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Document information

Author(s) and contributing partner(s) - if any

Name	Organisation	Contribution
All Partners	All Organisations	Information on the hubs
Sander Oudbier	AMS Institute	Review and revise
Jet Berndsen	City of Amsterdam	First draft DEL06's framework
Erwin Gorter	City of Amsterdam	
Miquel Martí	UPC	Section 2.4
Lara Espindola	UPC	Section 2.4
Joan Moreno	UPC	Revision section 2.4
Inés Aquilué	CARNET	Revision section 2.4
Frederico Henriques	EMEL	Section 2.5
Maria Coutinho	EMEL	Section 2.5
Liliana Magalhães	EMEL	Revision section 2.5
Sofia Taborda	EMEL	Revision section 2.5
Adam Jędrzejewski	MobilneMiasto	Revision section 2.7

List of abbreviations (if any)

Contents

1. Executive Summary

At the start of the SmartHub pilots a structured pilot validation framework was defined, that is used by the consortium to set up the SmartHub pilots in a consistent way, and to allow for comparison of results across pilots and cases. This framework describes the logic of piloting and what aspects, assumptions and variables will have to be tested and validated in each context, to realize the project results. It also includes a baseline study of the different areas/city districts in which the hubs will be implemented, a series of infographics representing the different hubs and hub goals. Indicators for monitoring performance of the hubs were selected with the partners in the project through in co-creation sessions. The indicators and monitoring were adapted according to each city's situation. Each city was responsible for reporting data on hubs in their own city.

To collect data performance of the hubs was measured. Most important indicators of for performance were number of users and duration. Customer satisfaction and possible avenues for improvement were collected through surveys.

In the first 5 months of operation of the hubs the performance of the hubs shows room for improvement. The hubs are mostly new and unfamiliar for the general public. Number of users is generally lower than expected. Biggest reason for this is covid restrictions and travel recommendations which slowed uptake of users. Customer satisfaction is favourable across all the hubs measured. Users are pleased with provided services and also provided guidance for service improvements. For most hubs the challenge for next year is attracting more customers and increasing revenue. To achieve this growth most hubs will scale up communication and marketing efforts next year. With growth and less covid restrictions cities are able to collect data and reach the research goals set for next year.

2. WP2 – Mid-term evaluation report Hub Pilots

This chapter shows the mid-term results of the pilots for the first months of operation. It includes the operational hubs performance on usage, as well as the customer satisfaction and identification of new service improvements across the different pilot hubs.

To build the mid-term evaluation report, the follow steps were completed:

A set of indicators were made to assess the performance of hubs in a more statistical manner. In addition, this list was supplemented with a set of indicators specific to the goals each hub set out for itself at the beginning of the year during the pilot plan interviews. This list was then sent out to each pilot city as a framework to gather information about different data points to be able to evaluate the mid-term performance of the hub. The end result is a combination of both mobility usage data as well as survey data.

2.1. Amsterdam

2.1.1. Amsterdam Student Hotel City

Use per shared mobility modes Amsterdam Student Hotel City
The hub at the Student hotel City opened in July 2021. Hely is the operator of this hub. Hely operates 12 hubs in Amsterdam and plans to open 8 more in 2022. The hub is located on a parking lot next to a hotel. The hotel is aimed at students who stay for periods up to 6 months in Amsterdam. The hub is easily accessible from the surrounding streets but not directly visible. The distance to the subway station is within 100 meters walking distance. The hub started operation with city bikes, comfort bikes and e-bikes. In the future there will be an expansion with cargo bikes.
The hub is aimed at residents from the Student hotel and neighbourhood of the hub. Secondary group of users are visitors to the area. This could be tourist of people arriving through the subway.

Use of the hub

AMSTERDAM – Student Hotel	total
Total succesful sign ups	36
Succesful sign ups / month	11
Nr of unique users / month	13
Average nr rentals / active user / month	-
Percentage Multi-Modal rentals / user / month	-

There is limited data generated about users, signups and unique users. Next year will generate more data which will make it possible to draw conclusions about the successfulness of this hub.

Rental data Student Hotel

	month	city	comfort	ebike	total
Total rentals	August	2	5	-	7
Average rental duration	August	124	700		
Total rentals	September	7	9	17	33
Average rental duration	September	320	280	250	
Total rentals	October	2	24	20	46
Average rental duration	October	1000	380	378	
Total rentals	November	11	5	16	32
Average rental duration	November	196	1322	401	
Total rentals	December	3	12	8	23
Average rental duration	December	275	355	104	
Total rentals 2021					141

The number of trips and users is not at the level expected. The number of trips was growing until October, but then fell back. Most probable cause for this development has been tightening Covid– restrictions. This has probably led to less usage of the hub due to lower amount of travel of residents and of visitors to Amsterdam. This has had an important impact in the amount of users and growth of the hubs. Hely reported that all users were able to make a successful reservation.
Up till now there is limited data about the origin of the users so it is difficult to state conclusions. Currently the users are mainly students/residents of the hotel but not yet from the neighborhood or arriving from further away with public transport. In the next year we expect more detailed information about origins of users.

2.1.2. Amsterdam Fashion Hotel

Use per shared mobility modes Amsterdam Fashion Hotel

The hub at the Fashion hotel City opened in july 2021. Hely is the operator of this hub. Hely operates 12 hubs in Amsterdam and plans to open 8 more in 2022. The hub is different from other hubs with regard that is located inside a hotel. The hub is easily accessible from the surrounding streets but not directly visible. The hub started operation with city bikes, comfort bikes and e-bikes. In the future there will be an expansion with cargo bikes.
The hub is aimed at visitors (both leisure and business) coming into the city by car; business guests in the local business area; city residents who use the hub to get out of the city. residents from the neighbourhood of the hub.

AMSTERDAM - FASHION HOTEL	total
Total successful sign ups	24
Successful sign ups / month	8
Nr of unique users / month	9
Average nr rentals / active user / month	-
Percentage Multi-Modal rentals / user / month	-

There is limited data generated about users, signups and unique users. Next year will generate more data which will make it possible to draw conclusions about the successfulness of this hub.

Rental data Fashion Hotel

		city	comfort	ebike	total
Total rentals	August	-	1	4	5
Average rental duration	August	-	131	248	
Total rentals	September	7	7	2	16
Average rental duration	September	222	401	314	
Total rentals	October	6	13	3	22
Average rental duration	October	169	170	130	
Total rentals	November	4	14	5	23
Average rental duration	November	111	207	165	
Total rentals	December	2	12	-	14
Average rental duration	December	135	325		
Total rentals 2021					80

The number of trips and users at the Fashion hotel is not is at the level expected. The number of trips was growing until November, but then fell back. Most probable cause for this development has been tightening Covid–restrictions. This has led to less usage of the hub due to lower amount of travel of residents and visitors to Amsterdam. This has had an important impact in the amount of users and growth of the hubs. Hely reported that all users were able to make a successful reservation.
The usage of e-bikes is less than the other types of bikes. Users reported that they find the extra assistance of a battery unnecessary for traveling in the city.
Up till now there is limited data about the origin of the users so it is difficult to state conclusions. In the next year we expect more detailed information about origins of users.

2.1.3. Fashion and Student hotel's additional indicators

The hubs at the Fashion and Student hotel have the following policy goals:
- Long term goal: incentivize residents – both current and new residents – to do away their privately owned car by developing attractive shared mobility concepts at the neighbourhood level that can be implemented in both current and new area development.
- Test the usage and business case for shared mobility hubs located within privately owned spaces / parking lots – indoors and outdoors. The current hubs are in operation but not yet functioning as desired.
- Decision support for policymakers and developers who have to decide where to locate what kind of hubs in area development.

Covid had has a big impact on first period of operation of the hubs. The size of the impact is unclear but from the first results the effect has surely been negative. The coming year Covid-19 will also influence the results of the hubs. These effects are probably to big tot mitigate with adjustments and measures in the projects.

In 2022 there will be further efforts at developing measures to stimulate citizens in the neighbourhood to make use of the hub. For this we want to create greater awareness of the hub and thereby improving numbers and expanding the client base. There will be two approaches to achieve this goal; marketing and creating bigger presence in the physical space through better wayfinding.

The above mentioned will help the city of Amsterdam integrate hubs in its existing city fabric. This will be helpful to not only scale the number of hubs in city but also give learnings how to improve the functioning of the current and new hubs.

There is not yet survey data due to difficulties in questioning users. Next year we will approach users differently and expect more information on user experience of the hubs in Amsterdam.

Hely is scaling up its operations in Amsterdam next year with launching multiple new hubs. This will help the usage of the Student and Fashion hotel hubs by networking effect though growing of the customer base in Amsterdam.

2.2. Eindhoven

2.2.1. Introduction

The city of Eindhoven uses the location P+R Genneper Parken as the Smart Hub-use case. In this analysis, we will go into detail on the hubs' performance since opening in June of this year. Firstly, we will describe the location of the smart hub, and the characteristics of the location, justifying it as an interesting test case for the smart hub concept. Secondly, we will shortly describe the research framework for the hub before finally going into the actual hub performance in accordance to the data indicator framework.

The smart hub opened in June 2021, offering space for 640 cars to park in, divided over 5 floors. In addition, the location has 19 electric charging stations, 6 parking spots for disabled people and ambulance station of the GGD Brabant South-East, the Dutch public healthcare institute. The smart hub aims to get people on their way to the city centre off the road at the Aalsterweg leading into the city and having them park their car further away. This way, we reduce the number of cars in our city centre. This is possible because the hub is located next to the A2-A67, along the Aalsterweg which is a main axis connecting the highway to the city. The target audience for the hub drives right past the hub on their way to the destination in the city centre. The challenge is to create alternative at the hub for the current door-to-door via car habit that people have, that people will choose to leave their car at the hub and complete the last miles via E-bike, E-scooter or bus. The alternatives we offer at the hub are:
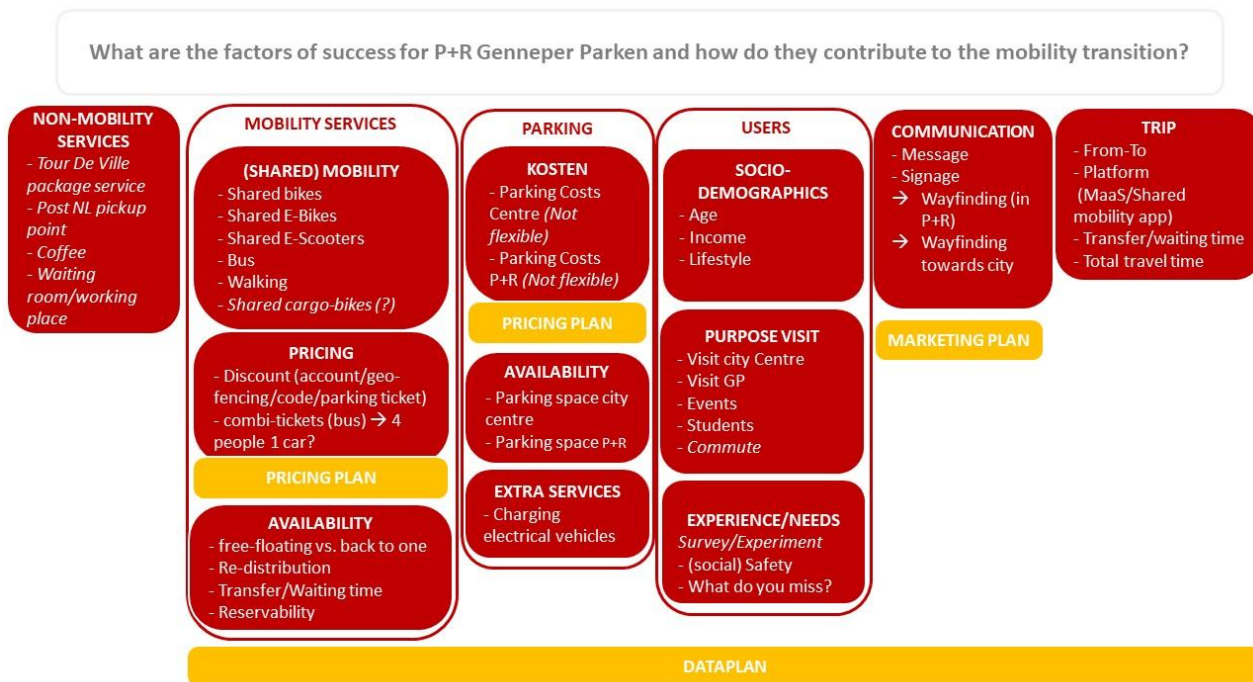
- Transit via high frequent bus line to city centre (every 10 minutes)
- Shared E-Scooters: Felyx and Go Sharing
- Shared E-Bikes; Hely (Partner in the project), since October e-bikes of Go Sharing and TIER.
- Walking (for nearby locations, or walking through green corridor to city (45mins))

2.2.2. Conceptual model

In order to stimulate use of the hub, and to identify what the factors are that determine the success of the hub, we collected an overview of all the elements we can alter at the hub. Our research then focuses on the central research question: What are the factors of success for P+R (smart hub) Genneper Parken and how do they contribute to the mobility transition?

This conceptual model is an overview of all the elements/factors we found relevant to do research on, in both

What are the factors of success for P+R Genneper Parken and how do they contribute to the mobility transition?

NON-MOBILITY SERVICES	MOBILITY SERVICES	PARKING	USERS	COMMUNICATION	TRIP

NON-MOBILITY SERVICES
- *Tour De Ville package service*
- *Post NL pickup point*
- *Coffee*
- *Waiting room/working place*

MOBILITY SERVICES

(SHARED) MOBILITY
- Shared bikes
- Shared E-Bikes
- Shared E-Scooters
- Bus
- Walking
- *Shared cargo-bikes (?)*

PRICING
- Discount (account/geo-fencing/code/parking ticket)
- combi-tickets (bus) → 4 people 1 car?

PRICING PLAN

AVAILABILITY
- free-floating vs. back to one
- Re-distribution
- Transfer/Waiting time
- Reservability

PARKING

KOSTEN
- Parking Costs Centre *(Not flexible)*
- Parking Costs P+R *(Not flexible)*

PRICING PLAN

AVAILABILITY
- Parking space city centre
- Parking space P+R

EXTRA SERVICES
- Charging electrical vehicles

USERS

SOCIO-DEMOGRAPHICS
- Age
- Income
- Lifestyle

PURPOSE VISIT
- Visit city Centre
- Visit GP
- Events
- Students
- *Commute*

EXPERIENCE/NEEDS
Survey/Experiment
- (social) Safety
- What do you miss?

