FLEXBUS PILOT

Evaluation report, November 2021

Schoutetstraat 2
2800 Mechelen

www.igemo.be
info@igemo.be

015 28 50 50

Schoutetstraat 2
2800 Mechelen

www.igemo.be
info@igemo.be

015 28 50 50

CONTENT

1 GENERAL IDEA

The Flex Bus is an on-demand bus service. It operates in a delimited area and travellers can take the bus between bus stops in that area. However the bus does not follow a fixed route. Travelers have to book the trip they want to make in advance, by telephone or by means of an internet application.

This service is meant to service areas that are too sparsely populated to have fixed bus lines operating at fixed hours. Experience has shown that bus services that are scheduled at a pace lower than one per hour, do not deliver a satisfactory service. Busses in rural areas therefore are often used only by disadvantaged and elderly people who have no other means of transportation.

By offering a demand responsive bus service the customer has three advantages:

- The bus will pick the traveller at a convenient time.
- The bus trip will be shorter than a fixed line service.
- The occupancy rate of busses will be increased.

By offering these advantages, public transport can service rural areas in a way that is more competitive with the private car. Although the modal shift will be limited, some of the advantages of public transport in terms of reduction of mobility poverty and environmental gains can be achieved.

Public transport generally is not a profitable activity, but public services have to spend the financial means in an ever more efficient way. The Flexbus is meant to provide a public bus service at a cost, similar to a regular bus, but to an extended group of customers.

2 CONTEXT

2.1 Geography

The pilot that IGEMO and local partners implemented from September 2019 to February 2020, was located in Klein-Brabant, an area that, from a European perspective, would be characterised as peri-urban. It is located in the South-West of the province of Antwerp in Belgium. This situates the pilot area right in between the major Belgian cities of Antwerp, Ghent and Brussels, and very near to the city of Mechelen. The area consists of two municipalities: Puurs-Sint-Amands and Bornem.

The area is mostly surrounded by water (North: River Rupel and West: River Scheldt), and in the West it is delimited by the A12 motorway. The number of water crossings is limited, which makes it a challenging area to provide transportation services to.

You could represent the area as a circle with a radius of 4 to 7 kilometres around the main village of Puurs. Village centres are generally 2 to 3 kilometres away from the next village centre, beyond walking distance. These distances are ideal for bicycling, also since the landscape has no hills.

