URBAN PLANNING AND TRANSPORTATION

Academic Year : 2024-2025

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EXISTING BUS ROUTES

The Transurbaine project aims to link Ans to Chênée.

This route would not exactly cover the study area, but would still bring very close to it for someone coming from the outskirts of Liège but not from the city centre.

The positive point of this project is to reduce traffic congestion and improve air quality (less pollution)

Projects to be implemented according to the PUM :

- The long version of the tram
- 3 new BHNS lines
- 3 new orbital bus routes
- Relieve Place Saint-Lambert, which handles 750 buses a day >> relocate terminuses

Bus journey times are generally too long >> plans to expand the bus network and introduce a tram to compensate.

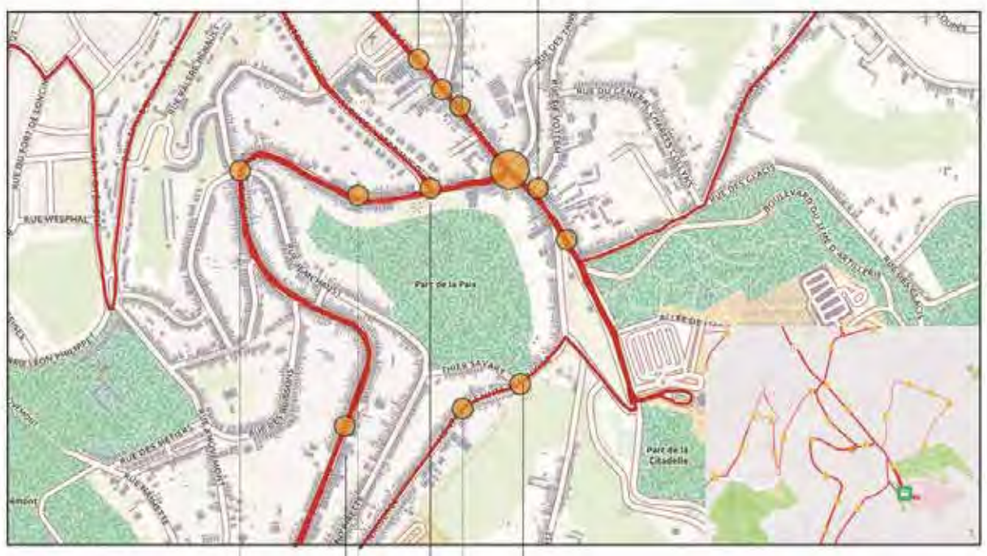
Another objective is to create connections between the centre and the suburbs, and to create soft mobility networks.

* BUSWAY = lines are planned for 2027 in the region of Liège so they'll be permiting to citizens from various neighbourhoods to reach more easily another far point of the map.

Mcreover these new lines as well as the extension of a tram will try to eradicate the problems of congestions and trafics of buses that we observe in both senses of each line.

Hypothesis : As the parking lots are currently most of the time full, these new ways of public transport will partly answer this issue and maybe empty a little parking lots.

PLANNED TRANSPORTATION ROUTES



THE INTERVIEW

"There are many accidents in the area because there are no traffic lights. Recently two vehicles coming from Rue de Campine and Rue Sainte-Walburge collided and entered my shop."

"And think, it's only been a month since I opened this shop. I've seen this in a month. I've seen a lot of smaller things too. Often vehicles can't see each other, when they're turning right or left or crossing the street. This is the case elsewhere in this area too."

"It is not a safe place for cyclists either. I personally would not choose to cycle here. Bus drivers are not careful either."

"There are no set hours for unloading goods from shops, nor for homes. Therefore, there can be traffic.If regulations were introduced for these actions, it could have a beneficial effect on traffic."

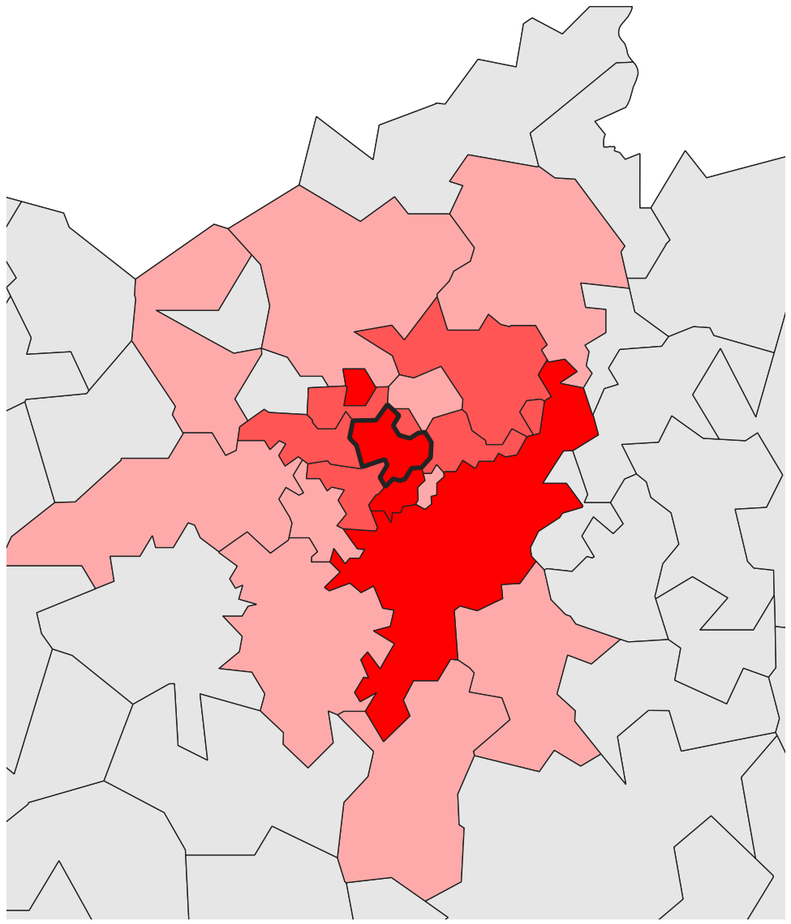
"This route goes towards the hospital. Maybe 8-10 times a day, an ambulance passes. Of course, there is noise, but that is another matter. However, imagine that there is a traffic jam here. Then, the ambulance cannot go as fast as it should."

FIRST IMPRESSIONS

TASK 1

Plan Piéton (2004)	**Plan Communal de Mobilité de Liège (PCM)**	**Plan Urbain de Mobilité de l'agglomération liégeoise (PUM)**	**Stratégie Régionale de Mobilité et Vision FAST 2030**	**Plan de secteur**	**Strategic Objectives for Sainte-Walburge**
Promote soft mobility in the Sainte-Walburge district	- Walking accounts for 40% of trips in the district. - Highlights the importance of pedestrian and cycling infrastructure, such as the redevelopment of the E313 into an urban boulevard and the refurbishment of local streets.	- Describes line 70 as a backbone of the TEC network in the district, with several complementary lines (23, 24, 39, 71, 72, 73, 74, and 174). - **Associated Projects**: Extension of line 70 to the right bank with the TEC network restructuring planned for 2025.	Encourages reducing car use in the city through measures such as the Conversion of several streets to one-way traffic to prevent transit traffic in residential areas.	Plans for a direct link between the highway exit and the CHR Citadel, though this project is not currently part of planned investments.	**Target Modal Share (according to the PUM)**: ● Active modes (walking/cycling): 30%-40%. ● Public transport: 30%-40%. ● Cars: 20%-30%. **Major Projects to Achieve These Objectives**: ● Implementation of the Transurbaine project. ● Complete redevelopment of the city entrance (Burenville-Fontainebleau-Hocheporte-Cadran-Saint-Lambert).