COMMUNICATION
- Message
- Signage
→ Wayfinding (in P+R)
→ Wayfinding towards city

MARKETING PLAN

TRIP
- From-To
- Platform (MaaS/Shared mobility app)
- Transfer/waiting time
- Total travel time

DATAPLAN

2021 and 2022. We translated the different elements into a data plan, a marketing strategy and a pricing plan. The pricing plan is something we want to put into practice in 2022. Since the opening of the hub was delayed in the beginning of 2021, we decided to keep the prices stable at the start of the hub in order to see how the status-quo situation would work out.

The data plan was the basis for defining the smart hub indicators, which we collectively sharpened to a shared set of indicators which we will present below. Many of the factors we find relevant for research as stated in the model, have been operationalised into the data-collection and the survey.

The marketing plan was the basis for all the communicational actions we put into place in order to stimulate use of the hub. As a city, we take great interest in stimulating use of the hub as a whole, with the first concern being: how can we get people to park at the hub. The next steps are related to get people to use certain modes of follow-up transport. Together with Hely we have had talks on how to combine our communication efforts to meet both our ambitions.

The pricing plan was put on hold for 2021. The idea of the pricing plan is to do research into how changes in the price of shared mobility, the ticket price for parking at the hub and the price for the bus ticket affect the choices people make. It is one of the factors we can manipulate, and a factor which is one of the three main factors that influence the choice of travel for people. The three factors being cost, time and comfort. We put the plan on hold due to the delay in the opening of

the hub. We first need a time period to gather data on the use of the hub in a 'status quo' price situation, as a benchmark. Afterwards, we will put the plan into practice in 2022.

2.2.3. Data analysis

Since the hub opened the first of June 2021, the number of visitors is increasing gradually as can be seen in Table 1. These numbers contain both the people that use the facility of Park + Ride and people that only use the hub for parking. Those are probably people working at or visiting the GGD (Municipal Health Services) or visitors of the Van der Valk Hotel, which are both located near the hub. The number of visitors is not yet at the level that was expected. There are two possible explanations:

- Due to Covid-19, the number of visitors of Eindhoven has been decreased drastically during the past year. In addition, one of the expected incentives of using the hub was that from this point a traffic jam used to arise all the way towards the city center. However, at this moment the traffic jam does not exist anymore and therefore it is easier to just park in the center.
- With new facilities like these there is always a start-up period before people get used to the service and experience using it. We expect a gradual increase in use over time.

Table 1 Number of cars parked at hub / month (with/without subscription)

	06 2021	07 2021	08 2021	09 2021	10 2021	11 2021*
Number of cars parked at hub / month	328	389	343	433	512	741

* data until 18th of November

As can be seen in Table 2, only a part of the people parking their car at the hub use the bus as a last-mile modality. It could be that the other visitors had a destination in the proximity of the hub (sports facilities, vaccination location), or that they have used shared mobility for their last-mile trip. Especially in the month of November we see a drastic increase of hub users. A possible explanation is that parking at the hub was free of charge during GLOW (6 – 13 November).

Table 2 Usage of bus

	06 2021	07 2021	08 2021	09 2021	10 2021	11 2021
Number of car tickets used to buy bus tickets (cars)	38	72	122	85	152	374
Number of bus tickets ordered (persons)	75	185	297	165	332	1013

Hely shared bikes and e-bikes

The Hely bikes and e-bikes haven't been used much during this period (see Table 3). Only three trips have been made by e-bike in July, two in August, two in October and three trips with a regular bike are made in November. Reasons for this might be that this is the only location in Eindhoven where the Hely bikes can be used, in contrast to the e-mopeds and e-bikes of the other shared mobility providers in Eindhoven. People have to sign up to Hely especially for using these bikes, this can be a barrier. Another reason might be that the tariffs are quite high. The bikes can be used for €1,- per hour, and you continue paying when the bike is parked and you are in fact not riding the bike. Especially in comparison with the tariffs of the bus (€0,50 per person two-way ticket) the bike prices are quite high. When compared to the e-scooters, the Hely (e-)bikes are in the same price range depending on the duration of the visit. The costs for a one-way trip with an e-moped are approximately €3,00, making it around €6.00 for a two-way trip. Lastly, the bikes of Hely are less flexible than the other shared mobility modes, which is an advantage and a disadvantage. An advantage, because the bikes offer certainty of availability. Disadvantage, because the cost of the bike rental keeps running while you visit the city which people might find put pressure on getting back fast. What the actual preferences are for people remains to be seen.

Table 3 Usage of Hely bikes

	07	08	09	10	11

|	2021	2021	2021	2021	2021
Number of subscriptions	12 in total				
Number of trips e-bike	3	2	0	2	0
Number of trips regular bike	0	0	0	0	3
Average rental duration (min)	223	133	-	12	100
Number of attempted reservations vs. number of successful reservations per month	100%	100%	100%	100%	100%
Time of reservation (hours/days ahead)	0	0	0	0	0
Number of broken-down vehicles / month	0	0	0	0	0

Free-floating shared e-mopeds and e-bikes

In Eindhoven we have free-floating shared mobility of Felyx, Go Sharing and TIER. Felyx and Go Sharing are operating shared e-mopeds, Go Sharing and TIER are operating e-bikes since October. Agreements have been made on the availability of e-mopeds at the hub. Felyx, Go Sharing and TIER have a service area at the hub from which users can start and end their trip with a shared e-moped or e-bike. Moreover, the providers installed discount codes for the hub users, see Figure 1 (the code of TIER still has to be added). The discount codes have been used seventeen times in total now.

Figure 1 Codes for registration at Hely, and discount codes for

trial period of 30 minutes for Go Sharing and Felyx

With regards to business sensitive information, we can only share information that all three providers were able to share with us. This limits our data to the trips ending at the hub. Note that the data of one provider is missing in the months October and November, so this influences the figure drastically.

Figure 2 E-moped and e-bike rentals ending at Smart Hub Genneper Parken

e-moped and e-bike rentals
trips ending at P+R
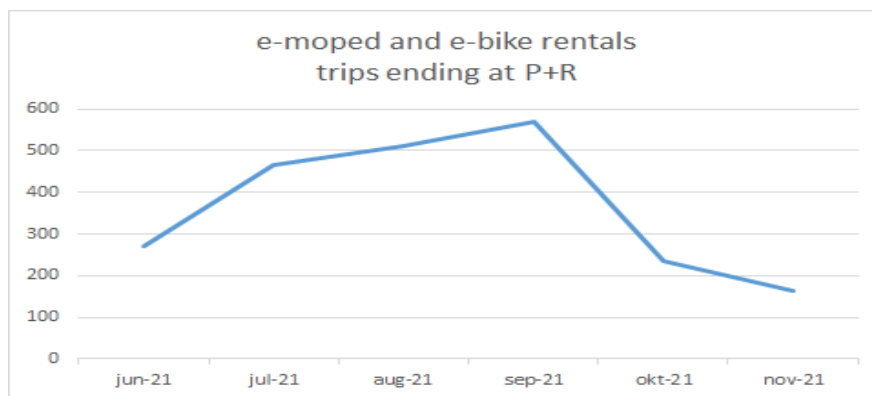
As can be seen in figure 2, quite some trips have been conducted by e-moped and e-bikes to the Smart Hub during the months of June, July, August and September. This number is increasing gradually throughout these months. However, due to the missing information of 1 service provider during the months October and November, we can't tell for sure if the use is still increasing or not, although we suspect they are, based on the increasing trend before September.

It is questionable if all e-moped and e-bike users are also using the P+R service, since the service area of the shared e-mopeds is located outside of the hub and therefore it is not necessary to have parked your car at the hub.

The data shows us that trips people make by e-moped to the smart hub take on average 4.5 km. In Figure 3 you can see what area can be reached approximately within 4.5 km (as the crow flies). This includes the center area, but also important working and school locations.
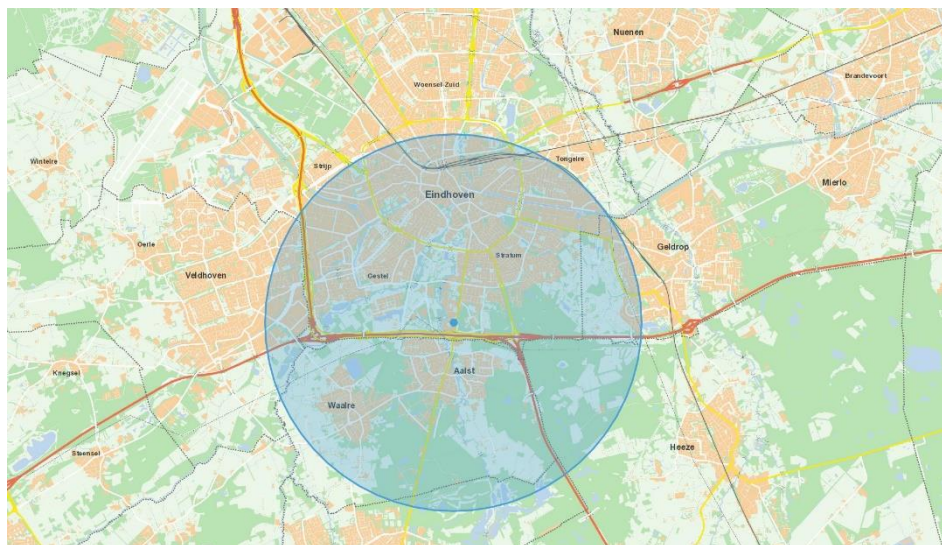

Figure 3

Reachable area by e-moped in 4.5 km

2.2.4. Survey results

In order to give insight into the user experiences and to get an idea about the suggestions users have for the hub, we have conducted a survey at the hub to ask these questions. The survey was initially conducted at the hub on the 20th till the 22nd of October (during Dutch Design Week), and again on the 12th of November (during GLOW). The results are presented here, however the amount of people willing to participate in the survey was quite low.

In total we received 18 responses to the survey, which is not representative. People gave insights in their experience and provided us with suggestions on how we can improve the hub with additional services to improve the experience. The low usage of the hub is a bottleneck for obtaining the research results.

2.2.5. Survey

The survey consisted of the following questions and was conducted via an online survey tool called Survalyzer.

General questions:
- What is your age?
- What is your gender?
- Have you used the hub before? If yes, how often do you use the hub?
- How did you know you could use the hub for your trip?

Trip characteristics:
- What place is the starting point of your trip today?
- What is the purpose of your visit?
- What is your destination?
- How long will you expect to park here today?
- What mode of transport brought you here?
- What mode of transport did you use from here?

Experience:
- How easy was finding your way in the hub?
- How smooth was your payment procedure?
- What do you think of the prices?
    o Parking
    o Bus
    o Shared mobility
- Would you recommend others to use the hub?
- Is there something missing in the hub in terms of services, information or anything else to improve your experience?

3.4.2 Results

- As already mentioned, these responses to the survey have mainly been obtained during the period of Dutch Design Week and GLOW in Eindhoven. This means that some results have been linked specifically to these events. In order to draw some general conclusions, we focus in this paragraph on the results that are not specific for these events.

- The results show that for the majority of respondents (78%) this was the first time they visited the smart hub and almost all of the respondents came from a city or village in the Southern region of Eindhoven. One came from Western part of Brabant and one from Germany.

- In addition to the purpose 'event', other purposes that were mentioned are 'working', 'shopping' and 'recreational purposes'.

- Most people knew about the existence of the smart hub via websites (Municipality of Eindhoven, parking in Eindhoven and GLOW) or social media.

- All respondents drove by car to the smart hub and then took the bus towards the city centre (and back), except for one respondent for whom the smart hub was his final destination. People that used the bus all gave their experience 4 or 5 stars.

- Most respondents thought it was easy finding their way inside the smart hub and also most people thought the payment went smooth. Some thought the process of getting a bus ticket was somewhat difficult to understand.

- The majority thought the tariffs for parking were quite low. The same applies to the tariffs of the bus. Two people indicated that they thought the tariffs for shared mobility were quite high, despite they didn't use it.

- All respondents indicate they would recommend others to use the P+R facility at the smart hub. Positive feedback they provide is that it is cheaper than in the city centre (especially with the promotion campaign of free parking). Respondents also see it as a plus that it is close to the highway, and that you know there are parking spots available.

2.2.6. Service improvements

Suggestions we got for improving the hub services via the survey were:

- Translation of the information at the hub into more languages.
- The process of getting a bus ticket was not clear.
- Information about the price of parking and shared mobility outside.
- Information about bus-stops for return trip. From where in the city can we get the bus back to the hub?
- Better signage towards the entrance of the hub facility.
- Broaden payment options for health facility.
- Integrate payment for parking ticket and E-bikes into 1 app.
- A warm waiting spot for the bus.
- The toilets are not functioning.

Suggestions on better information and signage have immediately been picked up by the project team.

2.2.7. (Social) media marketing analysis

Part of the research into the smart hub Genneper Parken is focused on our marketing plan results. The aim of our marketing strategy is to make people aware of the hub, to introduce them to the services in the hub and how to use them, all in order to see an increase in the use of the hub over time.

The first stage of the marketing plan has been social media efforts. The second stage, which was supposed to start in December 2021, but will now commence in Q1 2022 as soon as the Netherlands comes out of yet another lockdown, will focus on physical presence on top of digital presence. In this short analysis, we give an overview of the results of our social media effort. We will present the outreach as well as the interaction.

Number of posts
Throughout 2021 there have been 16 occasions of media-outings regarding the Smart Hub. Of those 16 occasions, 11 were by the initiative of the city of Eindhoven, promoting the hub on various Owned Media platforms, such as Facebook and Instagram. 3 media outings were done by local and regional media papers, raising awareness on the smart hub, and fulfilling their journalistic creed by reporting on the city's' new smart hub. The other 2 outings were done in local newspapers, being opinion pieces reflecting on the smart hub.

Types of posts
Paid media
- *Indebuurt.nl*
- *DPG*

Owned media
- *Instagram*
- *Facebook*
- *Z-cards*
- *Construction sign*

Earned media
- *Indebuurt.nl*
- *Eindhoven's Daily mail*
- *Other*

Number of people reached
The number of people reached with our social media outings can only be traced back to the owned media. We are owner of those media channels, being Instagram and Facebook. Therefore, we have direct insight into the numbers of 8 of the 16 media outings.

