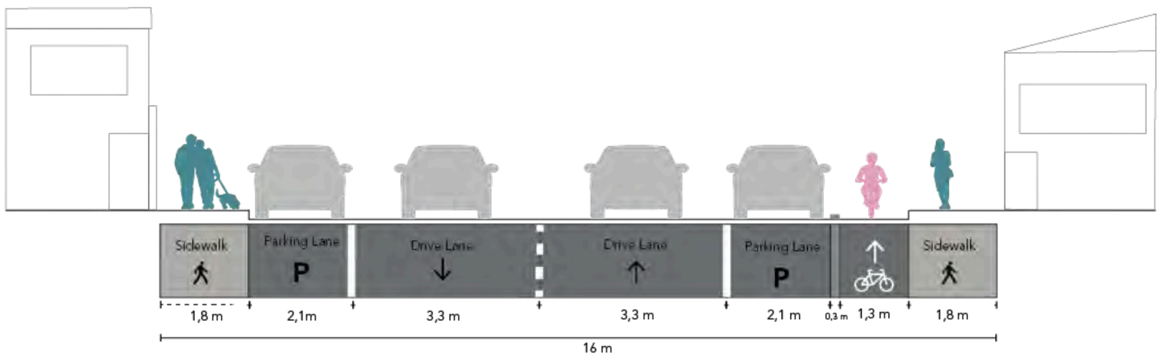
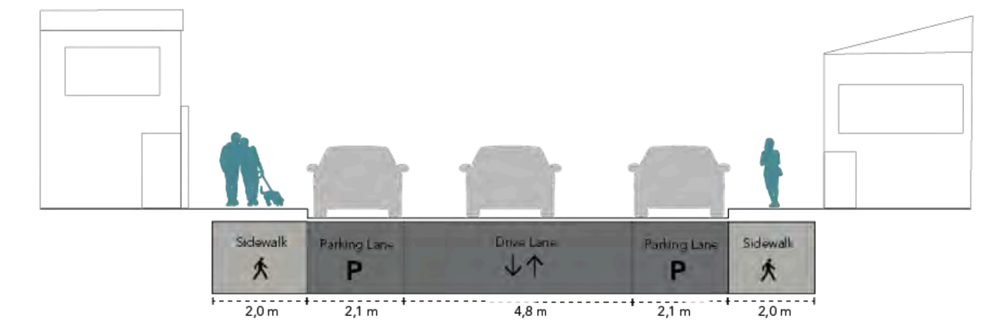


Rue de Fort de Loncin

Before



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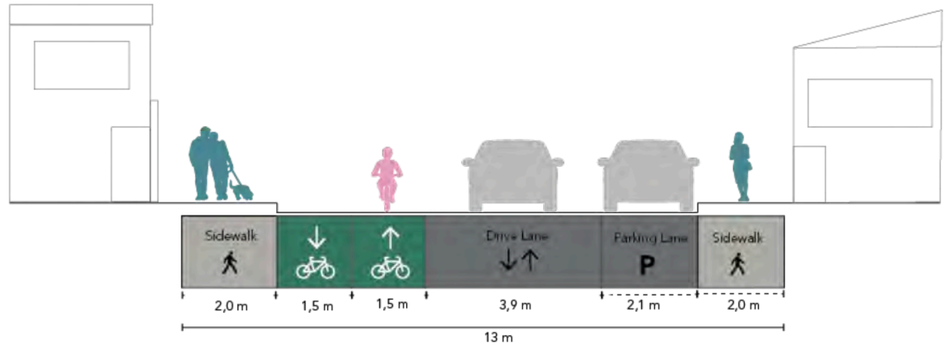
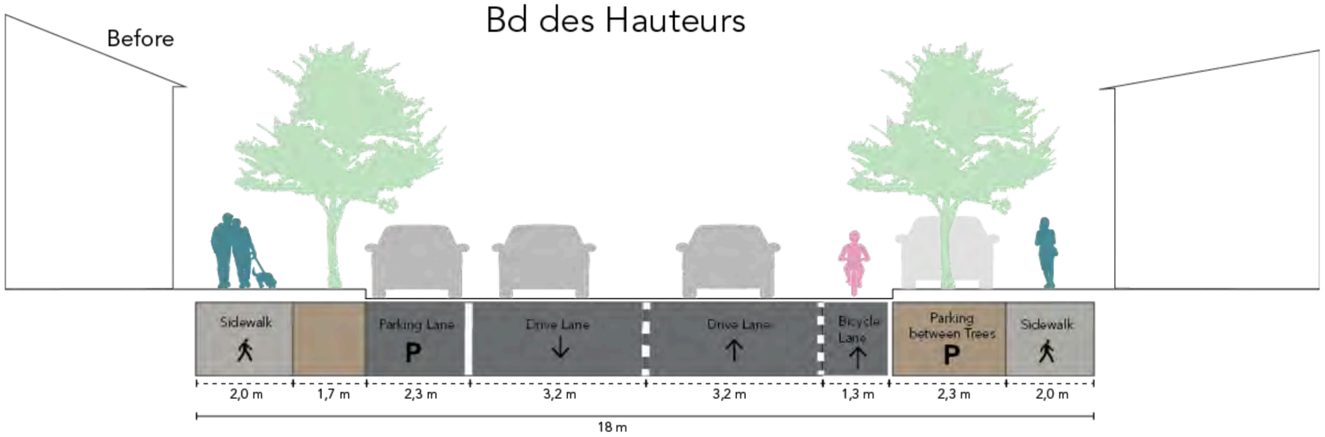