Flows from Sainte-Walburge on Weekdays

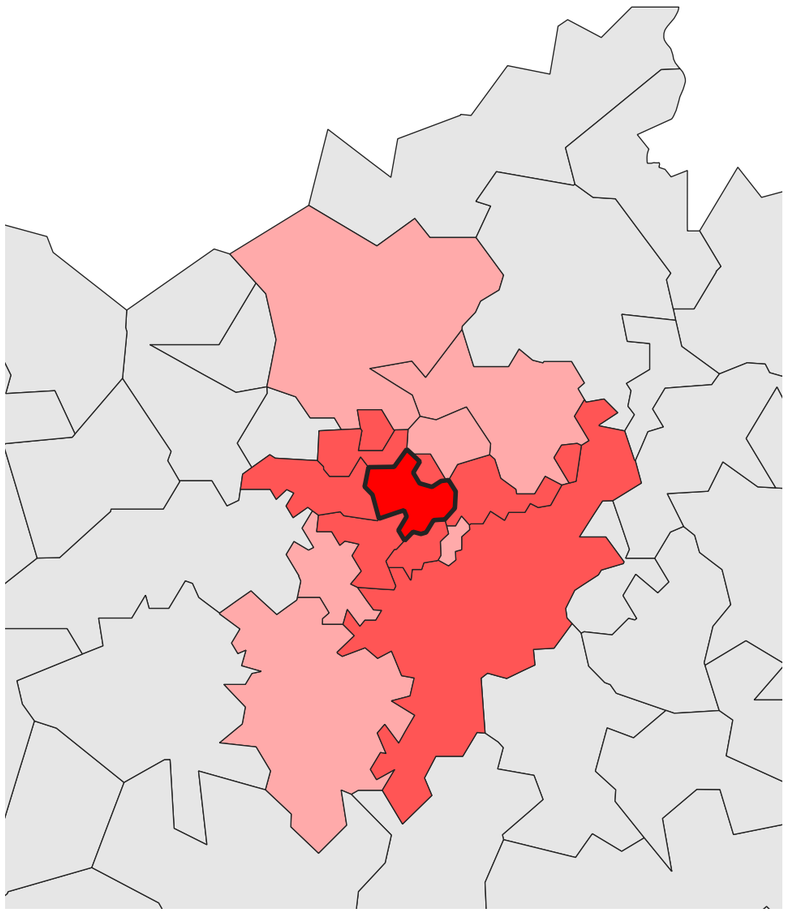


Sainte-Walburge

Number of flows
- 0 - 200
- 200 - 1000
- 1000 - 4000
- 4000 - 9000

Autors : Group 9
Date : November 2024
Source : Data from the course's online Drive

Flows from Sainte Walburge on Weekends

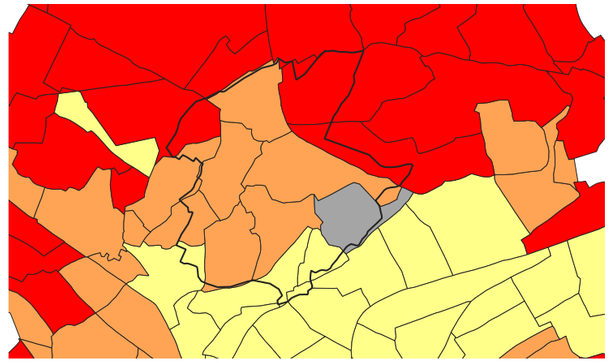


Sainte Walburge

Number of flows
- 0 - 200
- 200 - 1000
- 1000 - 4000
- 4000 - 9000

Autors : Group 9
Date : November 2024
Source : Data from the course's online Drive

Car Ownership In and Around the Ste Walburge Area



Sainte-Walburge

Number of Vehicles per 100 Households
- 31 - 67
- 67 - 90
- 90 - 142
- not specified

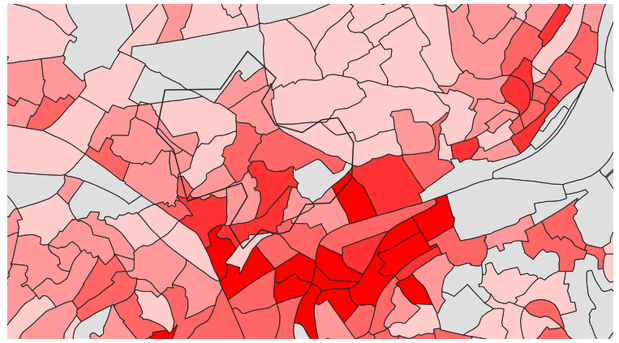
0 500 1 000 m

Autors : Group 9

Date : 2024

Source : Data frome the Course's Drive

Housing density in and around our study area : Sainte-walburge



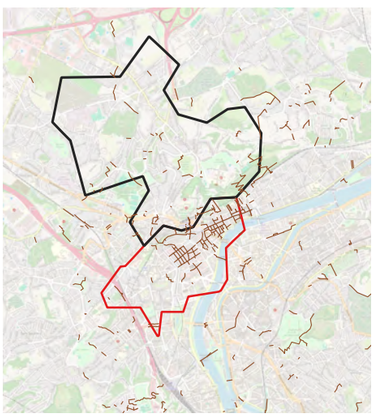
Sainte-Walburge

Housing Density (housing units per hectare)
- 0 - 10
- 10 - 30
- 30 - 50
- 50 - 70
- 70 - 90
- 90 - 180

0 750 1 500 m

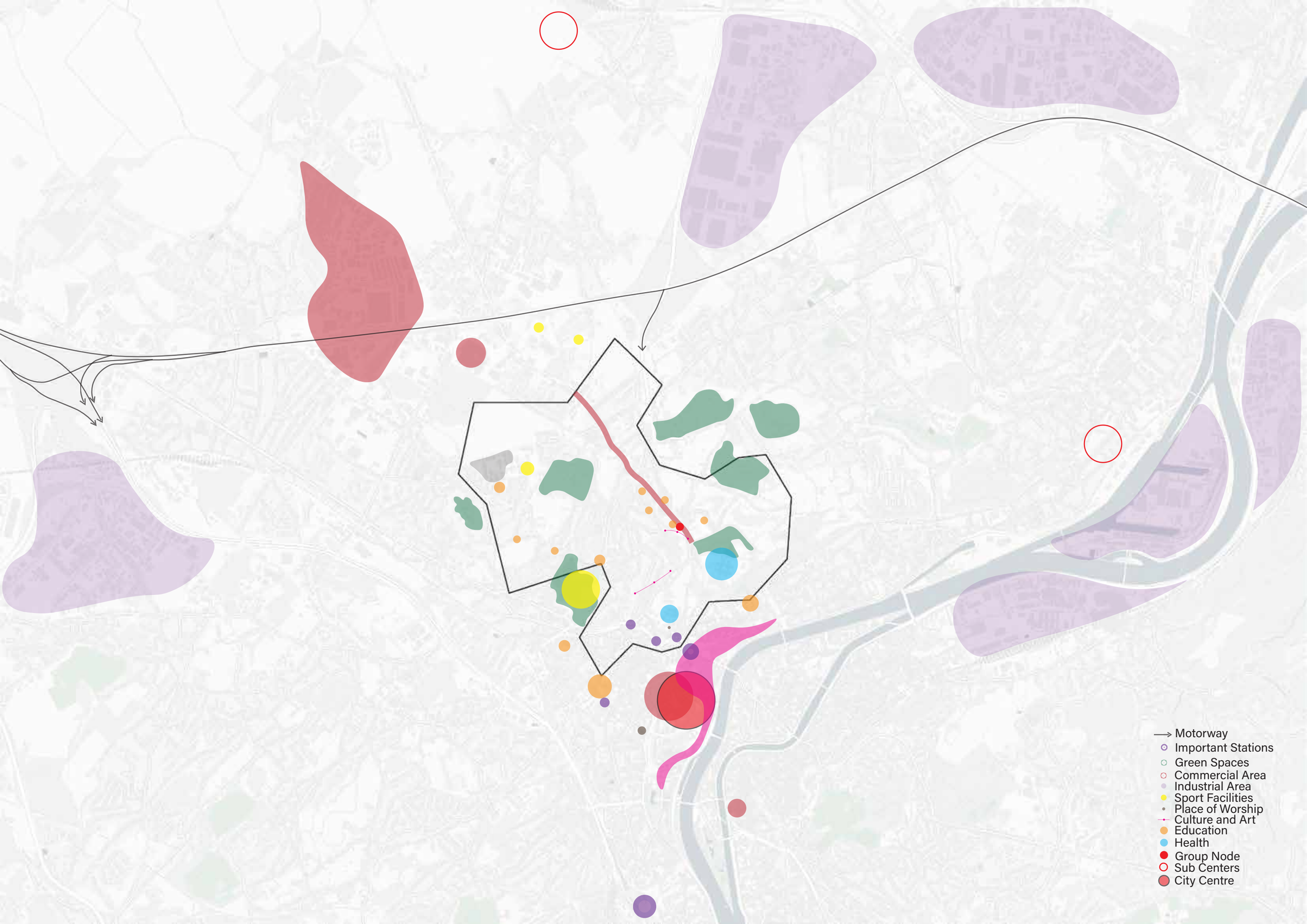
Source : Statistical sector data
Autors : Group 9
Nov. 2024

Pedestrian ways around Sainte-Walburge



Pedestrian Ways
Sainte Walburge
Liege City Center

Autors : group9
Sources : Course's drive datas


Motorway
Important Stations
Green Spaces
Commercial Area
Industrial Area
Sport Facilities
Place of Worship
Culture and Art
Education
Health
Group Node
Sub Centers
City Centre

TASK 2

The first map shows that the majority of the flows coming from the Sainte-Walburge neighbourhood goes to the neighbourhood itself, and to Liège City Center. There is a smaller number of flows going to Herstal, Liège Ans Rocourt Alleur, Ans Loncin, Liège Saint-Léonard Coronmeuse and Liège Saint-Laurent Glain. These neighbourhoods are located on the outer ring of Liège : the map is concentric.