In total we have had:
- *An outreach of ~72.000 viewers*
- *A total of 1650 responses*
- *A total of 150 shares*

Responses
In general, we see both positive and negative response to the outings on social media. We can conclude that the social media outings have helped in getting the Smart Hub known, since the

number of responses in new papers from inhabitants as well as from journalists increased as soon as we increased the number of posts on social media. This was challenge one, making the hub known.

Follow-up

In 2022, we will continue doing what we have been doing in 2021, as we see a steady increase in the use of the Smart Hub throughout the year. We will stay on top of our communication about the smart hub and look for new and exciting ways to stimulate the use of it.

For 2022, we see that the hub should also be promoted via local initiatives. By making a link between the smart hub and for instance the local businesses in the city centre, we can stimulate the use of the smart hub by awarding it with something we organize with the local business. A free coffee could be one of those options

2.3. Helmond

2.3.1. Use of the hub per shared mobility mode

The hub in Helmond opened up on July 2nd 2021 with one e-city car and two electric cargo bikes. In period July-November the use was as follows (Source: hely):

	Total rentals / month		Average duration / month	
	e-city car	e-cargo bike	e-city car	e-cargo bike
July	7	18	400	109
August	3	13	354	106
September	12	13	443	151
October	18	9	176	148
November	19	4	164	153
AVERAGE per month	12	11	218	133
Total number of trips:	59	57		
Combined total number of trips:	116			

According to Hely, these are okay numbers for a new hub. Duration is slowly climbing up as is the number of unique users per month (9 by the beginning of December) and number of sign-ups (total: 58, per month: 18). Hely aims at 20-25 trips per month with a minimum of 15 unique users per month.

The EIT goal is: …"This means that they have daily usage, and have at least 200 unique users (registered since opening in April) and at least a total of 5000 trips are made between April and October 2021, for each hub pilot." That would be 833 trips per month. As indicated before, this is not realistic for Helmond. There are about 3.600 households in the neighborhood (9.700 inhabitants) so it is not a big urban area that we are talking about. Moreover, this neighborhood (Brandevoort) is not yet accustomed to shared mobility at all and many people own second cars (high SES neighborhood). Of course, the number of trips and users at the train station where the hely hub is located is higher if we include the other available shared mobility modes but we don't not have the numbers. This will become clear when the MaaS apps are available.

The challenge for Helmond is to get more people to sign up for the hely app. We did no promotional activities during the summer (apart from announcing the opening of the hub in July). However in September we experimented with a promotion on facebook (in #durftevragenBrandevoort, a popular local facebook group). We asked people to come up with their greatest idea for a day trip with the e-cargo bike and they could win that day for free (free use of the cargo bike). Conclusions after evaluation:

- Only a few (five) people participated and they were mainly early adopters who already signed up.
- Many people (1114 persons) however read the message, so it definitely had an impact on the awareness of the hubs' existence and its possibilities.
- The winning message was "I would use the e-cargo bike to take the rubbish from my garage to the recycle station in a sustainable way". The winner was announced on Facebook and got a private message from Hely.
- Final conclusion: this promotion with a link for registration did not work (at least not directly) to get new users. Mainly people who already were involved, participated.

More marketing and communication activities were planned in October and November so we hope to see better results from those.

2.3.2. Service improvements

No service improvements were made during this period (July-September).

2.3.3. Helmond's additional indicator's

Helmond's additional indicators are:

1. Effective 'catchment area' of hub near train station – how long are residents willing to travel to access the hub?

2. Distance residential address & knowledge of hub's existence

3. Acceptance of hub as alternative to owning a second car

We discussed the use of a questionnaire with the responsible department but we decided to postpone further research as we were not sure about the prolongation of the hub and the municipality of Helmond had already done a similar exercise last year (see

https://infogram.com/deelvervoer-2020-1h1749p0q9kq6zj?live). Some related results from that research (representative, 789 respondents) are:

- 75% of the inhabitants of Helmond knows at least one supplier of shared mobility.

- The older respondents are, the less familiar they are with shared mobility.

- In neighborhoods with lower social status (SES), the demand for (affordable) shared mobility is higher.

- In 2020, 8% of the inhabitants used shared mobility.

- One third of inhabitants who are not using shared mobility at the moment, is interested to (maybe) do so in the future.

- Location and price are important indicators in this decision but more than half of the population is unfamiliar with the prices and locations of shared mobility in Helmond.

At this moment (beginning of December 2021) we are working on a questionnaire that aims specifically on the Brandevoort neighborhood and that will include the additional indicators (and much more).

More details about the first indicator can be derived from the heatmap below that hely has provided. Plotting actual users gives even more insights than qualitative research. All users of the Helmond Brandevoort hub live within 1.72 km (excluded one outlier) and most users (11 of 18 = 61%) live within a 800m radius from the hub.
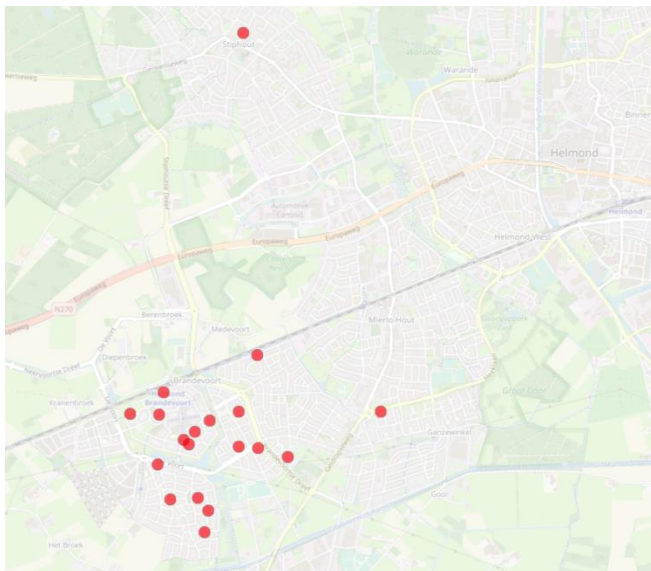
2.4. Barcelona – Sant Cugat del Vallès

The Hub Sant Cugat, in the Metropolitan Area of Barcelona, started to operate on the 2nd of July and was officially inaugurated on the 5th of July of 2021. This midterm report on the hub's performance is mainly based on the data from its use during the months of July, August, September and until October 12th of 2021. The available data is the following:

- Date of the reservation, time and duration of the reservation and origin of the users of Bicibox (secured bike parking created for the SmartHub project)
- Survey carried out (between October 18th and October 20th 2021) to the users of Bicibox, in order to assess their degree of satisfaction and their purposes and behaviours when using the Hub Sant Cugat. 16 people answered the questionnaire.
- Number of people taking the municipal bus in the bus stop of the Hub (Joan Borràs square / FGC Mira-Sol).

2.4.1. Use per shared mobility mode

The shared mobility mode in the Hub Sant Cugat consist in two cargo bikes available in the new Bicibox. Since the inauguration of this service, two people have used the cargo bikes, one of them twice. The first user has reserved the cargo bike for 2 hours with the purpose of carrying shopping. The second has complained about the difficulties of the process to book and use the cargo bikes.

In order to increase the acceptance of the cargo bike service, the stakeholders involved in the Hub Sant Cugat pilot (Metropolitan Area of Barcelona, Municipality of Sant Cugat, CARNET, UPC and FGC – Catalan Railways) are preparing a seminar with the shop keepers of the Mirasol shopping mall (which concentrates the services in the Hub Sant Cugat) to encourage them to use the cargo bikes for delivering goods in the surrounding neighbourhood in a cooperative way (several shops could share a cargo bike journey).

A specific target would be the restaurants of the shopping mall. This seminar will be held on November 2021.

2.4.2. Use of the hub

Hub Sant Cugat is a multimodal hub combining:

- a Bicibox (parking for private bikes containing two shared cargo bikes)

- a train station, named Mira-Sol in the line Barcelona-Vallès (S1 and S7) of the Catalan Railways (FGC)

- a bus stop of the municipal line L1 named Joan Borràs square / FGC Mira-Sol

- the parking of the shopping mall

- a shopping mall offering multiple services (including a public market and a public library)

Number of users

The number of users of the mobility services in the Hub Sant Cugat during the considered period has been the following (2 July - 12 October):

- 25 people have used the Bicibox. The total number of times that the Bicibox has been used by these 25 users is 102. Two users (8% of the total) have parked their bike in the Bicibox more than 15 times. Three other users (12%) have parked between 5 and 15 times. The majority of users (80%) have parked their bikes less than 5 times.

- 3,195 people have taken the municipal bus in the bus stop Joan Borràs square / FGC Mira-Sol

- 132,702 citizens have used the train station FGC-MIRASOL:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
					1661	614	508
	1718	1741	1626	1643	1561	599	331
July	1567	1663	1574	1571	1529	590	380
36.562	1478	1506	1572	1486	1364	544	297
02/07-31/07	1411	1365	1406	1399	1341	517	
							309
	1018	987	951	996	922	448	276
August	781	751	770	784	700	404	301
22.686	705	736	763	705	710	360	283
01/08-31/08	841	866	943	968	1006	539	383
	1202	1278					
			1552	1613	1595	658	417
	1762	1859	1808	1816	1734	718	499
September	2338	2394	2485	2490	2486	746	538
52.592	2468	2425	2566	2478	1797	874	484
01/09-30/09	2465	2495	2525	2507			
					2601	931	458
October	2465	2602	2696	2692	2651	894	559
20.862	1.729	584					
01/10-12/10							

Table 1. Numbers of travellers using the train station FGC-Mira Sol, 2021.

Multimodality

Concerning the multimodal practices, among the 16 users of Bicibox that answered the survey: **75% combined the use of the bike with the railway**, 6.25% with the bus and 6.25% with the car parking of the shopping mall. Some users answer that they have used several transportation modes depending on the occasion. The 18.75% of users asked, have only used the bike and no other transport mode.

It's important to highlight that **50% of the surveyed users wouldn't use any mode of shared mobility if it was available**. The 31% that answered positively to that question, would like to use, in this order of preference, motorcycle, car and scooter.

Frequency of use

The 62,5% of travellers surveyed have used the Hub Sant Cugat every day, 6.25% twice a week and 25% twice per month.

Residents vs. commuters

Considering the data about the purpose of trips using the Bicibox, the place of residence and the job location, **the Bicibox is mainly used for commuting**. Probably, people living in Mira-Sol, biking to the Bicibox, shifting to another transport mode (railway, bus or even walking) to reach their working or studying destinations. There is also the case of one commuter coming by bike to Mira-Sol for working reasons from another municipality. The second main profile of user is a resident from Mira-Sol going by bike to the hub for shopping.

User satisfaction

The surveyed users are generally satisfied with the Hub Sant Cugat (62.5%) and even 37.5% are fully satisfied.

93,75% of them consider that the accessibility to the hub, both by walking and cycling, is good. Even though, some users request to improve the accessibility, particularly by increasing the bike lanes in the neighbourhood around the hub.

Reduction of car use

All the respondents to the survey affirm that, by using the new Bicibox service created in Hub Sant Cugat, **they have reduced the use of the private car.**

2.4.3. Service improvements

The Hub Sant Cugat has a wide range of services since it is located in a shopping mall that constitutes the only centrality of the Mira-Sol neighbourhood. The new opened Bicibox has become a place for safely parking private bikes, including lockers for users, self-maintaining tools and plugs for charging electric bikes.

Moreover, together with the people responsible for the shopping centre, the partners involved in the Hub Sant Cugat pilot are working on the possibility of placing online shopping lockers (some of them refrigerated) near the Bicibox. The idea is that users could do their shopping online and pick it up at any time (even if the shopping mall is closed). That aim is to encourage local purchases.

2.4.4. Barcelona's additional indicator's

In this section, we provide some specific data concerning the Bicibox, which is the new mobility service that the SmartHub project has added to the Hub Sant Cugat.

User's profile

In order to give an idea of the user profile of the Bicibox, it could be said that 62.5% of the respondents are male and 37.5% female. Regarding age, the average is 41 years old. 43.75% of those surveyed are between 46-55 years old, followed by 31.25% between 36-45 years old, 18.75% between 26-35 years old and only 6.25% under 18 years. **The large majority of users are active working adults**. Regarding the academic level of the respondents, more than half have a university degree (68.75%), followed by 18.75% only secondary school studies and 12.5% with professional school. Regarding their current

occupation, the majority are employees (62.5%), and there are the same percentage of self-employed workers and students (18.75%).

Concerning the origin of the Bicibox users (following the 16 answers to the survey), **37.5% are from Mira-Sol (the neighbourhood around Hub Sant Cugat) and 50% live in other areas of Sant Cugat del Vallès**. Only 2 are from neighbour municipalities (Rubí and Cerdanyola del Vallès) and both of them are among the regular users.

Besides, it is important to note that **almost all respondents have a driving licence (93.75%).**

Use of bike parking in figures

Use per week	Average
Working days	74,51%
Weekend	25,49%

Duration of use	Working days	Weekend	All week
Average per person	9h42min	10h11min	9h42min

Time slots	Working days	Weekend	All week
Until 30min (short stay)	11,84%	23,08%	14,70%
Between 30min-2h (shopping stay)	21,05%	11,54%	18,63%
Between 2h-10h (half day stay)	26,31%	26,92%	26,47%
Between 10h-24h (full day stay)	40,80%	38,46%	40,20%

Table 2. Use of the bicycle parking at the Bicibox Sant Cugat del Vallès. According to the survey of users, 2021.

Distance

In relation to the estimated distance travelled by bicycle by those polled when using the Bicibox, most of them (87.5%) travel from 3 to 5km. The rest travel up to 1.5km (12.5%). **The use of the Bicibox is a local one.**

Purpose

The **two main reasons for which respondents have used the Bicibox are work (29.6%) and shopping (29.6%)** and secondly studies with 14.8%. Leisure, sports and outing-nightlife activities occupy third place with 7.4% each. And finally, the reason for visiting friends and/or family with 3.8%.

Services Used within the Bicibox

It is important to note that all of the respondents have only used a single Bicibox service, which is the private bicycle parking. The other services offered but have not been used to date are plugs for charging electric bikes, a repair desk and an inflator.

Type of Bike

The type of bicycle most used by the respondents is the electric bicycle (87.5%), while only 12.5% use the conventional bicycle. It could be because the Hub Sant Cugat is located in an environment with some steep slopes within a high-income neighbourhood.

The surveyed users fully satisfied with the Bicibox are 68.75%, while 31.25% are generally satisfied.