Bd des Hauteurs

Before



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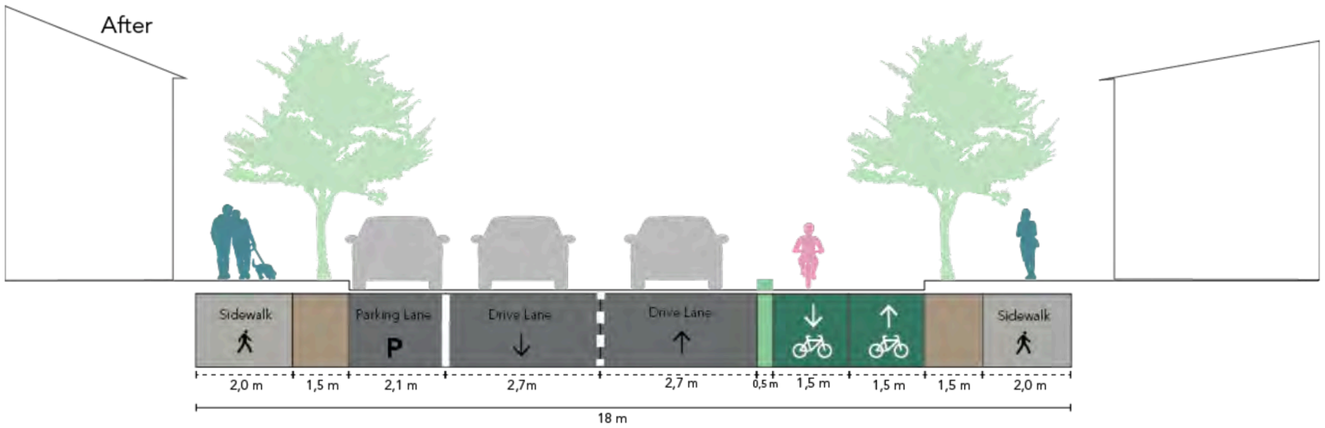
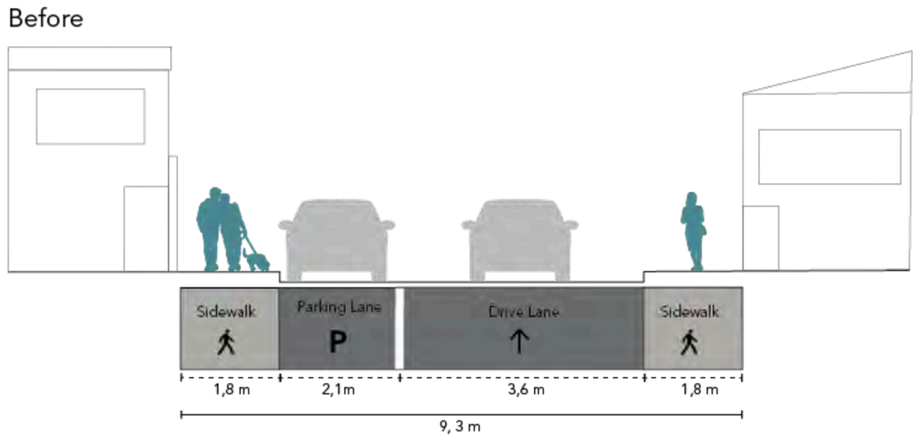