The flows come directly from the Origin Destination Matrix. The first map highlights flows which are mainly due to working and educational (kids going to schools) activities of the local population, whereas the second map displays the flows related to retail.

The third map focuses on the pedestrian ways available in and around Sainte-walburge. We observe that there is a large majority of these pedestrian ways located in Liège City Center itself but not much in the Sainte-Walburge area. Hence the difficulties related to mobility in the neighbourhood.

First, the integration of socioeconomic and demographic factors allows us to identify major trends regarding the population living in the neighborhood. These data are compiled at the statistical sector level : the smallest available scale.

Regarding housing density, significant disparities are visible between different statistical sectors. The southern and central parts of the neighborhood are densely populated (between 50 and 90 dwellings/ha). These areas have a very urban character. On the opposite side, the western statistical sectors are less dense, with densities ranging from 10 to 50 dwellings per hectare. These areas are mainly composed of collective or terraced residential housing.

In the northeast, where the cemetery is, the density is at its lowest. It does not even reach the threshold of 10 dwellings per hectare. This place is a little rural, but we could almost say that it's rural with its natural landscapes. Housing there is primarily detached single-family homes.

Thus, population density is structured around a historical main axis connecting the valley floor to the plateau: the road linking Liège to Tongres.

Our last map regarding the mobility demand is the car ownership map. It shows that the city center of Liège is not very much equipped with individual vehicles, whereas the zone at the North of Saint-walburge is very much equipped with it. Sainte-Walburge is situated right in between these two. This is an interesting situation, because we see that Sainte-Walburge is not a purely residential area, and it is not a purely economically speaking active area, but it is something in between.

For a better analysis of Origin Destination Matrix at a larger scale we read articles 3 and 4 (cf. bibliography) found on ScienceDirect which evoques a brand new method. This method could help perceiving mobility tendencies faster end in a more efficient way.

Main Attractors

This map is crucial in our reflection process regarding this study.

Indeed they underline the importance of areas in relation with Sainte-walburge :

- Parc industriel des Hauts de Sarts at the North in Herstal among others
- The city center of Liège, and the Rocourt area, which are important commercial areas. We can deduce that a lot of people will come to these places with varied transport modes to work or to make retail.
- Schools. There are many of them around the commercial street 'Rue Sainte-Walburge' and also all around the neighbourhood.
- The RUSGS and Province Naimette Area Sports facilities.
- The green spaces are all in and around sainte-walburge. They stand for a real potential for our project because we know that green connections can enhance the way inhabitants, visitors move around (better air quality, respect of environment, and more adapted ways and lanes for soft mobilities, …).
- The Hôpital de la Citadelle is a real attractor. It is responsible for many flows as we will show in the following steps of this document.

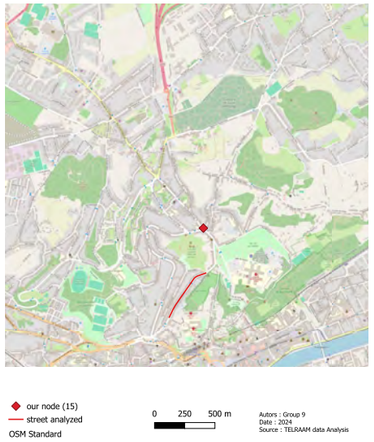
Additional informations

The attractor map organizes and visualizes key data based on land use categories such as green spaces, commercial areas, industrial zones, transportation hubs, sports facilities, places of worship, educational institutions, healthcare facilities, and cultural venues. It also situates the neighborhood within the city, marking both the city center and the project area. In Sainte-Walburge, significant attractors influence mobility patterns. The CHR Citadelle Hospital is the largest generator of local activity. Rue Sainte-Walburge is a central axis, concentrating economic activities and educational institutions, while Rue de Campine connects the neighborhood to the city center and experiences high volumes of both transit and public transport traffic.

External attractors, including the Cora-Rocourt commercial area and the Hauts-Sarts industrial zone, lie outside the neighborhood but generate substantial transit traffic through Sainte-Walburge. Additionally, the E25 motorway entrance increases the transit pressure on the area.

The neighborhood also features sports facilities and green spaces, which enhance local quality of life and present opportunities for improved mobility connections, such as promoting environmentally friendly and active travel options. This attractor map provides a clear overview of the neighborhood's key areas and their influence on movement and connectivity, offering valuable insights for future urban interventions.

Street Considered for our TELRAAM Data Analysis

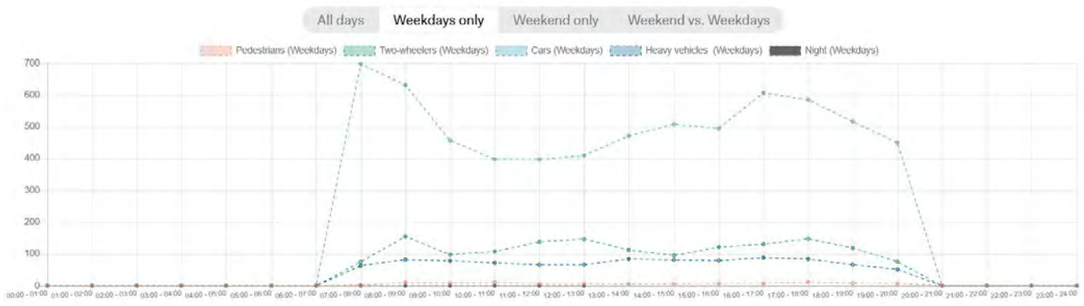


bikes (all day measures)

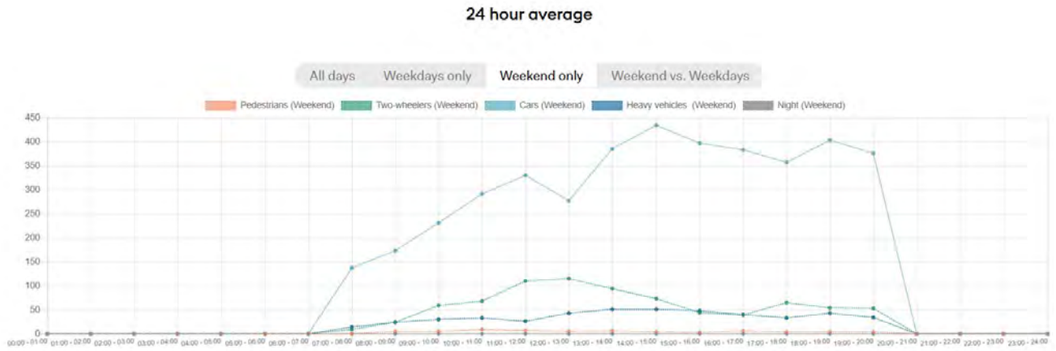
cars (all day measures)

pedestrians (all day measures)

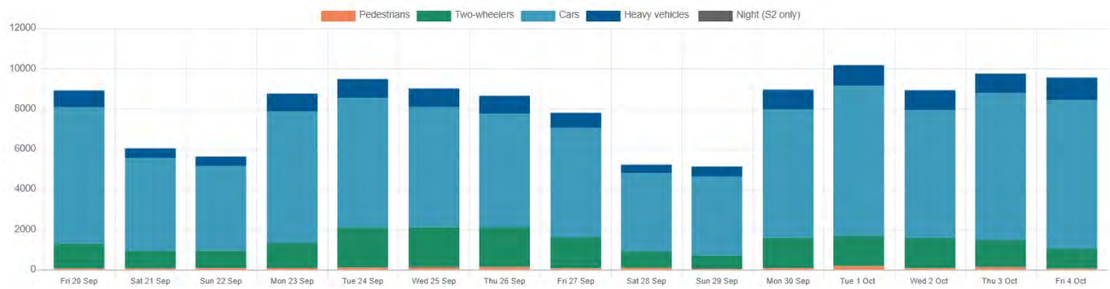
24 hour average



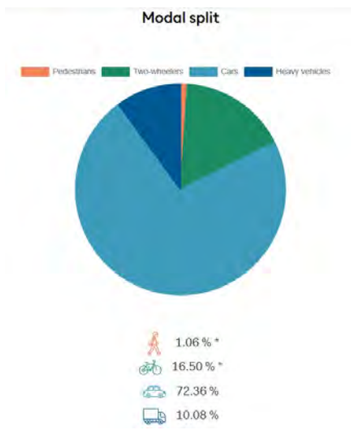
24 hour average



Daily overview



Modal split



TASK 3

TELRAAM

Telraam data provides an overview of the repartition of different modes of transportation (= Modal Share) as well as traffic intensity on streets equipped with counting cameras. There are about 10 cameras installed in Sainte-Walburge. Having these cameras on the main axis helps us understand the mobility tendencies in the neighborhood. Streets affected by heavy traffic loads, particularly transit traffic,are put on the foreground thanks to this TELRAAM Analysis.