Concerning intermodal exchanges with other means of transport (train, bus and parking), **93.75% of users consider that the Bicibox is easily to locate within the Hub Sant Cugat.** Furthermore, some users request to improve the bike parking time, proposing a new service for residents, with no time limit. Added to this, some of them request to improve the computer system, which works very slowly, and to fix the access door to the Bicibox.

2.5. Lisbon

Under the Smarthubs project, EMEL is working on a new concept of mobility hubs for short distance trips within the city of Lisbon, aiming to improve the current docking stations of the Lisbon bike-sharing system (GIRA). To this end EMEL plans to improve the docking stations into mobility hubs to support and boost the use of public and shared transport, providing citizens with more multimodal solutions, which facilitate the last-mile, including the use of bicycles. The GIRA bike-sharing system currently has 102 stations in the city of Lisbon and provides regular bicycles and electric ones (EPAC[1]), in a total of about 900 bicycles, 2/3 of which are electric bicycles.

Specifically, EMEL's objectives in this project are to:

- Promote the use of shared mobility services by offering a variety of services in a single location;
- Facilitate multimodality, such that local commuters take their bicycle or use a shared mobility service on their trips in the city;
- Promote the use of low-carbon transport solutions;
- Promote the use of bicycles by deploying secure parking infrastructure and other amenities for bicycle users;
- Promote orderly e-scooter parking (e.g. by creating charging stations) and reduce the impact of the "micro-mobility parking problem" in the urban realm;
- Gain insights and input for an evidence-based policy strategy on shared mobility hubs;
- (long-term) Create a network of shared mobility hubs at in-city and neighbourhood level;

Recognising there is no "one-size-fits-all" solution for what this "mobility hub" should be, as well as the need for flexible solutions that answer to new needs and to have citizen-centric approaches, EMEL explored different combinations of services in order to create a modular concept of local mobility hub, customisable according to location, profile of passengers, among other aspects.

Thus, the work carried out during 2021 focused on answering three questions, which are presented in the subsequent chapters:

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[1] Electrically power assisted cycles.

1. Select the best location for the implementation of the pilot mobility hub, by using a multi-criteria methodology;
2. Monitoring the use of the pilot mobility hub;
3. Explore, through a co-creation process, different combinations of mobility and value-added services to upgrade the mobility hub at a later stage.

2.5.1. Selection of the location for the implementation of the pilot mobility hub

Methodology

At the beginning of 2021 there were 85 operating GIRA docking stations in the city of Lisbon. Taking into account that it was expected that by the end of the year the network of this service would increase considerably in number of stations, and that EMEL intended the pilot mobility hub to take place in one of the new docking stations, it was necessary to develop a methodology to support the selection of the best location.

Thus, and seeking to respond to the specific objectives listed above, the methodology developed aimed to identify locations that correspond to areas of the city with greater need for mobility services and with greater potential for the implementation of a local-level mobility hub, as reflected in the criteria used in the model.

A multi-criteria methodology was used, taking the BGRI ("*Base Geográfica de Referenciação de Informação*", or Basis of Geographical Referencing Information in English, the smallest geographical unit provided by INE, Statistics Portugal) as the spatial unit of analysis and taking into consideration a set of variables and points of interest that could influence the success of the mobility hub location. It was also necessary to take into account two further key criteria to determine the location:

i. The locations foreseen in the expansion plan for the GIRA network docking stations scheduled to open in 2021, which have already incorporated the assessment of the territory conditions necessary for their setup;

ii. Areas of the city with more acceptance by their populations and local authorities for new mobility services - the following parishes were identified: *Campo de Ourique*, *Campolide*, *Lumiar*, *Olivais* and *Penha de França*.

The variables and points of interest identified in a first phase to support the decision on the location of the mobility hub were:

- Variables:
    - Number of residents per BGRI (INE, Census 2011);
    - Population density per BGRI (INE, Census 2011);
    - % on-street car parking spaces occupancy (EMEL);
- Points of Interest:
    - BUS stops (CML - Lisbon City Council);
    - Underground stations (CML);
    - Train stations (CML);
    - GIRA docking stations - existing and planned in 2021 (EMEL);
    - Electric vehicle charging points (Mobi.e);

- o   BICIPARK[2] (EMEL);
- o   Micro mobility parking spots (CML);
- ▪ Cycle paths - existing and planned by 2021:
  - o   Cycle paths network (EMEL).

However, and due to the fact that a set of factors had reduced impact on the model, this was simplified and the multi-criteria calculation was limited to four variables:

- ▪ Population density (P): represents the potential for trip generation by residents;
- ▪ On-street car parking spaces occupancy rate (E): represents the need for alternative modes of transport to the car;
- ▪ Underground stations (M): represents the potential of multimodality with a heavy mode (BUS stations of Carris were excluded from the multi-criteria model because, by rule, they exist in all the BGRIs; train stations were excluded from the multi-criteria model because there were no new GIRA docking stations foreseen close to the train stations);
- ▪ Cycle paths (C): represents the level of safety in accessibility to the mobility hub by cycling modes.

For the final application weightings were defined for each variable and the score (S) for each BGRI thus resulted from the following expression:

$$S = 0,30P + 0,30E + 0,20M + 0,20C$$

Selected Location

The application of the methodology resulted in the map with the score (the darker the shade of green, the higher the score) of each BGRI for the implementation of a mobility hub. In Figure 1 the map for the city of Lisbon is presented.

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[2] BICIPARK is a service provided by EMEL which consists on a network of secure bicycle parking spread across the various EMEL parking lots, to which all adherent users have access.
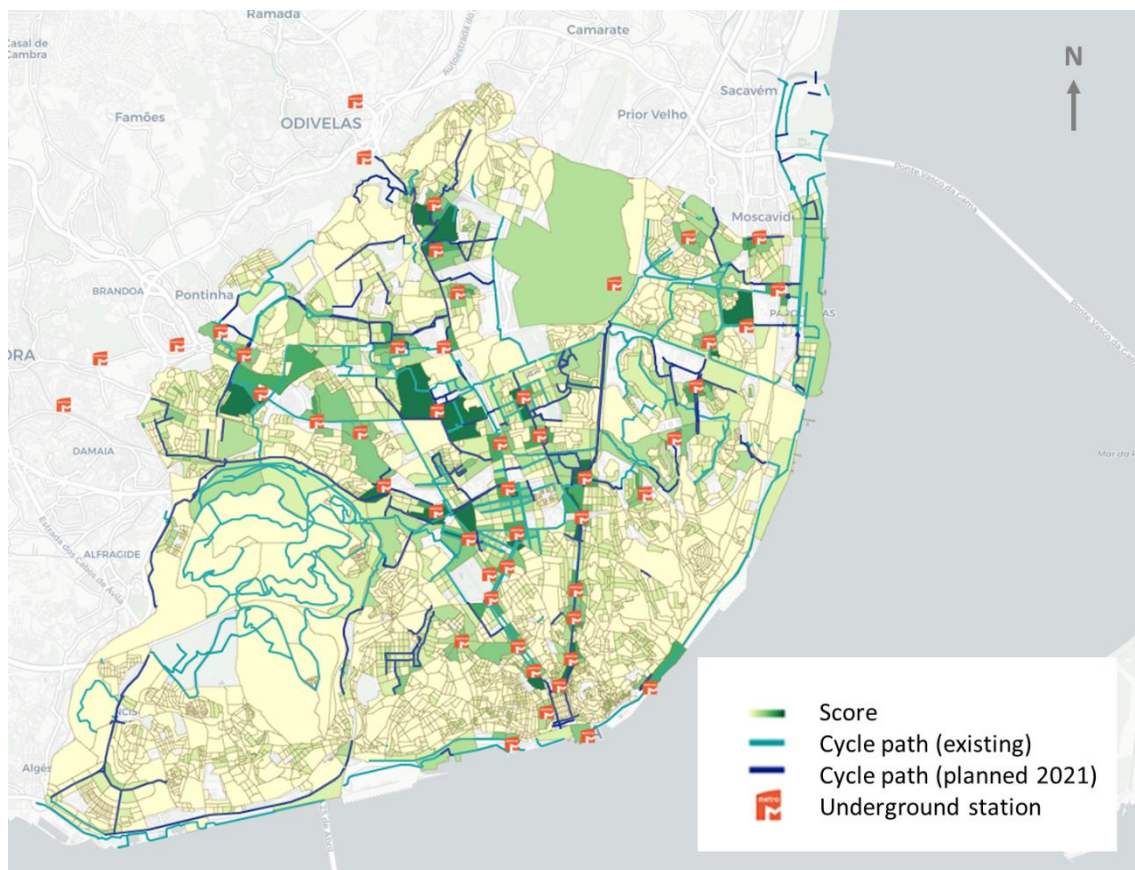
Figure 1 - Score for the implementation of a mobility hub

Analysing the areas with the highest scores together with the schedule for expanding the GIRA docking stations network and the cycling network, as well as the parishes identified above as areas with more acceptance for new mobility services, the (by then, future) GIRA docking station ID no. 550, located in *Lumiar* (see Figure 2), was the selected location for the pilot mobility hub.

This location has a global score of 0.379, which results mainly from two factors: the existence of an underground station (with two lines, green and yellow) and good accessibility through cycle paths.

In addition, the site has in its surroundings (within 100 meters walking distance) an off-street car parking (operated by a private operator, EMPARK), city bus stops (CARRIS), and is next to one of the city's main bus terminals, the *Campo Grande* terminal, which is one of the main city entry point for daily commuters from the North and West of the Metropolitan Area of Lisbon. Nearby there is also a school with students between 10 and 18 years old and a language school. However, currently this location is a pass-by spot and it is a non-place.
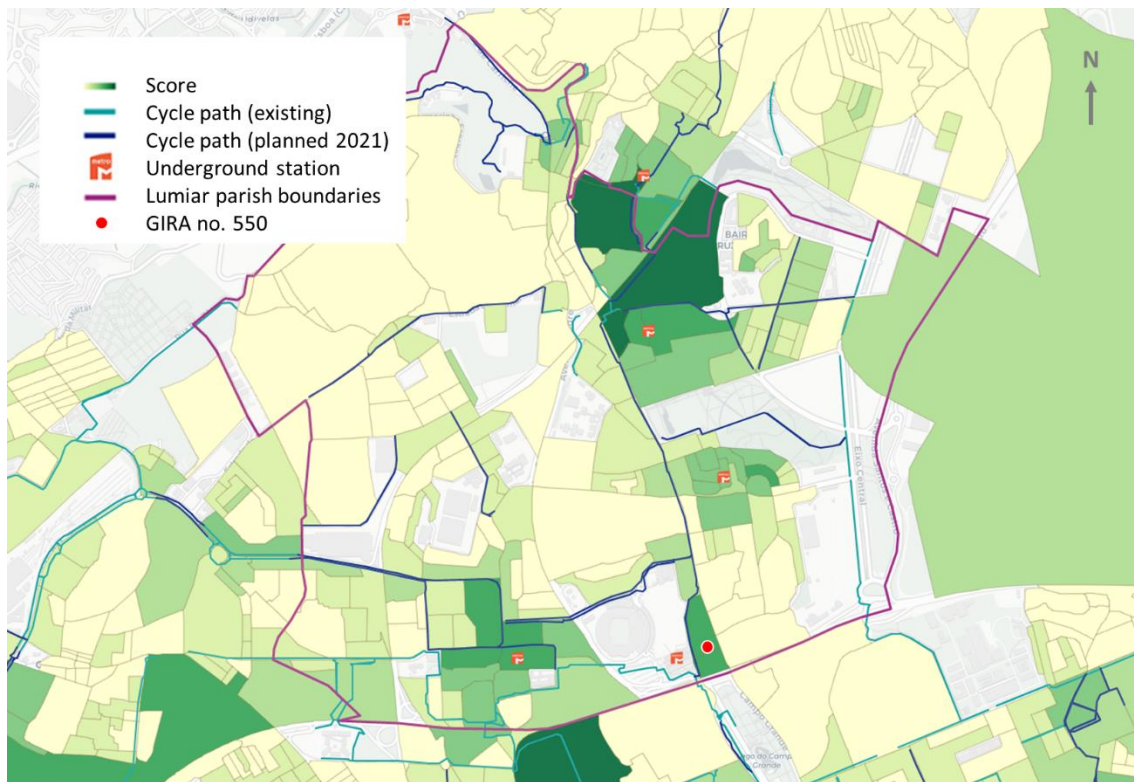
Figure 2 - Score for the implementation of a mobility hub - *Lumiar*

Below (Figure 3) we can see the location selected for the mobility hub pilot (the station 550 of the GIRA bike sharing system). This GIRA docking station is part of the new (and planned) docking stations and was recently (5 August 2021) made available in the city. This dock has a capacity for 20 bicycles, both conventional and electric.

Considering the characteristics of the selected location, multi-modality between bike-sharing and walking, bus, underground or car is expected.

Figure 3 - Selected location for pilot mobility hub - *Campo Grande* - GIRA Station no. 550

2.5.2. Mobility Hub Performance

To monitor the performance of the mobility hub in 2021, EMEL used the data available from the GIRA system. Below is presented a set of indicators that characterize the use of GIRA station no. 550, the trips to or from it and its users, in the period between its opening (5 August 2021) and 31 December 2021.

In this period a total of 10.704 trips were made to and from this station (see Figure 4), while the total number of trips in the 102 stations of the GIRA system was 897.170. The station has 22% more trips than the average number of trips of each station in the system.

Regarding the distribution of trips between electric and regular bicycles, there is a clear preference for travelling on electric bicycles, as they represent 93% of the trips [3].
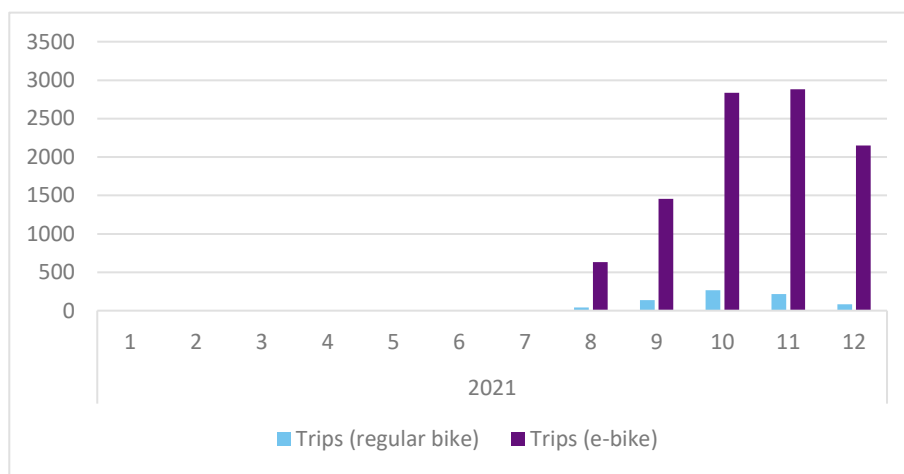
Figure 4 - Trips per bike type and per month (2021)

Regarding the trips to and from this station, they are mostly made on weekdays (see Figure 5), which reveals the commuting nature of the trips, for example, in the month of October there were on average 128 trips per day on working days and 42 trips per day on weekend days (three times more on working days).