Rue Sainte Walburge

Before



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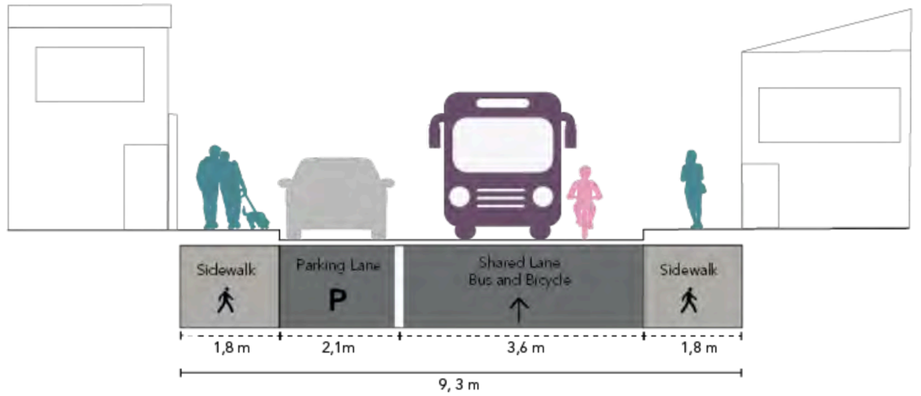
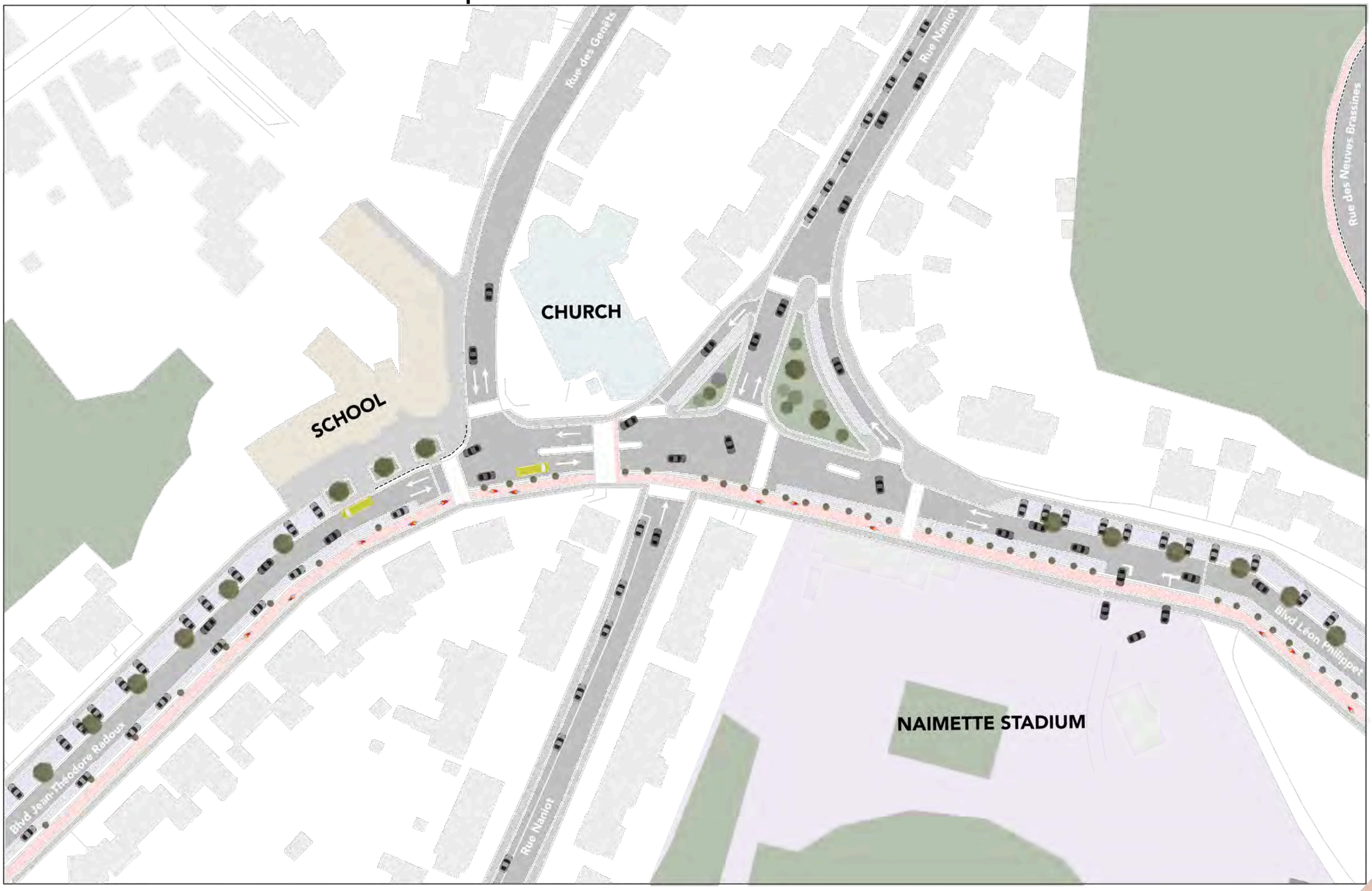
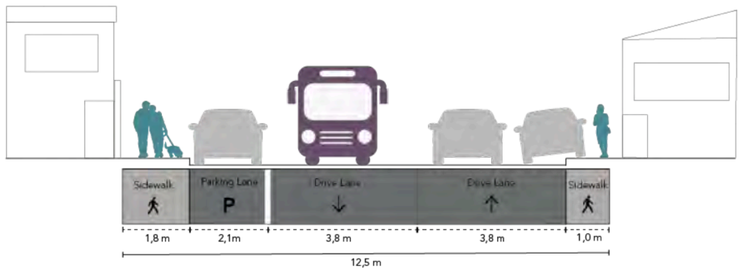