We picked a 14-day interval for our online TELRAAM Analysis : from September 20th to October 4th (2024). The street analyzed is Montagne Sainte-Walburge because it was the closest to our node (node 15).

We should be careful when analyzing these datas because of the method behind the datas : some sensors are located at a certain height that doesn't always count the pedestrians and bicycles flows.

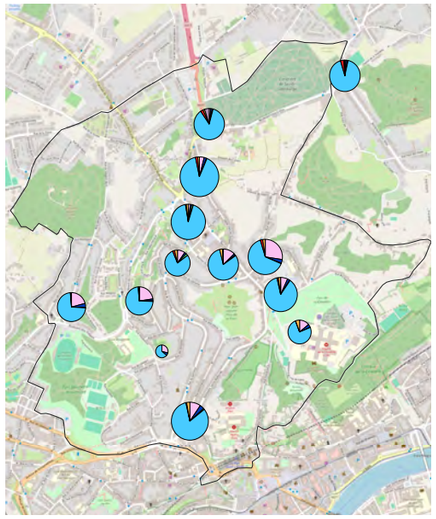
We can remark on our 3 maps with coloured circles that Cars and Bicycles are way more present than pedestrians. It is important to note this because our street that we study is indeed a structuring street in the neighborhood.

On The 24 hour Average for weekdays only, we observe two peaks of car flows : which stands mainly for one for going to and one for coming back from work.

On the week-end the phenomenon is more aleatory depending on the people's activities.

Modal Share

Modale Share on Weekday



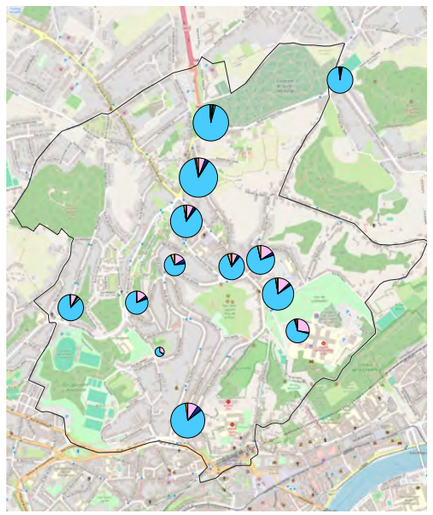
Nodes weekday
- Pedestrian
- Bicycle
- Motorbike / moped
- Car/van
- Truck
- Bus
- Other transport modes
- Sainte-Walburge

OSM Standard BaseMap

0 25 50 75 100 m

Autors : Group 9
Date : 2024
Source : Field countings data

Modale Share on Wednesday



Nodes weekday
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- Bicycle
- Motorbike / moped
- Car/van
- Truck
- Bus
- Other transport modes
- Sainte-Walburge

OSM Standard BaseMap

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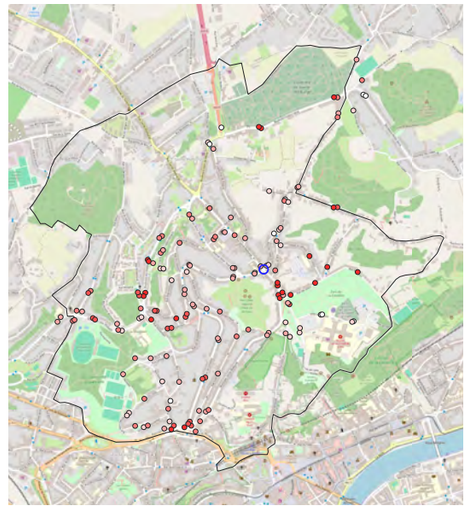
Autors : Group 9
Date : 2024
Source : Field countings data

PLOS / BLOS

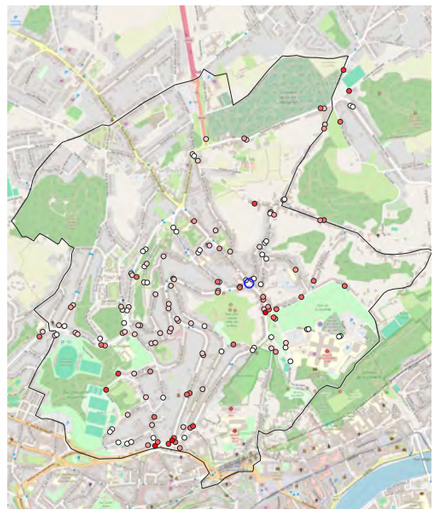
BLOS at the Neighbourhood Scale



BLOS
- A [Excellent]
- B [Very Good]
- C [Good]
- D [Average]
- E [Poor]
- F [Worst]
- Node 15
- Sainte-Walburge delimitation

Autors : Group 9
Source data from the courses drive and field work
Date : Nov. 2024

PLOS at the Neighbourhood Scale



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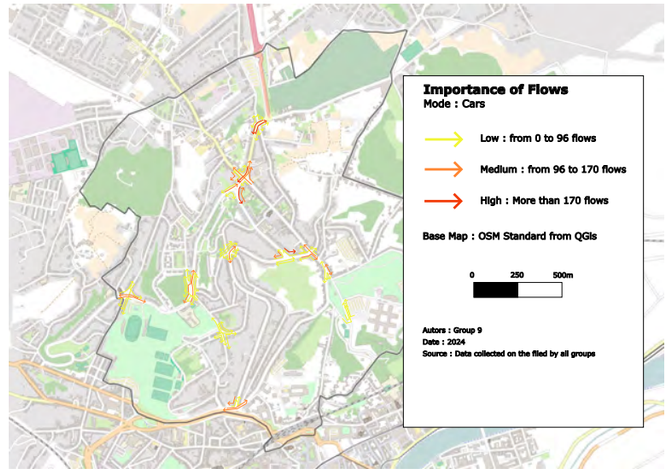
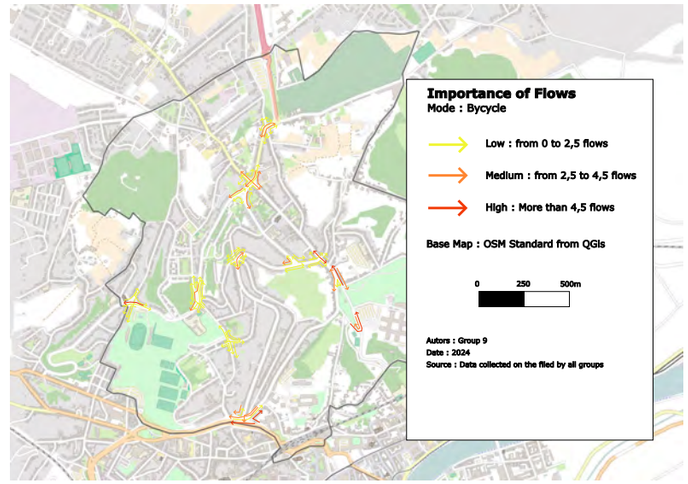
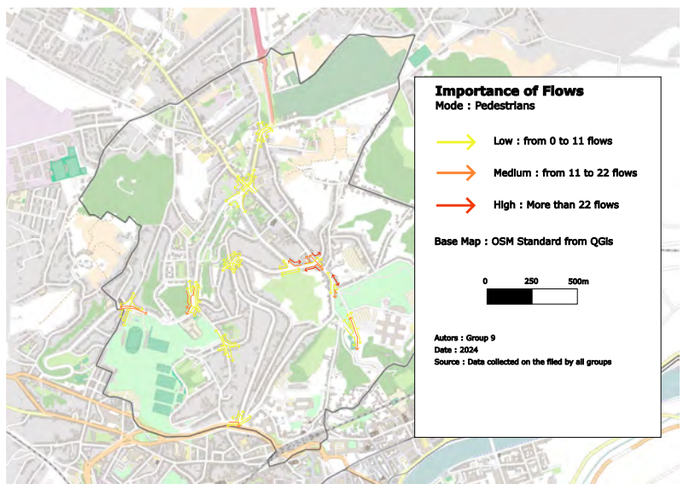
Source data from the courses drive and field work
Date : Nov. 2024