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[3] The GIRA system fare is the same both for the use of electric or regular bicycles, and the usual behaviour of the system users is to only use regular bicycles when there are no electric ones available at the station. In the total number of trips of the system in the same period, trips on electric bicycles represented 92% of the trips.
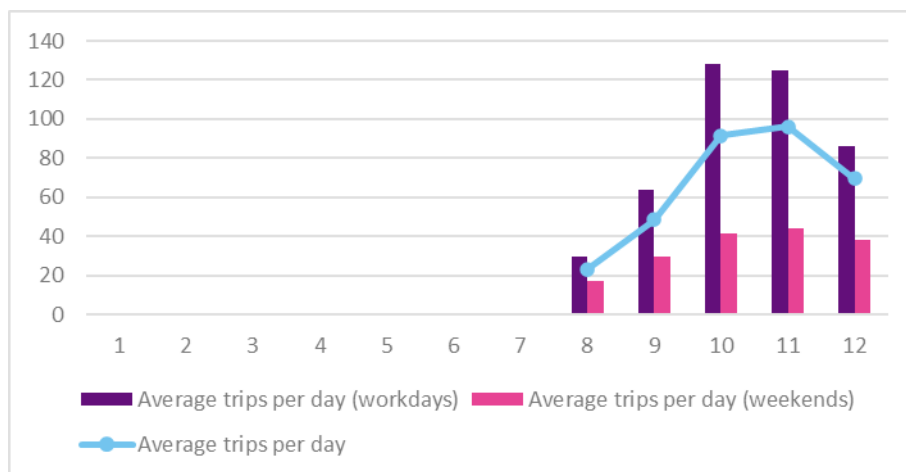
Figure 5 - Trips per type of day and per month (2021)

Analysing the distribution of trips throughout the day for both weekday and weekend day (see Figure 6), also here the commuter travel profile is suggested, with the identification of a morning peak hour by 8am, a slight peak at lunchtime and a longer peak period in the afternoon, as is known in other modes of transport.
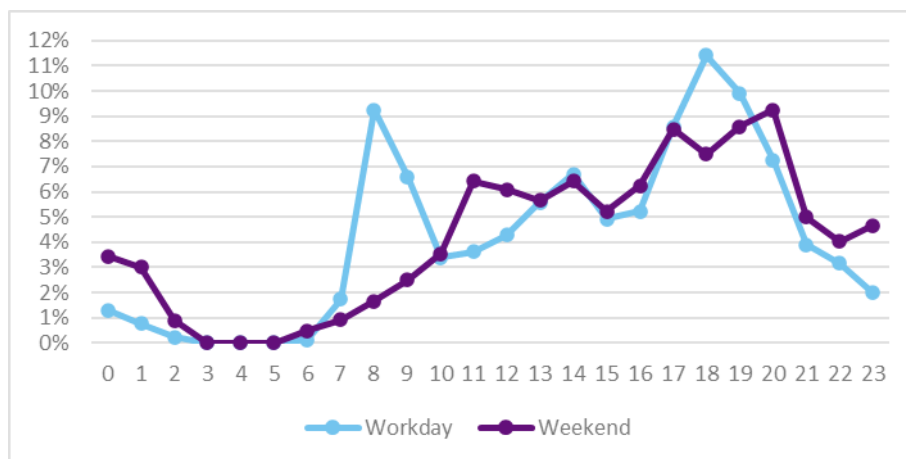

Figure 6 - Trips (beginning and finishing at the GIRA no. 550) per hour of the day and per type of day (workday vs weekend) (2021)

Figure 7 presents the duration and distance[4] of the trips made to and from station no. 550. The average trip in electric bicycle had the duration of 15 minutes and distance of 2.7km, while in regular bicycle was 12 minutes and 1.9km, which reveals the greater range that electric bicycles give to users of the mobility hub. Figure 8 presents a heat map, by month, of the bicycle trips to and from station no. 550, which shows that the trips to and from this station have been increasing their range over time.

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[4] Distance between origin and destination station, the value of the indicator could be underestimated; distance was determined using GoogleMaps, selecting bicycle as the mode of transport.
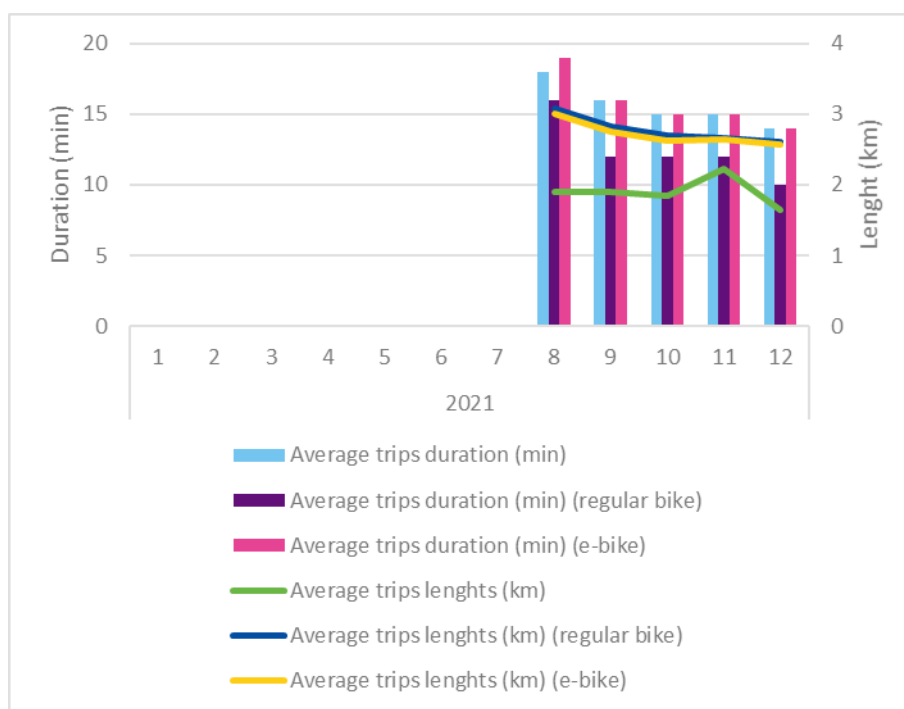
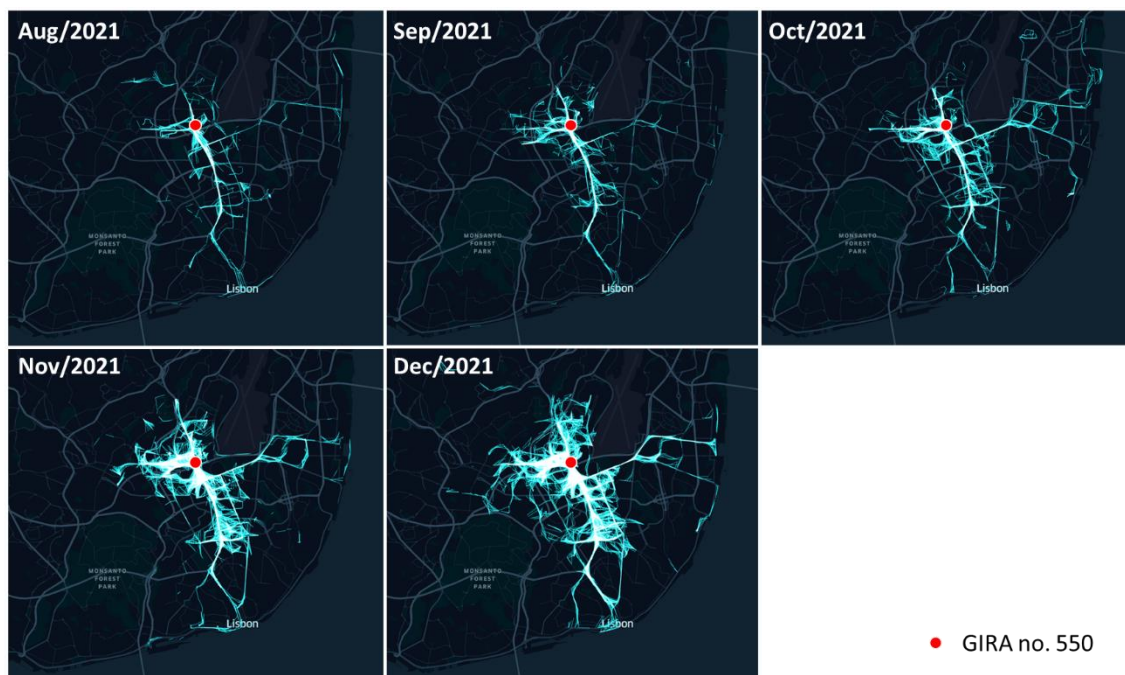Figure 7 - Trips length and duration per bike type and per month

Figure 8 – Heat map of trips to and from GIRA docking station no. 550 per month (bicycle GPS tracking)

Regarding the number of users of this station, between August and December, the station was used by 1832 unique users. The highest number of unique users per month was recorded in November (913 users) and the average number of trips per user per month was 3.2 trips (see Figure 9).

Of these 1832 users, 69% are men and 31% are women, which is the same distribution as for the overall system users. Regarding the age of the users, station 550 has a higher weight of younger users (18-24) than the system as a whole (see Figure 10), which may be related to the proximity of the station to the *Campo Grande* bus/underground terminal and to an area with several universities about 1.5km away.
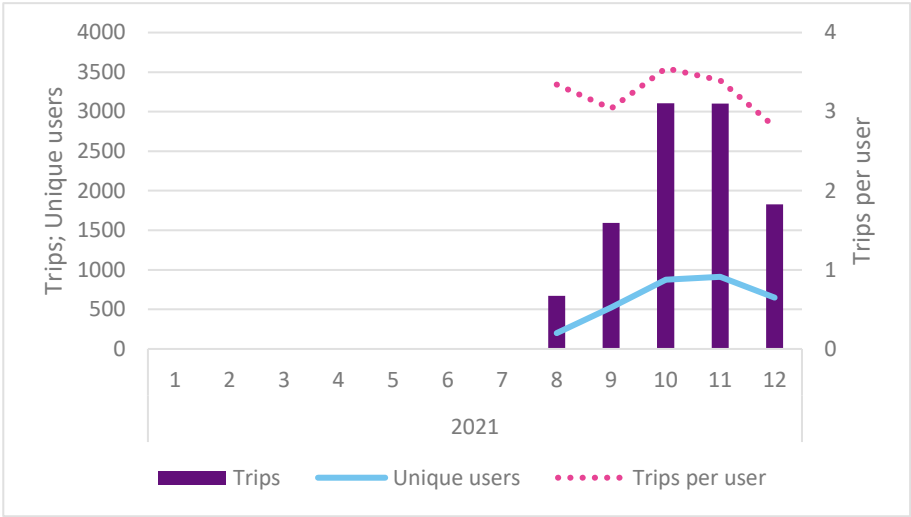
As for the place of residence of the users travelling to and from station no. 550, 85.7% live in the city of Lisbon, the next municipalities with more users are *Loures* (3.1%) and *Odivelas* (2.3%), both located in the North of Lisbon Metropolitan Area, which have several public transport connections to the *Campo Grande* station (bus terminal and underground station). Of the users living in Lisbon, most live in *Lumiar* (31.5%), the parish where the mobility hub is located, and in *Alvalade* (16.3%), an adjacent parish (see Figure 11).
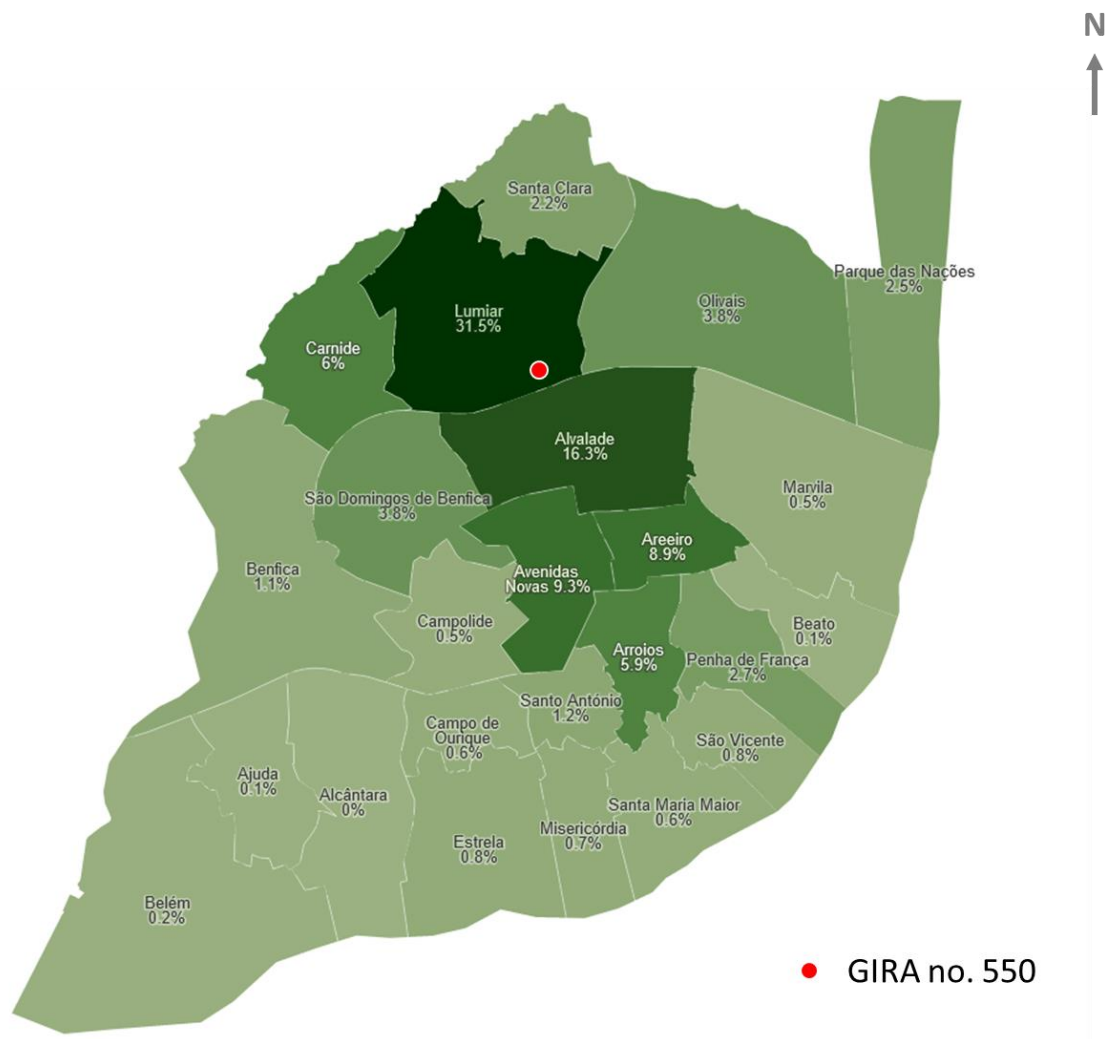
Carrying out a multifactor analysis of the trips to and from station no. 550, taking into account issues such as day and time of trip, place of residence of the user, origin-destination and frequency of the trips made by each user, and the land uses around the origin-destination docking stations, it is possible to infer the reason of the trips: there is a strong expression of commuting trips (70%), a value that is slightly higher than the one registered globally in the system (63%), as shown in Figure 12.
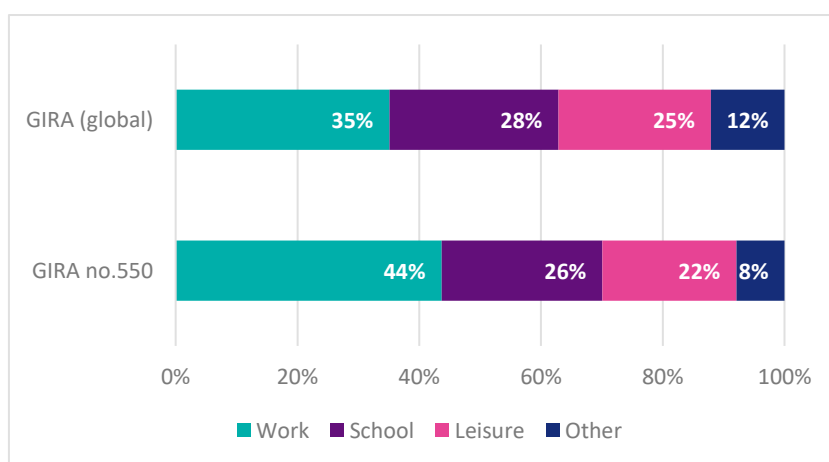
Figure 12 -Travel profile (GIRA no.550 vs GIRA global)