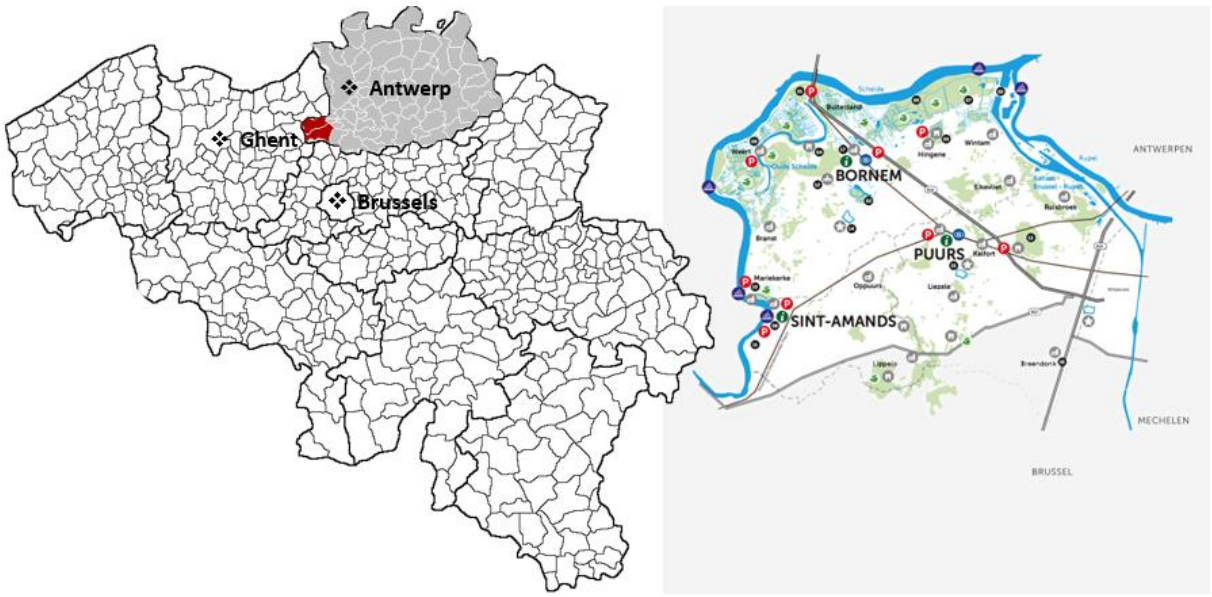


Figure 1: geographical situation of the pilot area Klein-Brabant

The area features several villages, a few main roads (N16 and N17 - Figure 1) which are the backbones for industry, agricultural land, and some very picturesque waterfront areas (Figure 2).

Figure 2: Impressions of the Klein-Brabant area

2.2 General statistics

The population density of Klein Brabant is higher than the EU, Flemish and Belgian averages. The population is rather old. Car ownership is rather high. Most families have at least one car, but many families own more than one car. The percentage of households that has at least one bicycle is also over 90%.

Table 1: Basic facts on the pilot area

	Puurs-Sint-Amands	Bornem
Population (2019)	25.882	21.366
Age 0-17	19,6%	17,6%
Age 18-64	60,2%	60,5%
65 and older	20,3%	21,9%
Surface (km²)	48,99	45,76
Open space (2017)	66,3%	68,7%
Residential area	14,5%	11,2%
Other (mostly industry)	19,3%	20,1%
Population density	528,31	466,91
Employment (2016)	10.613	8.222
Registered cars (2017)	12.939	14.932
Households with at least one car (2017)	94,8%	93,2%
Households with at least one bicycle (2017)	92,4%	92,9%

A survey conducted by the University of Ghent within the project MOVE, has shown that for most purposes, the car is the preferred means of transportation for more than half of the respondents to go to work, school/day-care, medical appointments, to go shopping, for leisure and to attend social activities. This area is so to speak addicted to the use of the private car. The bicycle is the main means of transportation for around a quarter of the respondents for several purposes (Figure 3).