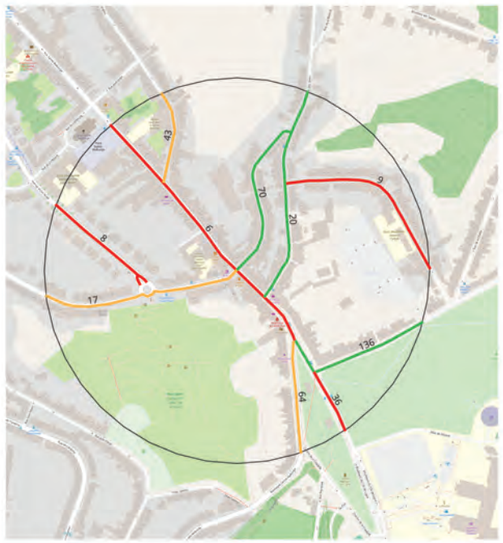
Flows







Occupation of the parking spots around Node 15



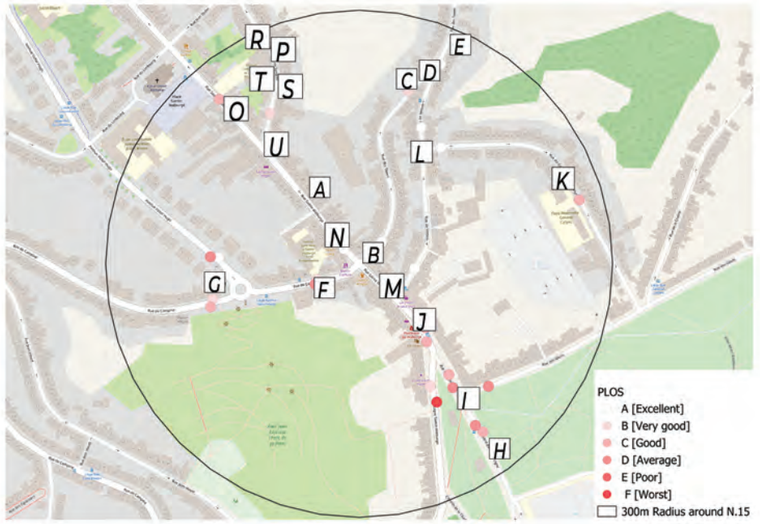
Occupation Rate
- 28% - 66%
- 66% - 79%
- 79% - 94%

6 - number of empty parking places

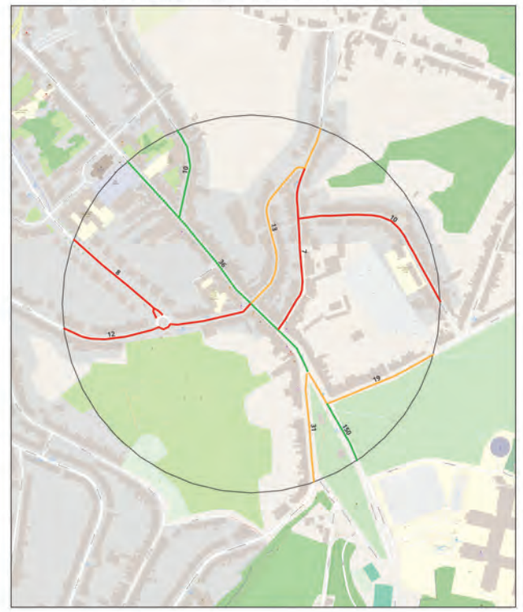
300 m radius around Node 15

Autors : Group 9
Source : data from the Drive
Date : Nov. 2024

PLOS on Node 15 _ St Walburge



Rotation of the vehicles around Node 15 after 1 hour



300m radius around node 15

Rotation Rate per hour
- 11,3% - 20,2%
- 20,2% - 29,9%
- 29,9% - 50%

0 75 150 m

- 36 - number of vehicles that have left after 1 hour

Autors : Group 9
Source : data from the field's group countings
Date : 2024

Autors : Ozum E., Lucien O., Yesim O.
Sources : Data from the course's Drive
Nov. 2024

PLOS on Node 15 _ St Walburge

PLOS
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- 300m Radius around N.15

Autors : Ozum E., Lucien O., Yesim O.
Sources : Data from the course's Drive
Nov. 2024

BLOS on Node 15 _ St Walburge

BLOS
- A [Excellent]
- B [Very good]
- C [Good]
- D [Average]
- E [Poor]
- F [Worst]
- 300m Radius around N.15

Autors : Ozum E., Lucien O., Yesim O.
Sources : Data from the course's Drive
Nov. 2024

TASK 6

Analysis and Mapping of Mobility Flows

Neighbourhood Scale :

We think that the formula giving **the PLOS and BLOS** and that is related to our countings on the field is optimistic.

Indeed, we don't see a lot of critical points in terms of bad pedestrian and bicycle level of service.

The 3 critical points that we distinguished are as following :

- (BLOS) Intersection of Rue Sainte-Walburge, Montagne Sainte-Walburge, and rue des Glacis : this area is close to the Hôpital de la Citadelle.
- (BLOS) The roundabout between rue Xhovémont, Boulevard des hauteurs et boulevard Léon Philippet.
- (BLOS + PLOS) The Saint-Lambert Section : there are indeed different modes generating lots of flows at the Node 1. Buses, and trains coming from and going to the City Center of Liège create this low level of Service both for bicycles and Pedestrians.

For the **Modal Share**, we observe that the main mode inside the neighborhood is Cars. However, the proportion of pedestrians at the Node which is located at the Citadelle Hospital gets bigger and bigger on Saturday counting : almost half of the flows at this Node.

We can guess that this comes from the fact that many people book appointments with doctors on weekends at this place. This also confirms our Map of main attractors (Task 2), where the Hôpital de la Citadelle is very important.

We also observe a similarity between PLOS/BLOS maps and the Flows (arrows of different colors) maps. It turns out that the nodes where there is most of the flows are the nodes where the Level of Service for Bicycles and Pedestrians is at its worth.

Node Scale :

PLOS/BLOS :

Our Node is actually located around one of the critical areas mentioned just above at the neighbourhood scale.

We can clearly see on the maps of BLOS and PLOS at Node Scale that the junction between Rue Sainte-walburge, Montagne Sainte-walburge and Rue des Glacis is the most problematic.