Regarding vandalism, there is no record of bicycles vandalized or stolen at this station during 2021. The fact that it is a high-traffic location with many commuter trips may help explain this.

In summary, despite its recent opening to the public, GIRA no. 550 is a station with high demand and its trips are mostly related with commuting (44% to work, 26% to school).

2.5.3. Co-creation process for the evolution of the pilot mobility hub

In order to explore what different combinations of mobility services, or other value-added services could be incorporated into the pilot mobility hub, EMEL **promoted and implemented** a co-creation process to identify and address citizens' needs, preferences and expectations.

Methodology
The aim of this methodology was to support - in a collaborative, participated and informed manner - the definition of the services and infrastructures that a mobility hub could offer to citizens and what should be the evolution for the Lisbon pilot.

In summary, the methodology was structured in three stages, which are described in the following chapters:

   i.   Desk Research[5]- which aimed to explore a selection of modules that could be considered in the mobility hub, based on the knowledge acquired through the exploration of case-studies;
   ii. One co-creation session - which aimed to select which modules were most relevant for the potential users of a mobility hub in Lisbon;
   iii. A public engagement action - which aimed to collect input from current users of GIRA station no. 550 and people living in its surroundings to define the modular composition to be tested in the pilot.

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[5] *Desk Research* is a method in which one seeks to gather existing information and/or documents in order to acquire relevant knowledge already produced on a given topic.

Desk Research

The first stage was the development of a Desk Research which had as purposes:

- To better understand the concept of mobility hubs and in particular the concept of local scale mobility hubs;
- To explore the work done in this field in other cities and learn about the challenges they have faced;
- To select the modules (i.e. services or infrastructures, mobility related or to support, as listed below) that could be tested and that would be discussed and presented during a restricted co-creation session (with technicians from different areas of expertise of EMEL and the Lisbon Municipality) and, later on, presented and discussed with the general population, at the location selected for the the pilot mobility hub.

We reviewed guides and business cases of projects carried out by entities such as Arup (United Kingdom), Los Angeles Urban Design Studio, Metrolinx (Toronto), SANDAG (San Diego), Share-North (Leuven, Saint Bernard, Vienna, Bremen, Bergen) or Translink (Vancouver), which allowed us to understand what they define as mobility hubs and how cities benefit from the existence of a network of mobility hubs to improve urban travel conditions.

The examples analysed in the research shows that mobility hubs do not have a pre-established size or mandatory service modules. What has shown to be relevant is that these modules ant their composition of modules should be flexible, in order to ensure that they meet the needs of the people living those places and that they follow mobility trends (such as: the growth in the use of on-demand modes; the increase of electric vehicles share; or increase in e-commerce which has direct implications on mobility management in a city).

In addition to these findings on the subject, this research also made it possible to map which categories of modules should be privileged and included in a mobility hub. The modules can be divided into the following categories:

- **Mobility modules** - these services are the basis of any mobility hub. These can be services such as: parking for bicycles and/or private cars; charging station for vehicle and/or bicycles; bicycle repair station; bike-sharing, etc.;
- **Complementary service modules** - these are services that aim to fill gaps or respond to needs in the mobility hub location, such as: public toilets; cafes/kiosks; post offices; pick-up/drop-off points; coworking spaces, *etc*.

Once the research was concluded, the modules to be to be validated in the co-creation session were listed. It was not intended to create a "final list", but rather a guide to validate, inspire and create new solutions in the co-creation session. The selected modules were the following:

Mobility modules:	Complementary service modules:
o bicycle and e-kick scooters parking; o restricted-access bicycle parking (BICIPARK type); o shared motorcycles parking spaces; o car sharing parking spaces; o micro mobility charging station; o electric vehicles charging station; o kiss&ride;	o Wi-Fi; o charging lockers for electronic devices; o contact button (SOS or customer service); o beacons (device that sends information via bluetooth to visually impaired people); o vending machine; o delivery parcel lockers Kiosk; o ATM machine; o information point;

o bicycle repair station;	o dustbin; o WC; o clock; o shelter; o outdoor seating; o street lighting; o green space (garden); o playground; o exhibition structure/events; o urban art.

When implementing a mobility hub, attention should also be paid to elements that provide a higher quality or comfort to its users, such as, elements or functionalities that increase safety, accessibility, convenience or access to information. These elements were used as "factor cards" in the co-creation session.

Co-creation Session

After the completion of the *Desk Research* and in a second stage, a co-creation session was held with the participation of technicians from different teams and with different skills from EMEL and Lisbon City Council (see Figure 13).

The session took place on 24 August 2021, and its main goal was the collaborative definition and selection of the modules to be presented in a public engagement action, where the citizens would contribute to the final definition of the relevant modules to deploy at the pilot mobility hub. The challenge launched to the participants for this session was to answer the question: *which services should a mobility hub provide in order to answer the needs of the different people's profile that move around Lisbon?*

Figure 13 - Co-creation session - project presentation and desk research sharing

Three work teams were created (each one with four elements from different technical backgrounds) whose mission was to build a mobility hub suitable for a total of six *personas* [6](2 *personas* per team). The *personas* we selected were the following (see Figure 14): resident (caretakers), teenager, person with reduced mobility, adult resident, commuter, tourist. The aim of this set of *personas* was to be representative of the potential users of the mobility hub, thus ensuring the inclusion of their needs in the choice of modules.

Figure 14 - Personas selected for the workshop

For 30 minutes each team had to discuss, design and create the module selection for the first *persona* assigned and build a three-dimensional model of a specific mobility hub, after which they should repeat the same exercise for the second *persona* assigned (see Figure 15).

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[6] *Personas* is a tool used in user-centred projects, which aims to define real user-type needs, enabling the design and orientation of the characteristics of a product or service to be developed in order to meet the needs of these typified users.

Figure 15 - Team working collaboratively on the design of a mobility hub

At the end of the session as results, six mobility hub models were created (see Figure 16), one for each of the six *personas*, and the modules selected, in order of relevance, were:

- GIRA docking station (mobility hub base module - 6);
- micro mobility parking zone (selected for 4 *personas*);
- car sharing parking space (selected for 3 *personas*);
- (on-street) bicycle parking (selected for 2 *personas*);
- BICIPARK (secure bicycle parking) (selected for 2 *personas*);
- kiss&ride (selected for 2 *personas*);
- shared motorcycles parking spaces (selected for 1 *persona*);
- bicycle repair station (selected for 1 *persona*);
- electric vehicles charging station(selected for 1 *persona*);
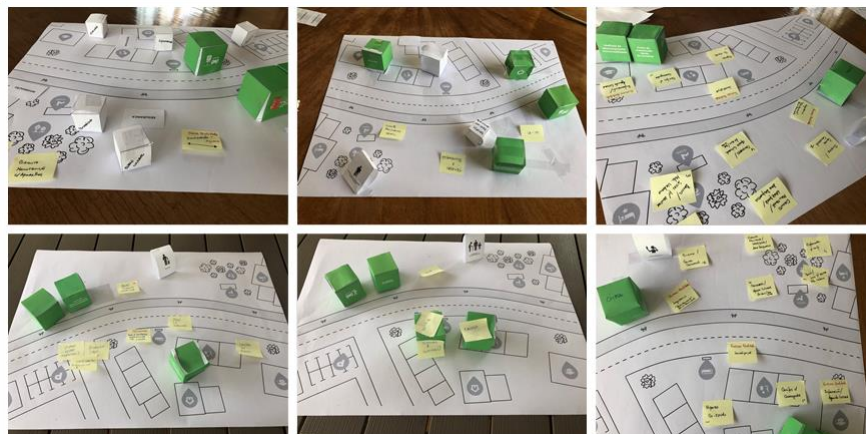- micro mobility charging station (selected for 1 *persona*).

Figure 16 - Mobility hub mock-ups generated in the co-creation session

Considering the analysis of the results of the co-creation process, the reflections and mock-ups created for each of the *personas* in the co-creation session, in addition to the mobility modules listed

above, the following complementary service modules were selected to be tested in the public engagement action:

- Wi-Fi;
- charging lockers for electronic devices;
- vending machine;
- delivery parcel lockers;
- outdoor seating;
- WC;
- urban art/artistic structure;
- work/study space area with electric plugs for electronic devices;
- bookcrossing;
- information display board (and to understand what information should be made available on).

Public engagement action

After the co-creation session, and based on the results of this session, a participative intervention was designed in public space, which took place near the pilot mobility hub (GIRA station no. 550).

In an event format and over four days (25, 26, 27 and 29 November 2021), between 8am and 7pm (different timetables on each day), passers-by (residents or users of the site) were invited to select the modules they would like to have at that location to meet their needs while travelling.

With the support of two promotional staffers on site, and a magnetic board on a bicycle trailer (see **Error! Reference source not found.** e Figure 18), contributions from 274 participants were collected for the design and selection of the modules to be included in the evolution of the pilot mobility hub.

Figure 17 - Mock-up of the magnetic board on a bicycle trailer

Figure 18 - Public engagement action for the co-creation of a mobility hub

To collect contributions and ideas, the staffers proposed to the participants to select, among the various modules available (Figure 19), those which could serve their needs (a maximum of 10 modules) and then choose the three most relevant ("top 3"), having as support a magnetic board where they schematised their mobility hub.

Figure 19 - Modules for selection in the creation of a mobility hub

To characterise the needs, (anonymised) demographic information was also requested, through the selection of the participant's age group and the selection of the *persona* in which they see themselves. In case they did not see themselves in any of the proposed *personas*, they were asked to put in the blank box the "*persona*" with which they identified.

At the end of the contribution, each participant's panel was photographed for later analysis (Figure 20).

Figure 20 - Photograph exemplifying the selection made by a participant

This initiative was also communicated in the *media* and through the social networks of EMEL and Smarthubs project (Figure 21).
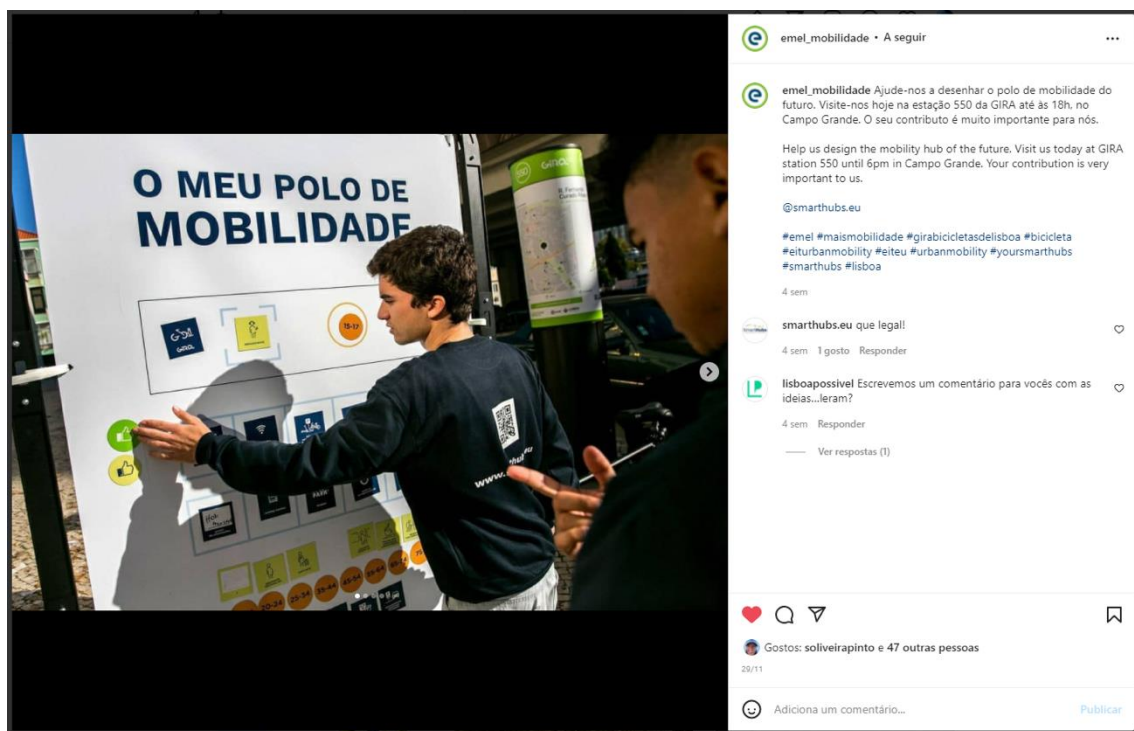
Figure 21 - EMEL's Instagram post

Analysis of results

The public engagement action was attended by 274 participants. Of these, about one third (92 participants) were users of the GIRA bike-sharing system.