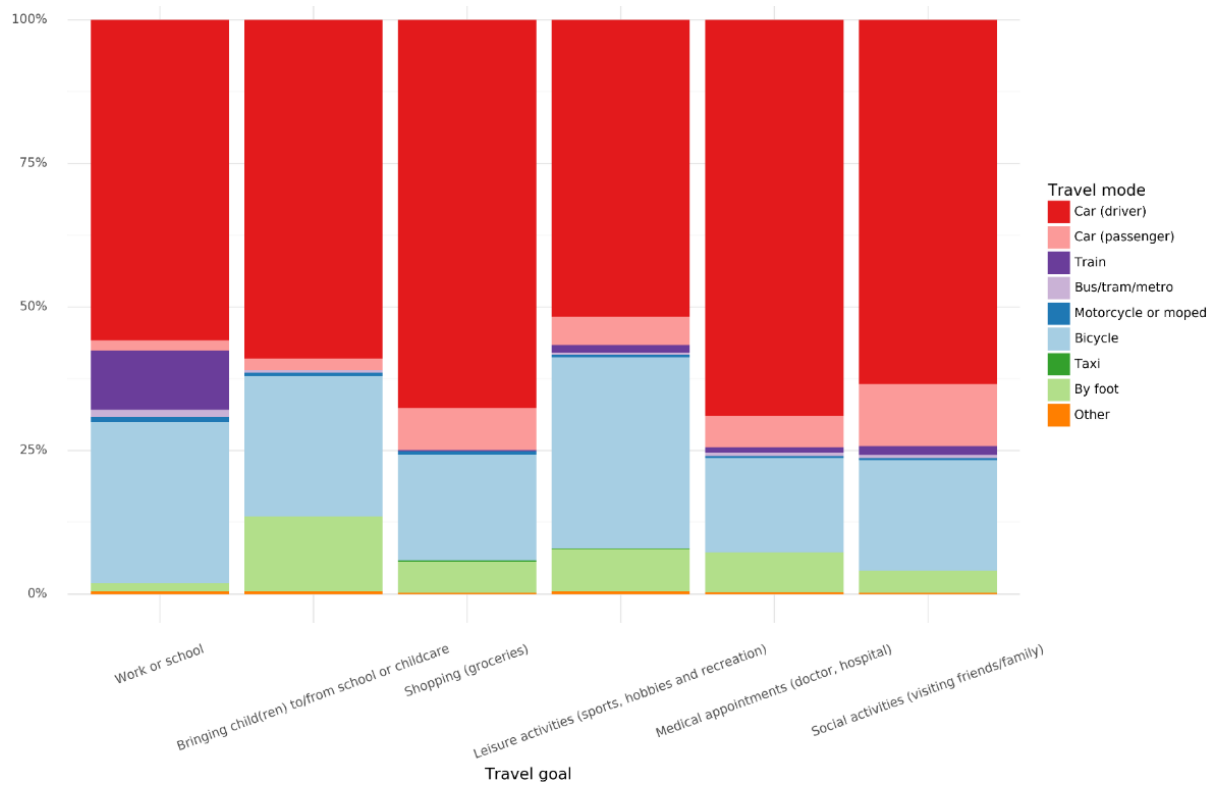


Figure 3: Modal split per travel goal (relative)

2.3 Political context

In its 2014-2019 Coalition Agreement, the Flemish Government first expressed its intention to thoroughly reform public transport in Flanders. This would involve moving away from "basic mobility", which has been one of the foundations of the Flemish mobility policy since 2001 and which involved guaranteeing a minimum provision of public transport close to home for everyone, and making way for the new concept of "basic accessibility".

This new Flemish vision for mobility policy aims in the first place at a shift from supply-oriented public transport to more demand-driven public transport on the basis of actual transport flows.

In addition, the emphasis is placed on "combi-mobility", in which different means of transport are combined to reach a certain destination. In order to make such combi-mobility somewhat workable, an integrated multimodal mobility network with seamless interconnection needs to be put in place to ensure a smooth flow between the various means of transport.

Finally, local authorities must also be involved in the organisation of public transport, and innovative information and communication technologies must be promoted.

This political shift implies that the offer of publicly available transport services will be redrawn. One of the consequences is that the Belbus will no longer be organised by the Flemish government, but a Regional Transport Council decides on the budgets and priorities.

The shift from basic mobility to basic accessibility, and thus the introduction of the new vision for mobility into the regulatory framework, was anchored in the decree of 3 April 2019 on basic accessibility, which entered into force on 22 June 2019.

2.4 Integration into the public transport network

2.4.1 From an organisational perspective

For any service, it is important to define a clear vision on the role it takes in a global public transport architecture. The Flexbus is a service that is part of the local network. There it is situated at the same level as shared bikes, steps, taxis, small ferries, etc (Figure 4).