Node 11 after intervention option 1



Rue Naniot

Before



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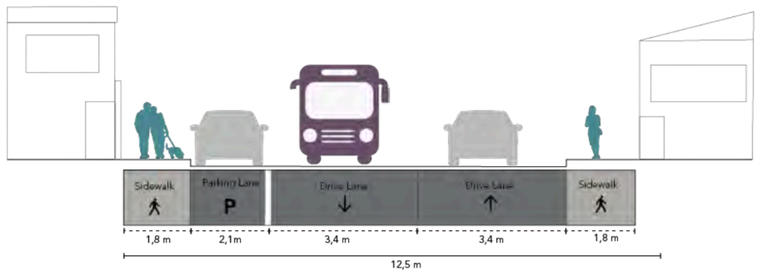
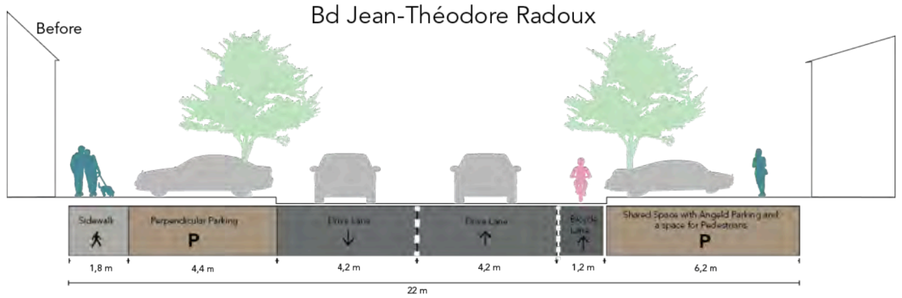


The first proposal focuses on maintaining the functionality of the node, while integrating cycling infrastructure and improving the pedestrian infrastructure. The street layout will remain unchanged, but one side of the Boulevard Leon Philippet and Boulevard Jean-Théodore Radoux will be completely redesigned. Currently, this side is shared by parked cars and pedestrians. There is no dedicated footpath, so pedestrians are forced to navigate between parked vehicles. In addition, there is a narrow and marked 1.3 meter cycle lane on the street on this side, which poses a significant risk to cyclists, particularly from cars reversing out of parking spaces. To address these issues and improve safety for both cyclists and pedestrians the proposal envisages the creation of a two-way cycle lane and completely new sidewalk along the Boulevard. The current shared space has a width of around 6,2 m. These will be redesigned with a separated 3-meter wide two way cycle lane. This dedicated cycle lane will provide cyclists with a safe and convenient route that will provide a much-improved experience for all users of the Boulevard. In addition, an entirely new footpath will be created alongside the cycle path that provides plenty of space for pedestrians and significantly improves the usability and accessibility of the one side of Boulevard Leon Philippet and Boulevard Jean-Théodore Radoux. This is a significant improvement as there was previously no proper footpath on the one side of the Boulevards. The sidewalk will be around 2,4 meters wide. To accommodate these changes, the existing angled parking spaces along the Boulevard will be repurposed to make room for the new bike and pedestrian path. However, the parking places at Boulevard Leon Philippet will not be completely removed. A dedicated parking lane of 2,1 meters will be created on the road itself to provide enough parking spaces for the rugby stadium and the schools around the node. The angled parking at Boulevard Jean-Théodore Radoux will be removed to create more safe space for the children to walk to school. This change will have minimal impact on parking availability, because all residents already have private driveways for their vehicles.