As can be seen in the Figure 22 contributions were collected from participants from different age groups, however young people up to 24 years old represented 56% of the participants and people over 65 years old represented only 6% of the participants.
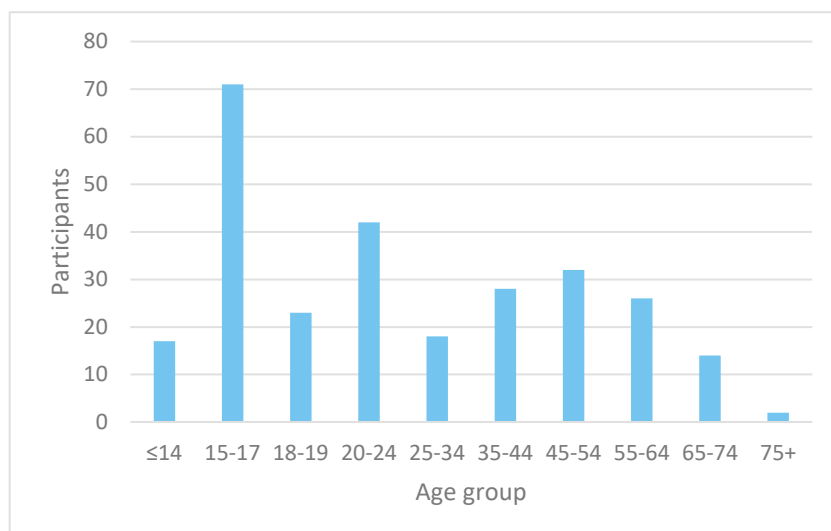

Figure 22 - Age group of the participants

Regarding the *persona* with which the participants most identified, and in line with the age distribution, the "teenager" was the most selected *persona*, as shown in the following Figure 23. On the other hand, nine participants (3% of the total universe) see themselves as "tourists" and three participants (1%) as "person with reduced mobility".
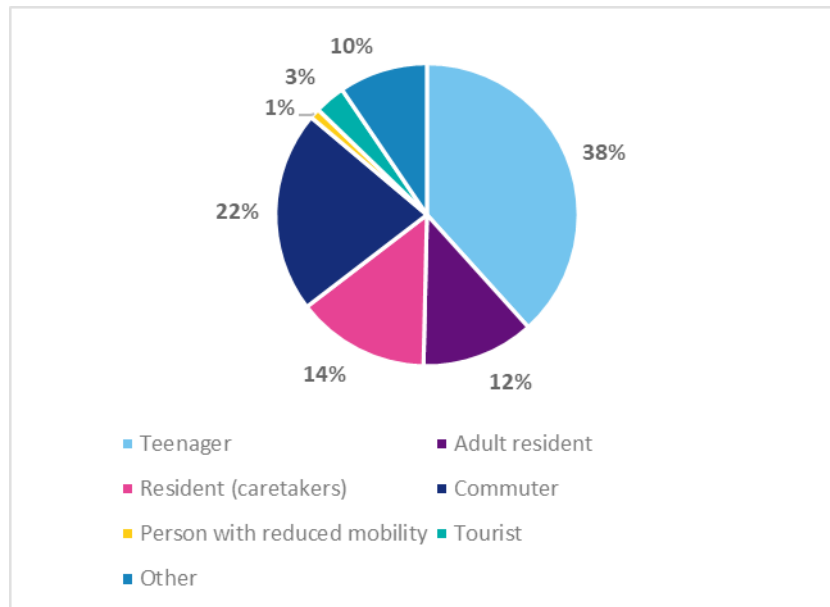
Figure 23 - Distribution of participants per *persona*.

The high representativity of young people may be related to the proximity of this mobility hub to schools and a language school. On the other hand, the proximity of the centre to the bus terminal and the underground station is also evident in the representativeness of the "commuter" *persona*.

Figure 24 presents a chart showing the selection of modules by the participants, and it is noteworthy that out of the five most selected modules only one is a mobility module ("micro mobility charging station"):

- Wi-Fi (198 participants have selected, 150 of which in the top 3);
- WC (179 participants have selected, 121 of which in the top 3);
- outdoor seating (126 participants have selected, 54 of which in the top 3);
- micro mobility charging station (119 participants have selected, 50 of which in the top 3);
- co-working/studying area with electric plugs for electronic devices (108 participants have selected, 41 of which in the top 3).
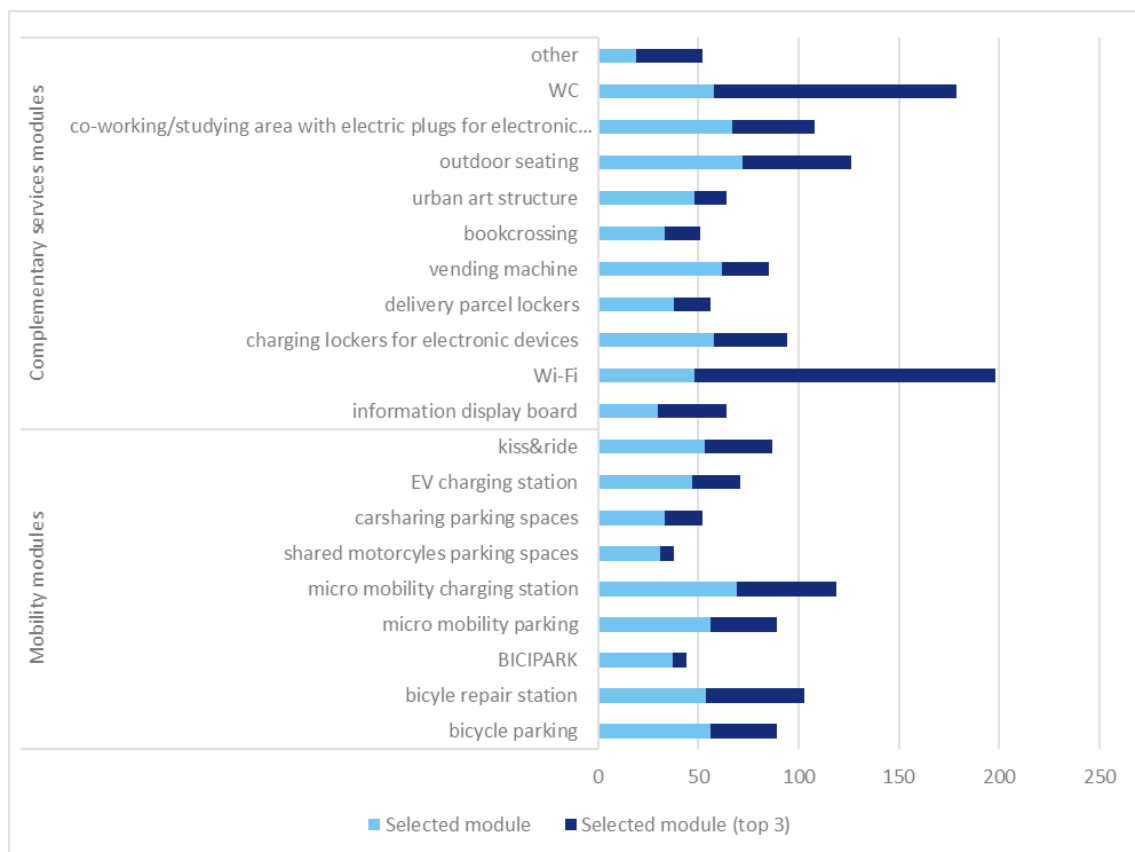
Figure 24 - Selected modules per type (mobility or support) and relevance (TOP3)

Looking only at the **mobility modules**, the selection reveals that there is a marked interest (four out of five) in services related to cycling and micro mobility:

- micro mobility charging station (119 participants have selected, 50 of which in the top 3);
- bicycle repair station (103 participants have selected, 49 of which in the top 3);
- bicycle parking (89 participants have selected, 33 of which in top 3);
- micro mobility parking (89 participants have selected, 33 of which in the top 3);
- kiss&ride (87 participants have selected, 34 of which in the top 3).

Performing the same analysis for the **complementary service modules**, besides the four modules already presented in the overall top 5 ("Wi-Fi", "WC", "outdoor seating" and " co-working/studying area with electric plugs for electronic devices "), there is the module "charging lockers for electronic devices" (selected by 94 participants, 36 of which in the top 3).

Regarding the "**information display board**" module (64 selections, 34 of which in the top 3), and for which we were looking to understand what information should be made available on it, the most mentioned information need was the possibility to see timetables of public transport passing close to the bike-sharing station and the map of their location (40), as well as information related to the GIRA system (such as: client service points, legislation, information on the use of the bike-sharing system and its App, geographical limits of use, routes and cycle paths and bicycles wayfinding, cost of use,

helmet deposit[7], charging status of electric bikes)[8] or information related to the surroundings (restaurants and public spaces near the mobility hub).

As for the "**other**" module, in which participants could identify other services or infrastructure that they did not have in the predefined modules, this was selected by 59 participants and includes suggestions such as:

- ATM machine (26 participants);
- car and motorbike parking spaces (9 participants);
- More local shops and cafés (4 participants);
- green space (2 participants);
- GIRA docking station shelter (1 participant).

When analysing the difference of needs between those who declared to be GIRA users - current users of this mobility hub (about 1/3 of the participants) - and those who are not GIRA users (see Figure 25), we verify that the needs have a similar distribution.

However, there are some differences that can be explained by their different mobility behaviours as users of mobility services: GIRA users show a higher preference for modules such as "bicycle repair station", "charging lockers for electronic devices", "outdoor seating " or "BICIPARK", while non-users of the system show a higher preference for modules such as "WC", "delivery parcel locker " or "electric vehicles charging station".

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[7] In Portugal it is not mandatory to use a helmet when riding an e-bike.
[8] Most of this information regarding GIRA is currently available at GIRA's website or mobile App.
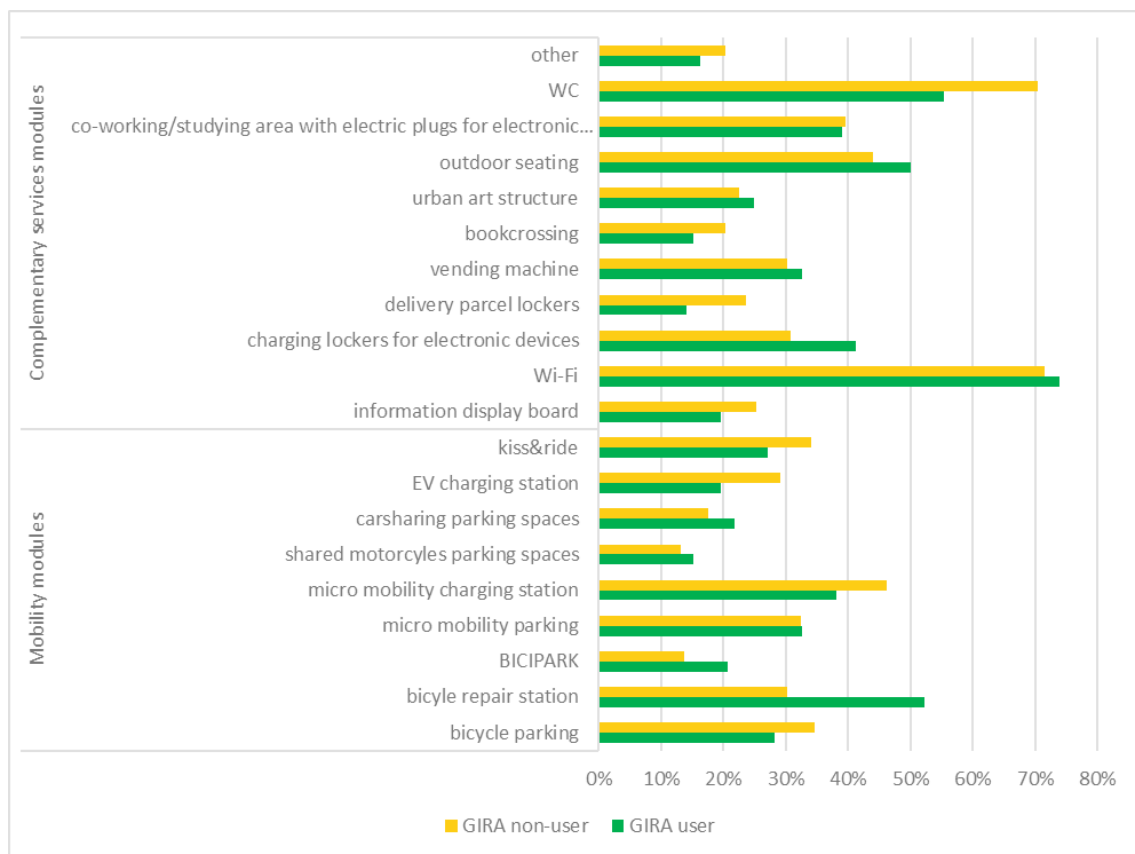
Figure 25 - Selected modules per type (mobility or complementary service) and per GIRA user vs. GIRA non-user

As regards the analysis by age group, the ranking of the most voted modules by participants up to 24 years old (56% of the total number of participants) is identical to the ranking of all participants. However, it is important to reveal the preference that some age groups have for certain modules, for example: the 25-34 age group has a higher preference for the "bicycle repair station " module than the other groups; the <14 and 35-44 age groups have a higher preference for the "BICIPARK" module than the other groups; the 25-34 and 35-44 age groups have a higher preference for the "electric vehicle charging station" module than the other groups;

Regarding the analysis per *personas*, there are also no major discrepancies between the modules which received the most votes. However, and although the sample of the "tourist" *persona* is small (9 participants), it is important to note the preference they have for modules more related to their stay and temporary experience of the city, such as "charging lockers for electronic devices", "WC" and "vending machine".