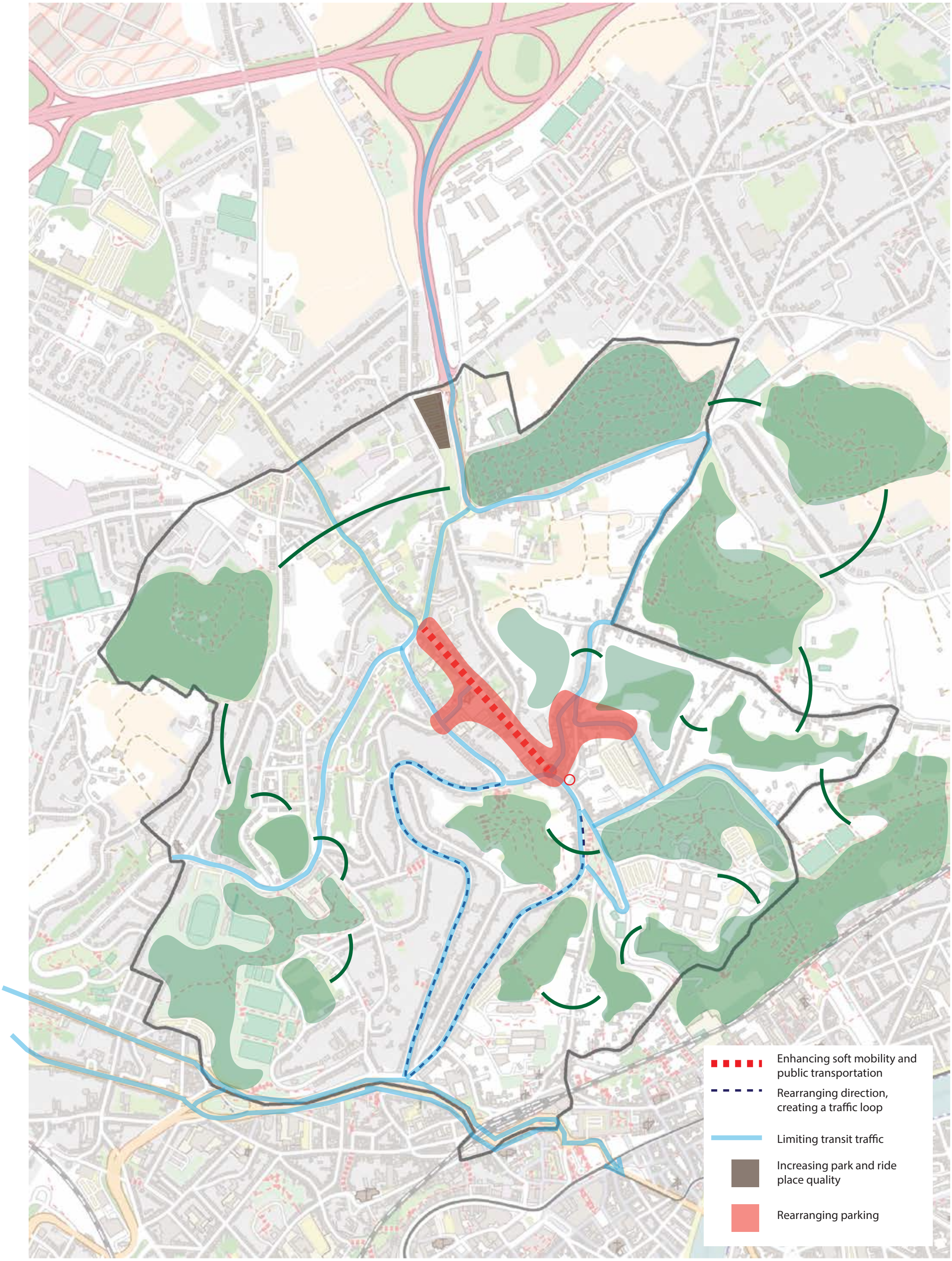
This point is to put in relation with the Flows maps (3 maps for 3 modes). Indeed, the flows (all modes included) at nodes 15 and 3 are some of the most high inside the area of the neighbourhood.

Barriers : Throughout the area, numerous barriers disrupting the circulation of pedestrians and cyclists have been identified. To address these barriers and eliminate them as an issue, several approaches have been considered: combining certain signs into a single traffic sign, transforming others into multifunctional structures integrated with street furniture, and relocating some to building facades.

Parking occupation / rotation :

We concluded from our maps regarding parking use that the Rue sainte-Walburge is the most occupied one (only 6 places free at the counting time, for the longest way of our zone). We see that Rue de Vottem and Rue des Tawes are not so occupied because they have a lot of free places (respectively 20 and 70). However, these are residential ones so they have a very low rotation rate. The turnover is on the other hand much higher on the Rue Sainte-walburge. This is in fact a commercial street so people come there for retail and for a quick drop-off and then leave.

We had the same analysis on the boulevard du douzième de ligne. There is a big turnover (150 cars left the street after only 1 hour). However the occupation is still very high at this specific place.


Enhancing soft mobility and public transportation
Rearranging direction, creating a traffic loop
Limiting transit traffic
Increasing park and ride place quality
Rearranging parking

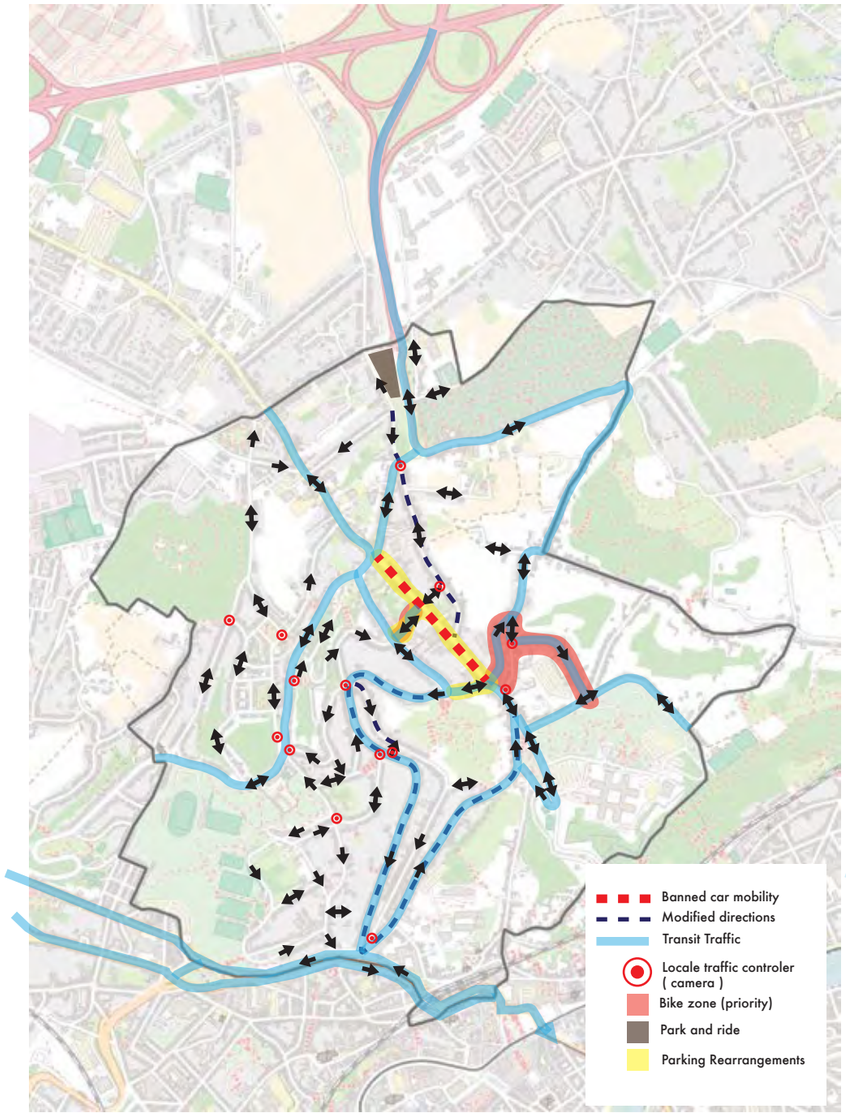
TASK 7 :

Creating sustainable Mobility Through Green Space Integration	Low Car Density in the Neighborhood
- Integrating Bicycle Infrastructure into urban green network - creating safe pedestrian pathways connected with green corridors - Enhancing community well-being with public spaces : 1. particularly around bus stops 2. intersections of different transportation modes 3. park and ride facilities 4. residential neighborhoods and school surroundings - possible solutions for barriers 1. combined poles : integrating traffic signs, street lights and other equipment onto a single pole to reduce clutter on sidewalks. 2. wall-mounted systems : mount traffic signs or lightning fixtures on buildings facades where feasible to free up sidewalks space 3. multi-functional poles : adding functionality to poles by incorporating seating, bike parking spaces, or greenery to enhance usability 4. implementation of shared spaces where the speed limit is lower (20km/h), and also larger pedestrian ways (at least 1,5m).	- Limiting transit traffic in the neighborhood by putting cameras at the entrance and exit of residential streets. - creating a loop with directions rearrangement for cars to reduce traffic in the neighborhood - Banning car traffic through part of rue Sainte Walburge. Only Buses, Cars, and pedestrians are allowed to go through the area. Limited car-access for businesses.
Rearranging parking according to residential needs	**Enhancing Public Transport System and City Center Integration**
- Shared parking spaces 1. allowing car owners to share their parking spaces with others during specific times of the day - time-based pricing 1. increasing prices during peak demand hours for parking spaces to reduce traffic congestion and balance demand for parking. This system can guide users towards public transportation and alternative modes of transportation. - increasing the percentage of residential parking spaces in the neighborhood. - Rearranging existing 43 free parking spaces in place sainte-walburge : 30 is only for residential and 13 would be for short stay (school, shopping, …)	- Separate Line for Bus 1. Separating bus lines in part of rue sainte walburge, rue de Campine, and Montagne Sainte-walburge to create a BHNS (Bus à Haut Niveau de Service) - Increasing bus station quality with sidewalk rearrangement and redesigning