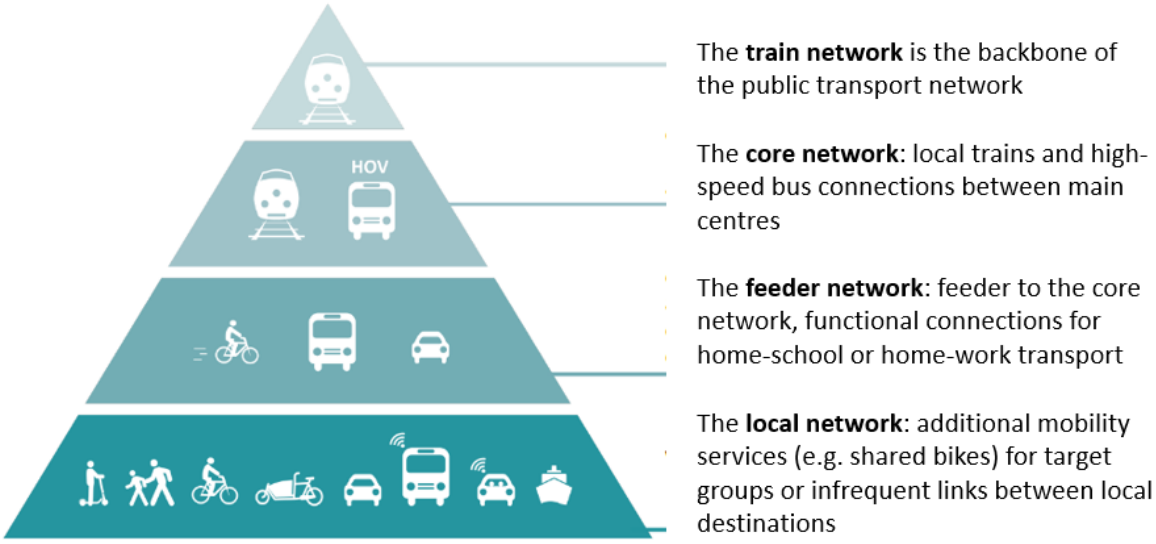


Figure 4: public transport architecture in Flanders

This is the theoretical architecture. In reality, the Flexbus serves as a feeder towards the train and core networks too.

The Flemish government is working on a MAAS platform to offer these functional layers of mobility services in a single customer oriented application. This is expected to be ready in 2021. The Flexbus will be part of this.

2.4.2 Existent transportation services

2.4.2.1 General accessibility by public transport

The bus routes in Belgium are handled by three different companies. De Lijn is responsible for the Flanders network, while TEC handles bus travel in Wallonia. The STIB buses cover the Brussels metropolitan area.

In the starting situation, public transport services are available. The main feature is the Dial-a-bus service or “Belbus”. This is a demand-driven bus, for which the numbers of passengers and trips were declining over the latest few years. In the next section, we inquire more in-depth why this service did not work well.

Belbus op sterven na dood

De belbussen verdwijnen geleidelijk uit het Vlaamse straatbeeld. ©ID/ photo agency

LUKAS VANACKER | 16 juni 2019 12:48

De dure belbussen vervoerden vorig jaar een kwart minder reizigers dan in 2017. De Lijn verwees naar eigen zeggen veel gebruikers door naar vaste buslijnen.

Figure 5: The "Belbus" was considered to be nearly "dead" in 2019. Article from De Tijd, 16 June 2019, https://www.tijd.be/ondernemen/transport/belbus-op-sterven-na-dood/10137020.html

There are two bus regular lines:

- Bus 252 Boom – Puurs – Bornem - Dendermonde
- Bus 257 Dendermonde - Bornem – Boom

The area also has three train stations:

- Puurs, with direct trains to Sint-Niklaas, Louvain and Mechelen (railway line 54) and Antwerp (railway line 52).
- Bornem, with direct trains to St.-Niklaas, Leuven en Mechelen (railway line 54).
- Ruisbroek, with direct trains to Puurs and Antwerp (railway line 52).

Moreover, there are dedicated transportation services available for special target groups (school children, handicapped). When the pilot started, the municipality of Bornem offered a local bus service on a fixed tour, free of charge. This service was successful but it was too expensive to be sustained. Figure 6 shows current bus stops (blue dots) and train stations NMBS.

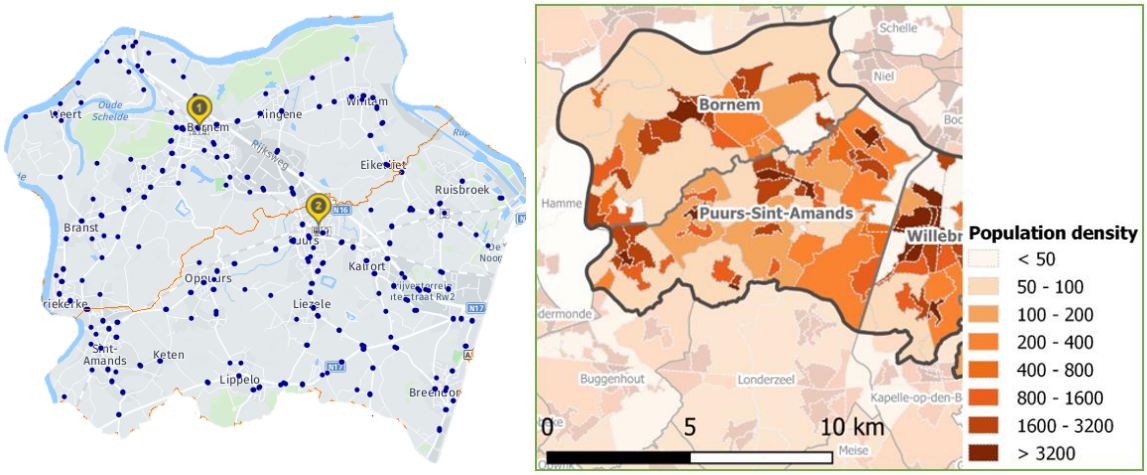


Figure 6: Service area Klein-Brabant and population density
Source: https://www.geopunt.be/

This offer, however, does not provide a sufficiently efficient possibility to travel. The University of Ghent, partner in the project MOVE, has plotted the time needed to reach several types of services. The maps below, show the entire region in which IGEMO operates.