Conclusions

From the analysis carried out it appears that there are no major discrepancies between the modules that were most voted and the modules selected as "top 3", neither when the analysis is carried out by users of the GIRA system, age group or *personas*. Thus, from the global analysis the following modules were identified as more desirable by the citizens:

- Mobility modules:
    - micro mobility charging station;
    - bicycle repair station;

- o bicycle parking;
- o micro mobility parking;
- o kiss&ride;
- Complementary services modules:
  - o Wi-Fi;
  - o WC;
  - o outdoor seating;
  - o co-working/studying area with electric plugs for electronic devices;
  - o charging lockers for electronic devices.

However, and considering the preferences of some targets highlighted above, in the evolution of the mobility hub the modules "electric vehicle charging station", "BICIPARK", or "delivery parcel lockers" could also be considered.

The project for the development of the mobility hub, and which modules it will comprise, will still have to be carried out and should take into account constraints such as the available space or compatibility with other pre-existing infrastructures.

However, since the that selected location is currently a pass-by place (or a non-place) it is recommended to include modules that could promote a placemaking strategy such as "outdoor seating " or "co-working/studying area with electric plugs for electronic devices" so they can increase the liveability of this place.

2.6. Setubal

The mobility hub in Setúbal has the purpose of promoting the use of public transport and micro mobility among residents in the wider metropolitan area surrounding Lisbon. It is located near to a multimodal station in which both bus and train services are available and was initially planned to provide the following facilities for private bikes:
- Bicibox – 1 closed parking structure for 12 bicycles.
- Sheffield stands – 9 open parking structure with lower bar for two bicycles fixed to the pavement.
- Repair station – 1 self-service bicycle repair facility that includes an air pump and nine tools. This station will allow bicycle users to carry out minor repairs on their bicycles autonomously.

Since the beginning of the project, a shared e-scooter services started to operate in the city and a dock station (10 places) was planned to be included in the hub. The city is also negotiating the operation of shared e-bike services for the beginning of 2022 and their integration to hub is also intended.

The hub is not yet in operation due to delays in the multimodal station construction as well as due to the municipal election in September, which slowed down the progress of the project. Delays in the delivery of the equipment acquired, namely the Bicibox (expected to be delivered by the end of January 2022), also contributed for not having the hub deployed yet. Nonetheless, the Sheffield stands are already in place as well as the basic infrastructure for the installation of the remain equipment (power connections, etc.).

As the multimodal station is expected to be finished by the end of December 2021, we are considering opening the hub operation in a soft mode with only part of the equipment and to entry in a full operation mode by the end of January 2022 when the rest of the equipment will be installed.

Use per shared mobility mode

As the hub is not in operation mode, we don't have information about the use per shared mobility mode to share. However, the shared e-scooter services already in operation in the city has presented expressive numbers:

- Maximum of Vehicles Available for Use: 355
- Total number of trips (7 june – 13 september): 308,087 rides
- Average distance: 2 km
- Average minutes per trip: 13 min
- Total kilometers traveled: 580,491 km
- Total users registered: 13,089 (approximately 10% of the total population of Setúbal)
- Average number of daily trips per scooter: 10 trips per scooter

Use of the hub

As the hub is not in operation mode, we don't have information about its use to share.

Service improvements

All the improvements planned were already described in the BP2022.

Setubal's additional indicator's

As the hub is not in operation mode, we don't have information about this to share.

2.7. Warsaw

The mobility hub in Warsaw has been incorporated into the SmartHubs project in the end of 2021, by using an already existing multimodal mobility hub located in one of the business districts in Warsaw and operating since 7th May 2021. This hub will be refurbished as soon as the weather conditions allow to proceed with field works (painting requires dry weather and temperatures above 0). Also, one more mobility hub location in Warsaw is to be opened in the course of 2022 as a result of the activities carried out in 2021, most probably in Q1 or in Q2, once the weather conditions allow to proceed with construction works. As a result, two mobility hubs will operate for the SmartHubs project in the course of 2022.

In the period between May and November 2021 (a total of 207 days), the acquired mobility hub reported a traffic (utilization) of more than 1200 rentals of different shared mobility modes that either started or ended the trip in this place. 53% of these trips accounted for car sharing, 28% for e-scooter sharing, and 19% for e-moped sharing, as shown in a monthly breakdown below. These results gave an average daily number of interactions with the hub of 6 trips.

	number of rentals (A)	number of returns (B)	total traffic (A+B)	% share
e-scooters	256	95	351	28%
daily average	1,2	0,5	1,7	
e-mopeds	186	51	237	19%
daily average	0,9	0,2	1,1	
car sharing	380	270	650	53%
daily average	1,8	1,3	3,1	
total	822	416	1238	100%
daily average	4,0	2,0	6,0	

Almost two-thirds (66%) of the shared mobility trips were rentals starting in the mobility hub and slightly above one-third (34%) were rentals that ended their voyage there. With regard to the

monthly breakdown, as presented in the table below, the highest traffic in the Warsaw mobility hub was observed in July and September.

	May	Jun	Jul	Aug	Sep	Oct	Nov
e-scooters	10	35	90	64	52	51	49
e-mopeds	38	39	38	47	34	41	0
car sharing	71	110	88	88	124	77	92
total	119	184	216	199	210	169	98

3. Results

The hubs in Amsterdam, Eindhoven, Helmond, Lisbon and Barcelona, are for the most part operating for 5 months or longer. In this period most hubs have been experiencing impact of Covid restrictions in one way or the other. This impact is for the most part negative on the operation of the hubs but the size and effect on the results of the research is difficult to ascertain because there isn't a non-covid baseline. The outlook for next year is that Covid will not go away and will also be an important factor in the operation of the hubs and therefore on this research.

The hubs in Setubal and Warsaw are in development

Hub	Results
Amsterdam (Student hotel & Fashion hotel)	The hubs are functioning as proposed but due to lower than expected usage there is limited generation of data. It is not yet possible to draw conclusions if the hubs achieve the set out research goals. In 2022 there have to be some extra efforts to achieve the research goals. The municipality and Hely are discussing measures to improve the functioning of the hubs and thereby achieving the research goals. Also extra efforts are necessary to survey the users. Due to low amount of users and physical questioning with an interviewer the survey has not worked out.
Eindhoven	The hub is functioning well and generating the data needed to answer the research goals. Due to Covid the starting situation has altered (less traffic) and it is uncertain whether the question about contribution of a hub in decreasing congestion can be answered.
Helmond	The hub is functioning as proposed and generating user data to answer the research questions. The origin of users is mainly from within a distance of 800 meters of the hub. In the next year the research will be more focused on answering the whether people are accepting shared mobility as an alternative to

	owning a second car because this questing could not yet be answered with the current data.
Barcelona	The hub is functioning as proposed and generating user data to answer the research questions. Bicibox is a well-used and received service by its users and serves as great addition to the services of the Sant Cugat hub. It makes traveling by bike to station more convenient. Users say that they use their private car less because of the services provided by the hub.
Lisbon	The hub is opened and has registered a total of 10.704 bicycle trips and 1.832 unique users between August and December 2021. Moreover, a co-creation process for the evolution of the hub has been conducted and received contributions from 274 citizens (2/3 of them were non-users of the hub) that will help to deploy the hub upgrade in 2022.
Setubal	TML worked hard together with the Setúbal Municipality to put in place the hub. However, due to delays in the multimodal station construction as well as an election period, the beginning of the hub operation needed to be postponed. This demonstrates the challenges faced in this kind of project when more the one entity is involved. Although TML did everything in its power to enable the implementation of the HUB (e.g., equipment acquisition, the definition of technological solutions, etc.), the construction of the station was beyond its control. Nevertheless, TML is working so that the hub starts operating as quickly as possible, even if the multimodal station is not fully operational, i.e., with only trains services, but not bus services and car parking.
Warsaw	In Warsaw, a multimodal mobility hub was launched in May 2021 by a company that in Poland is the first specialized mobility hub provider for cities (B2G) and real estate owners (B2B), particularly office buildings, retail, hotels and housing estates. This pilot mobility hub is the only multimodal mobility hub in Warsaw and is based on contracts concluded with the real estate (an office park: Adgar Plaza) on the one hand and with several providers of shared mobility services on the other. In the course of 2021, it offered 3 shared modalities (e-scooters, e-mopeds and car sharing, including e-cars) and also extended its range of services by concluding an agreement for installing chargers for privately owned e-bikes and e-scooters. Importantly, this particular mobility hub has been acquired for the purpose of the SmartHubs Project, which was done to take advantage of the unique market opportunity – having a ready-to-go multimodal mobility hub available in the project's pilot city of Warsaw.

4. Conclusions and Lessons learnt

Conclusions and lessons learned per city.

<u>Amsterdam Student hotel & Fashion hotel;</u>

There is lower than expected usage of these hubs. One of the reasons is Covid restrictions but mitigation of these effects is out of our control. Whit in control of the project is stimulating the usage of the hub by bigger marketing efforts. Goal is to attain more awareness and subscriptions from neighbours of the hub. Hely and city of Amsterdam are discussing measures to solve the problem of lack of visibility of the hub. Solution will be in better wayfinding. Lessons from hubs in Eindhoven and Helmond can form a basis for these extra efforts. Both parties will also discuss how the method of survey can be improved to get the data required.

<u>Eindhoven</u>

The low feedback of the survey is a bottleneck for getting our research results in. We aim to further spread the survey in order to get more feedback. The provided feedback gave valuable suggestions to improve the information too users and ways to provide payment.

<u>Helmond</u>

Helmond and Hely have put different marketing strategies in effect to promote the hub and creating and enlarging the user base. This case shows that it is necessary to continually be active to reach new users because it is difficult to grow beyond the early adapters. It is possible to reach a lot of potential customers but to convert them in to users takes some extra effort. Helmond and Hely will start new promotions in the coming period to enlarge the number of users.

<u>Barcelona</u>

The HUB of Sant Cugat is composed from a series of services that promoted intermodality. The main transport infrastructure is the train station that is attached to commercial and public services. The addition of the secured bike parking Bicibox complemented the transfer between modes of transport. The secured bike parking is placed in a chamber within the mall attached to the train station and this helps to reinforce the additional services located in the hub, but its transfer to/from the station needs to be improved. Another novelty implemented in the HUB, was the installation of two cargobikes. This was intended to reinforce the commercial structure of the HUB. The cargobikes could be used by either consumers, travellers or shopkeepers. Cargobikes are a new service within Bicibox and they aimed to diminished the impact that last-mile delivery has. To further improve the relation between all services in the HUB (train station, bus stop, secured bike parking, cargobikes, market, supermarket, library, shops, etc.), in 2022 some new activities are proposed to together involved travellers, consumers and shopkeeper. The usage of the secured bike parking is expected to increase in next months. Furthermore, the Municipality of Sant Cugat is implementing in the city centre another project of bike

logistics for last-mile distribution. This new project might generate new synergies with the cargobikes in the HUB Sant Cugat that will be evaluated.

<u>Lisbon</u>

The pilot location obtained with the application of a multi-criteria methodology was a winning strategy, judging by the significant number of trips - 10.704 bicycle trips in about five months. It is important to notice that this fact greatly contributes to cope with EMEL objectives in this project, namely: to promote of use of shared mobility services, to facilitate multimodality, and to acquire knowledge for an evidence-based policy strategy on shared mobility hubs, to name a few.

Regarding the use of the bike-sharing service, one can notice a clear preference for travelling on electric bicycles (93% of the trips), revealing the greater range that electric bicycles give to the users, which is also supported by the trips which are about 40% longer than the ones in regular bicycles.

Since August 2021 a total of 1.832 unique users have ride a bicycle to or from the mobility hub, and most of the users (85.7%) live in the city of Lisbon. 31% of the users were women, showing us that there is a gender gap in the bike-sharing usage. Moreover, the selected location has a high number of young users, which is a particularly relevant fact, evidencing that the sustainable mobility behaviours are being promoted among the younger people in the local community.

Overall, despite its recent opening to the public, this mobility hub reveals a high demand and the trips are mostly related with commuting (44% to work, 26% to school).

Regarding the co-creation process that allowed us to explore with the local community –274 citizens - different combinations "modules" (mobility services, or other value-added services) to upgrade the pilot mobility hub in the future, it is interesting to notice that in the top 5 four of the most desirable "modules" are value-added services that are not directly related with the mobility needs, such as Wi-Fi or a co-working/studying area. Regarding the mobility "modules" the top 4 ones are related with cycling and micro mobility.

As for future steps, we are looking forward to design the project for the mobility hub upgrade which will take into account constraints such as the available space or compatibility with other pre-existing infrastructures. However, taking into consideration that the location is currently a pass-by place it is recommendable to include modules that can increase the livability of this place, including placemaking strategies.

<u>Setubal;</u>

TML worked hard together with the Setúbal Municipality to put in place the hub. However, due to delays in the multimodal station construction as well as an election period, the beginning of the hub operation needed to be postponed. This demonstrates the challenges faced in this kind of project when more the one entity is involved. Although TML did everything in its power to enable the implementation of the HUB (e.g., equipment acquisition, the definition of technological solutions, etc.), the construction of the station was beyond its control. Nevertheless, TML is working so that the hub starts operating as quickly as possible, even if the multimodal station is not fully operational, i.e., with only trains services, but not bus services and car parking.

<u>Warsaw</u>

Conclusions and lessons learned from the operational period of the mobility hub in Warsaw are the following:

- concluding relevant but also flexible contracts with the shared mobility providers, as it is them to replenish the vehicle fleet and bear the related logistic costs;
- concluding a relevant and also a flexible contract with the property owner, who shall co-finance the mobility hub for the good of the property and its clients;
- marketing the services offered in the mobility hub among the local community as the adoption of a solution can last pretty long;
- securing such mix of services available in the mobility hub that will allow the hub to remain operational all year long (e.g. micromobility will encounter lower demand in winter season);
- insuring the hub as the hub's fit-out is exposed to the risk of damage, caused for example by the vehicles parked in the hub;
- assuming in the project's budget much more means for the hub's ongoing refurbishment, maintenance, development and also removal (after the expiry of the contract), at least equal to the capital expenditures needed for launching the hub.