Furthermore, improvements to pedestrian comfort and accessibility are planned for Rue Naniot. Currently, the footpath in the upper part of Rue Naniot is only about one meter wide, and its usability is often impaired by unauthorized parking. This makes the footpath virtually unusable in some areas. The lanes will be slightly reduced from 3,8 m width to 3,4 m width so that the footpath can be widened to around 1,8 meters. This change will significantly improve walkability and provide pedestrians with a safer, more welcoming walking space, while maintaining a slower traffic flow and keeping the street functional for all users. Because Rue Naniot is also a major route to school, these improvements will create a safer route for children walking to school. This could encourage more parents to bring the children to school by foot than with the car.

Bd Jean-Théodore Radoux

Before



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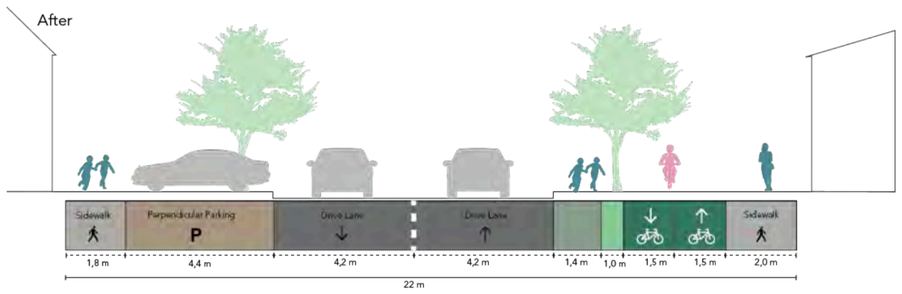
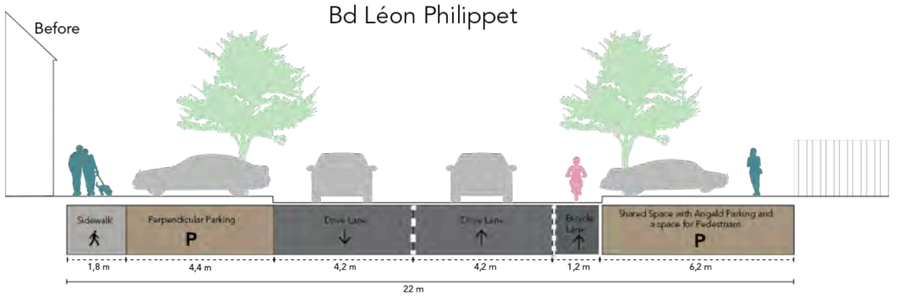