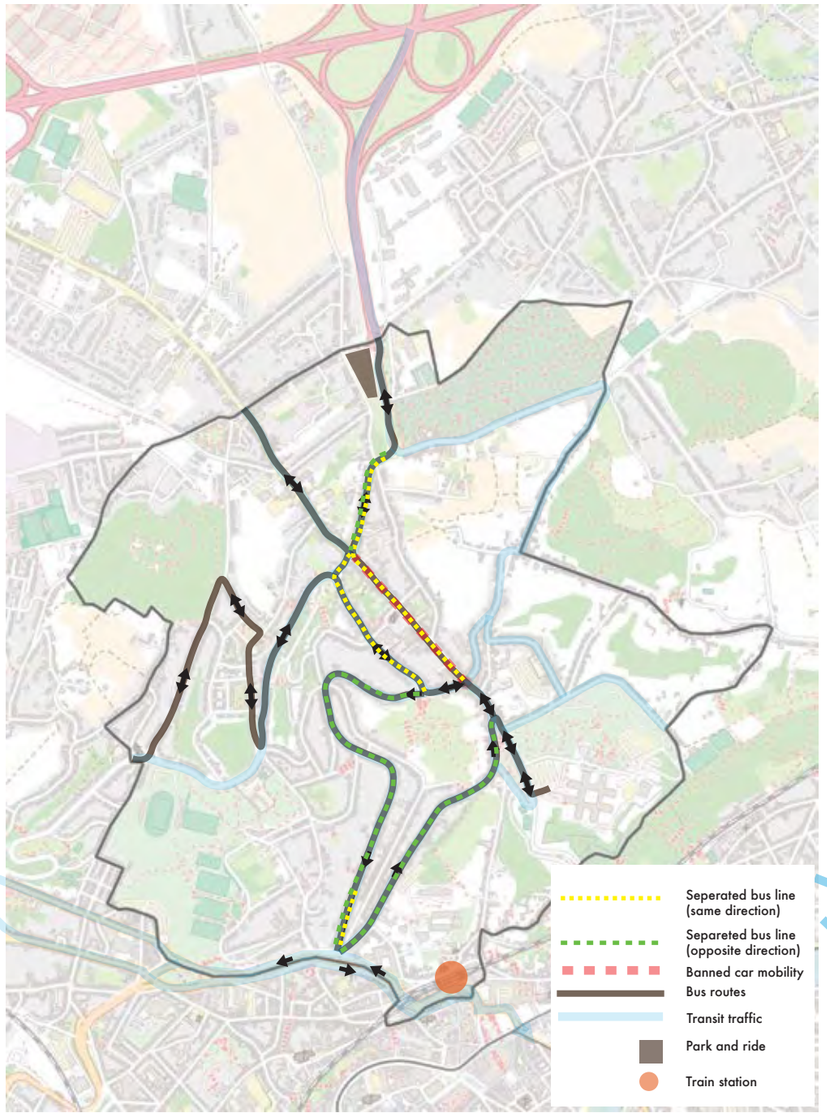
Another parameter has retained our attention : the topography and altitude of the area. It's something that should be considered notably for the implementation of bike lanes.

“Given the topography of the urban area of Liege, the difference in the altitude must be considered in addition to the travel distance. Fig. 6 shows the cumulative altitude differences for the distances most likely to be travelled by bike (1–12 km).”

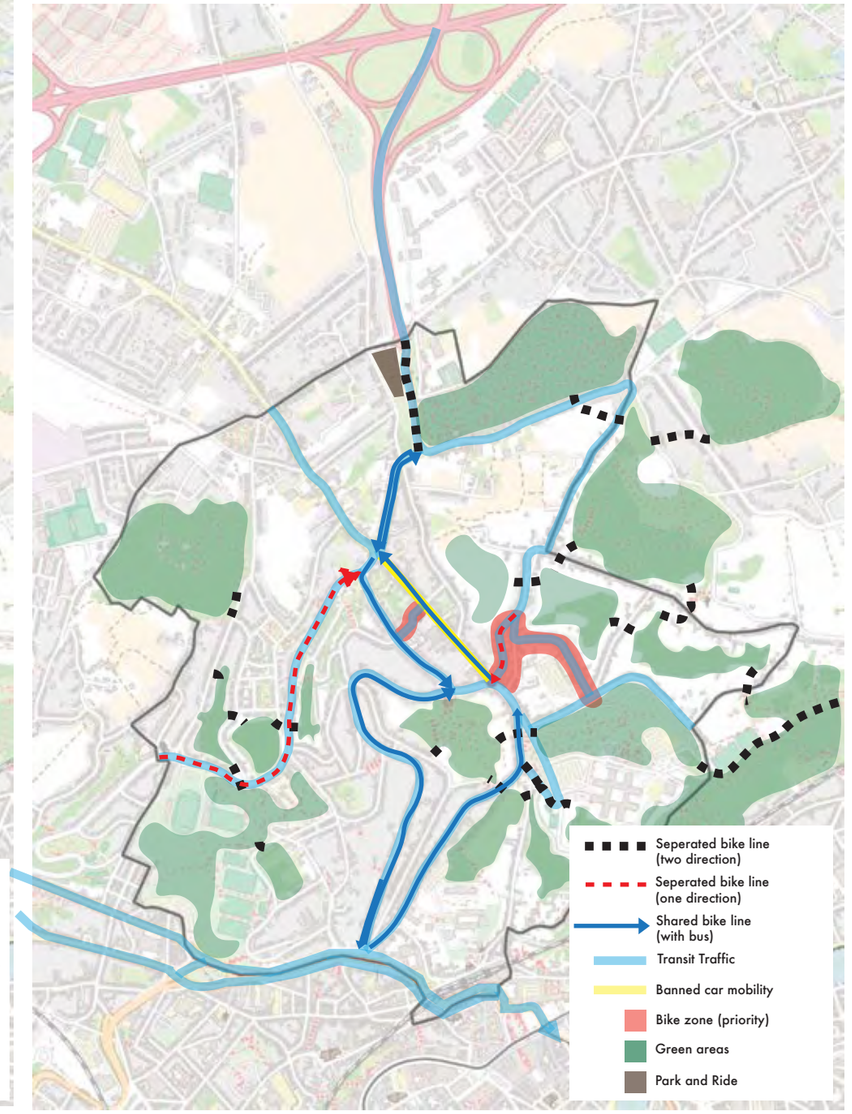
Car Mobility



Public Transportation



Soft Mobility



TASK 8

We divided our mobility plan into 3 maps.

The essential points to remember are :

- Part of the Rue Sainte Walburge will now be dedicated mostly to pedestrians.
- A bike zone begins at the Rue des Tawes
- We propose to implement Cameras (one for entrance and one for exit) as we planned in our objectives
- We did our best to connect the green spaces while keeping in mind that the topography is really to take into account.