Bd Léon Philippet

Before



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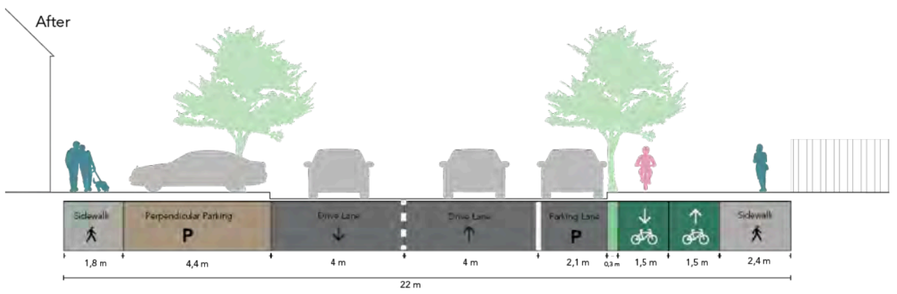
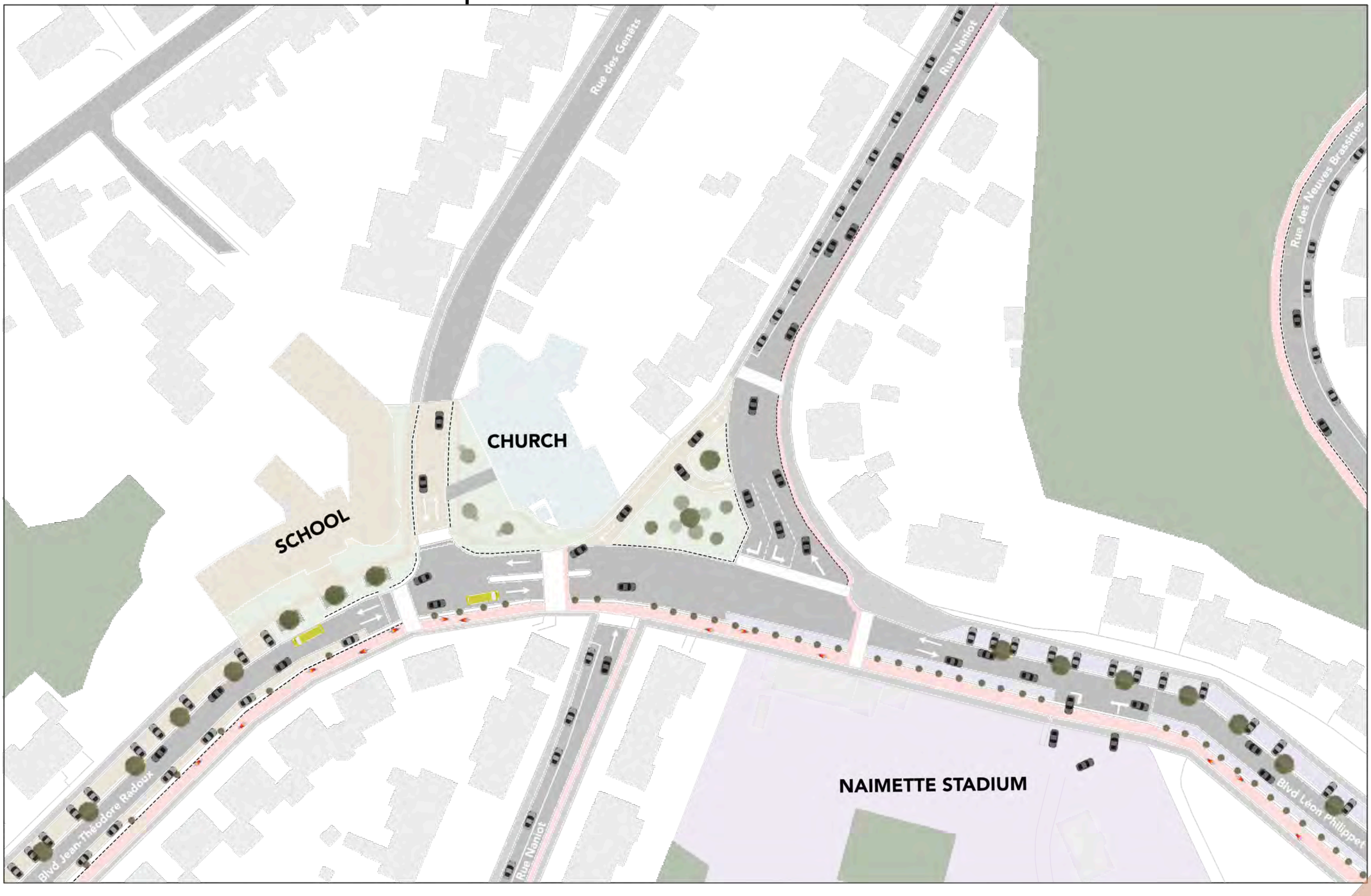


Node 11 after intervention option 2



TASK 9

The second option is a more optimal and more soft mobility oriented. The pedestrians and cyclists are a priority with comfortable bike lanes and sidewalks in every street in the node.