Vehicle Lane

Pedestrian Walkway

Parking Area

Bus and Bicycle Only

Separated Bike Lane

Green Public Space

OPTION 1

Vehicle Lane

Pedestrian Walkway

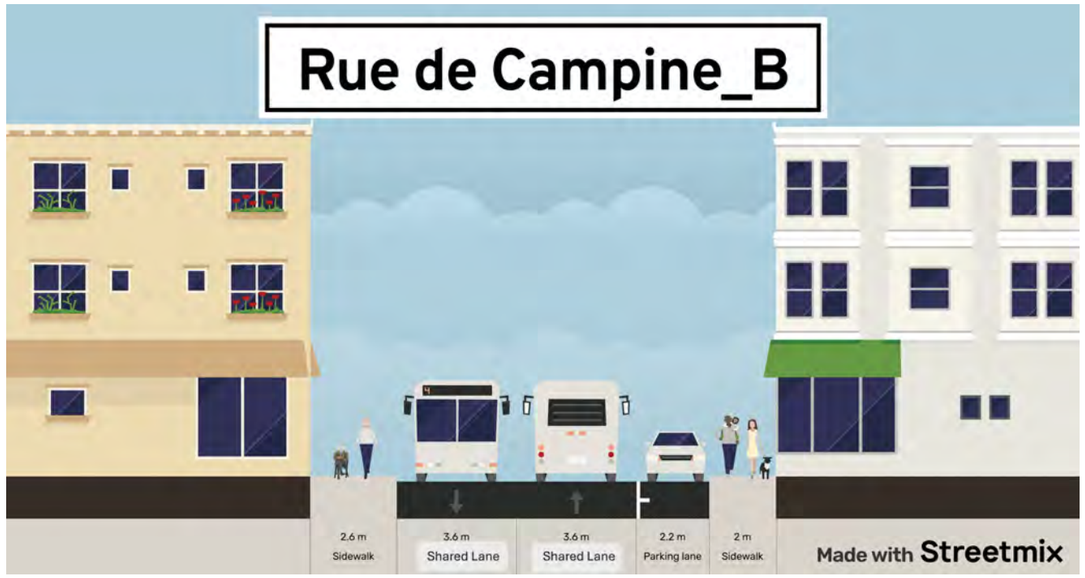
Parking Area

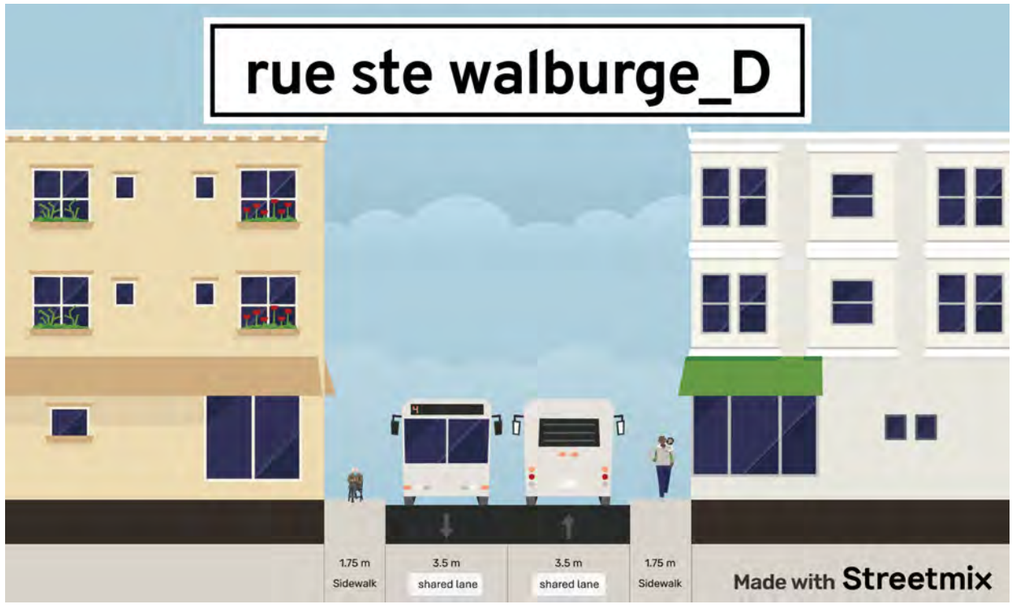
Bus and Bicycle Only

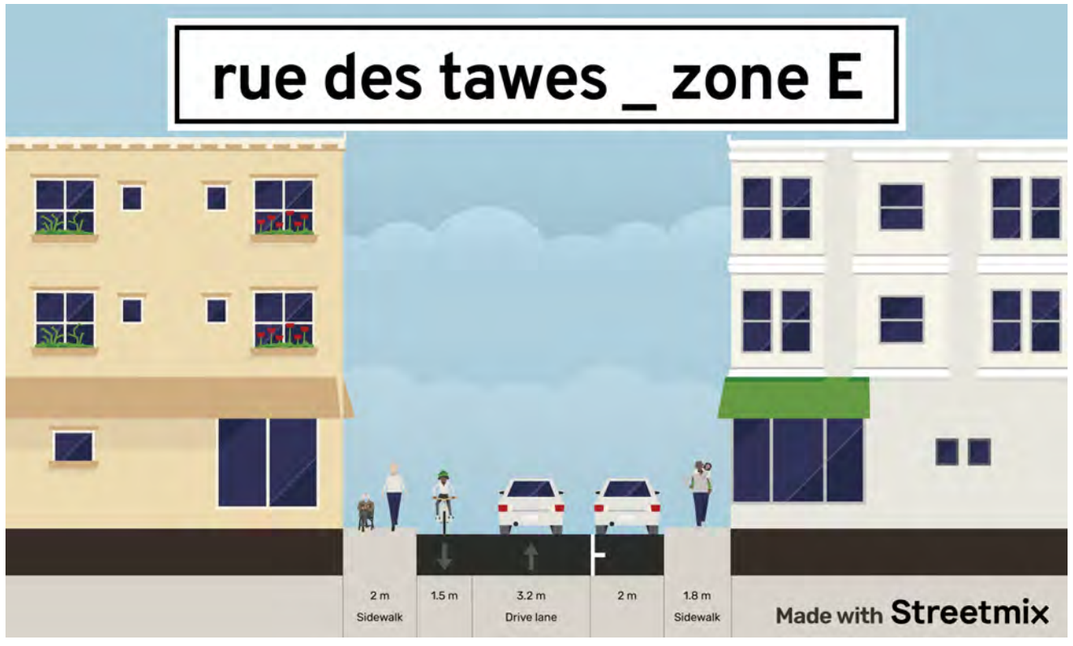
Separated Bike Lane

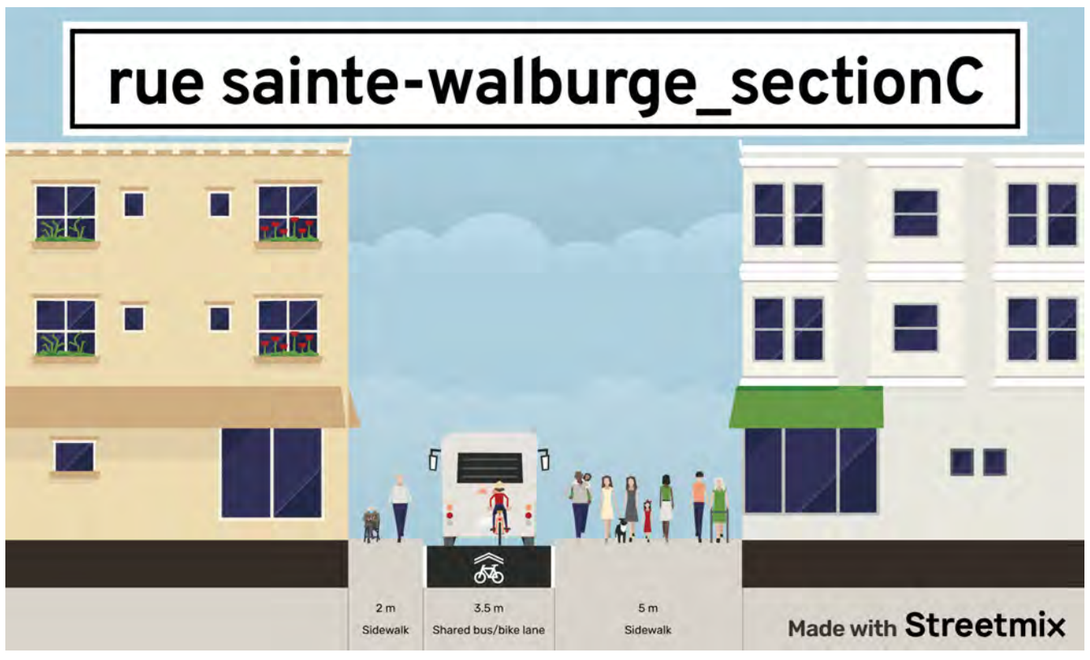
Green Public Space w Parking

OPTION 2


Rue de Campine_B
2.6 m
Sidewalk
3.6 m
Shared Lane
3.6 m
Shared Lane
2.2 m
Parking lane
2 m
Sidewalk
Made with Streetmix


rue ste walburge_D
1.75 m
Sidewalk
3.5 m
shared lane
3.5 m
shared lane
1.75 m
Sidewalk
Made with Streetmix


rue des tawes _ zone E
2 m
Sidewalk
1.5 m
3.2 m
Drive lane
2 m
1.8 m
Sidewalk
Made with Streetmix


rue sainte-walburge_sectionC
2 m
Sidewalk
3.5 m
Shared bus/bike lane
5 m
Sidewalk
Made with Streetmix

TASK 9 :

In the preparation of recommendations for transportation design, priority has been given to soft mobility wherever possible. Based on the data collected from various tasks, a pedestrianized zone has been proposed around the node on Rue St Walburge, allowing only one-way access for bicycles and buses. Within this zone, a green space has been proposed for the use of local residents, and the soft mobility network has been integrated with this area. Additionally, a separated bike lane has been created on Rue des Tawes.

For Option 2, a portion of the proposed green space has been repurposed as parking space for local residents. This adjustment is expected to enhance the community's accessibility and convenience while maintaining the overall balance of green infrastructure.

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