Currently, the Boulevard Leon Philippet and Boulevard Jean-Théodore Radoux is shared by parked cars and pedestrians. There is no dedicated footpath, so pedestrians are forced to navigate between parked vehicles. In addition, there is a narrow and marked 1.3 meter cycle lane on the street on this side, which poses a significant risk to cyclists, particularly from cars reversing out of parking spaces. To address these issues and improve safety for both cyclists and pedestrians the proposal envisages the creation of a two-way cycle lane and completely new sidewalk along the Boulevard. The current shared space has a width of around 6,2 m. These will be redesigned with a separated 3-meter wide two way cycle lane. This dedicated cycle lane will provide cyclists with a safe and convenient route that will provide a much improved experience for all users of the Boulevard.The sidewalk will be around 2,4 meters wide. To accommodate these changes, the existing angled parking spaces along the Boulevard will be repurposed to make room for the new bike and pedestrian path. However, the parking places at Boulevard Leon Philippet will not be completely removed. A dedicated parking lane of 2,1 meters will be created on the road itself to provide enough parking spaces for the rugby stadium and the schools around the node. The parking places in Boulevard Jean-Théodore Radoux will change affectation. The 2,1m parking and the other side of angled parking will be used as a drop off for kids.

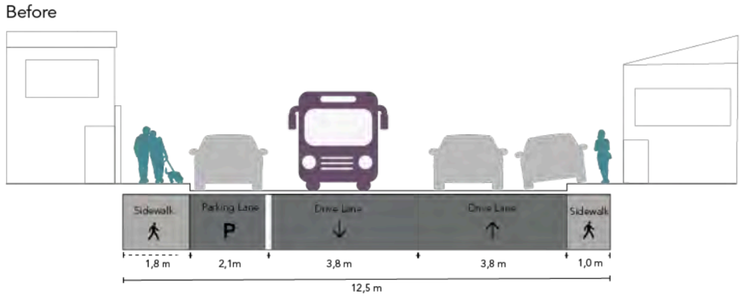
Furthermore, improvements to pedestrian comfort and accessibility are planned for Rue Naniot. Currently, the footpath in the upper part of Rue Naniot is only about one meter wide, and its usability is often impaired by unauthorized parking. This makes the footpath virtually unusable in some areas. The lanes will be reduced from 3,8 m width to 3 m width so that the footpath can be widened to around 1,5 meters and that an ascending bike lane of 1,3m can be created. This change will significantly improve walkability and provide pedestrians and cyclists with a safer, more welcoming walking space, while maintaining a slower traffic flow and keeping the street functional for all users. Because Rue Naniot is also a major route to school, these improvements will create a safer route for children walking to school. This could encourage more parents to bring the children to school by foot or bike than by car.

For the parents still taking the car, there will be an arranged drop off zone in a new green and pedestrian zone around the school. The arranged drop off will separate the children so they can walk safely to the school. The cars will be allowed to stop on the parking places on the Boulevard and at the arranged intersection. That way, lost spaces are limited and reused for pedestrians and kids.

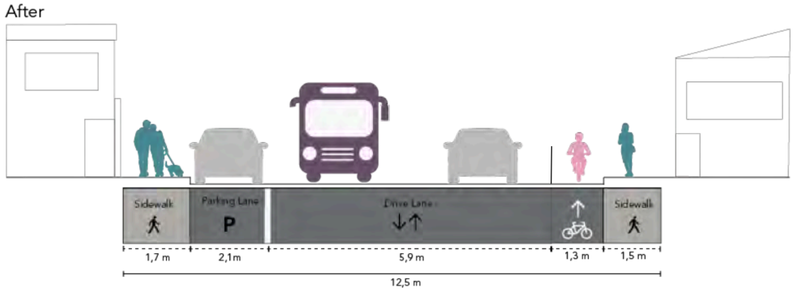
As part of the redesign, new green spaces will be created around the junction. These new public spaces will not only improve the overall environment, but will also help to create a welcoming and sustainable urban area. By integrating green spaces around the church and school, the redevelopment aims to foster a stronger sense of community while improving environmental sustainability and the quality of life for people living and working in the area.

Rue Naniot

Before

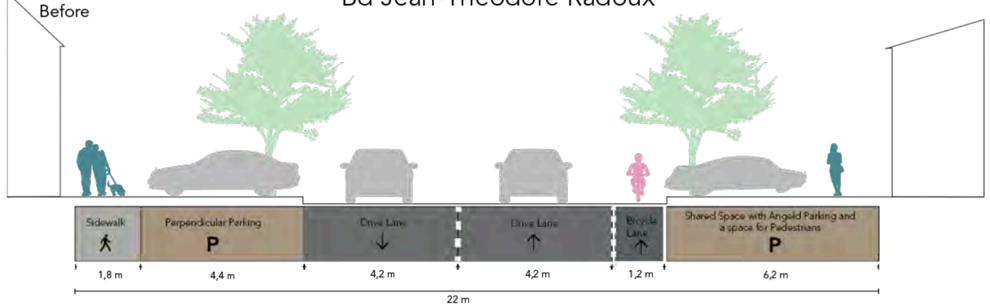


After

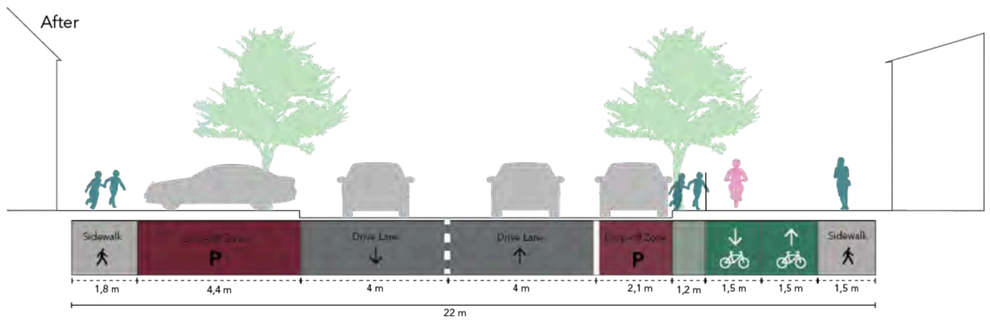


Bd Jean-Théodore Radoux

Before

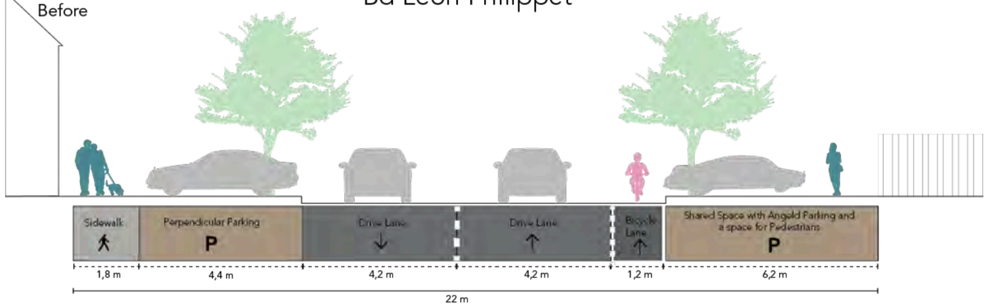


After



Bd Léon Philippet

Before



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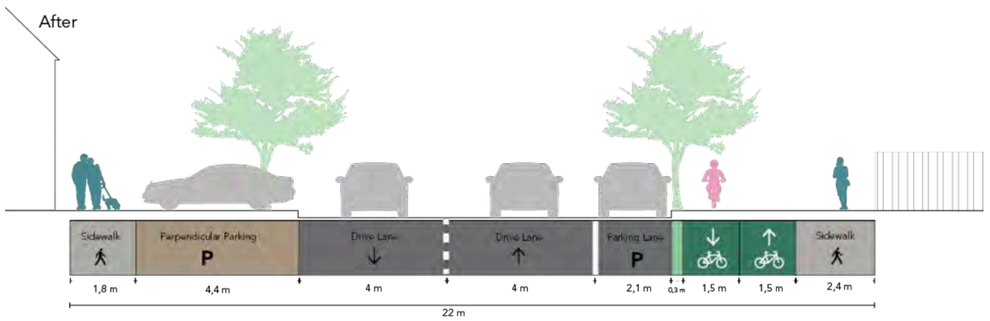

Pros Option 1	Cons Option 2	Pros Option 2	Cons Option 2
Improved Pedestrian Safety	Reduce of parking Spaces	Improved Pedestrian Safety	Reduce of Parking Spaces
Improved Pedestrian Comfort	Costs only for the bicycle lane and pedestrian ways	Improved Pedestrian Comfort	Costs to redesign the whole node
Improved Cycling Infrastructure		Improved Cycling Infrastructure	
		Creating a Connection with Green Spaces	
		Creating New Public Space	
		Safer School Route with Drop-Off Zones	

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