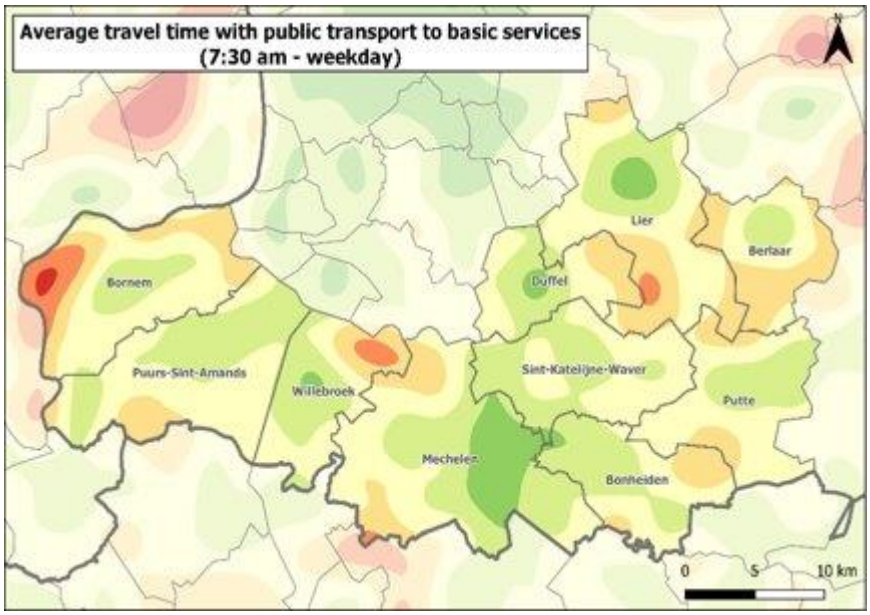


Figure 7: Average Travel Time to basic services by public transport (7:30 a.m. on week days)

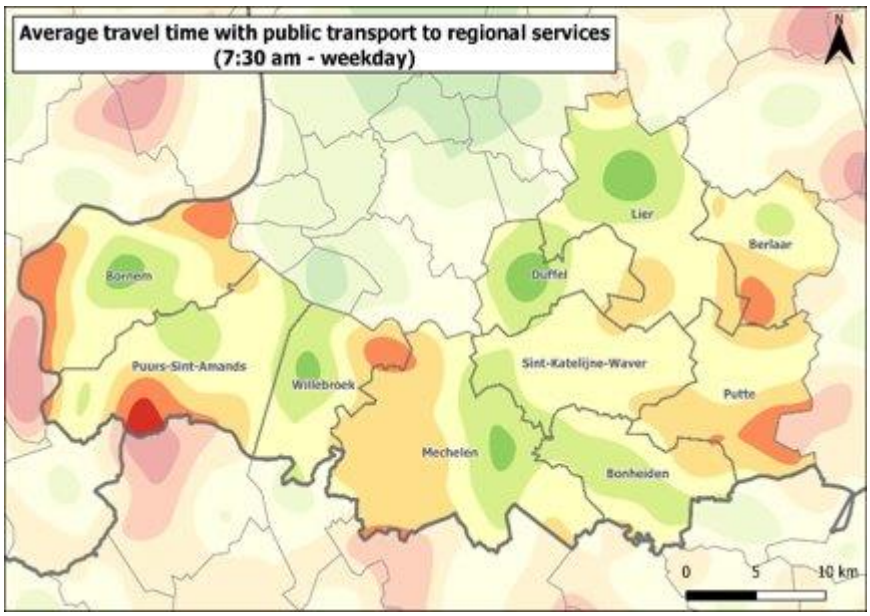


Figure 8: Average Travel Time to regional services by public transport (7:30 a.m. on week days)

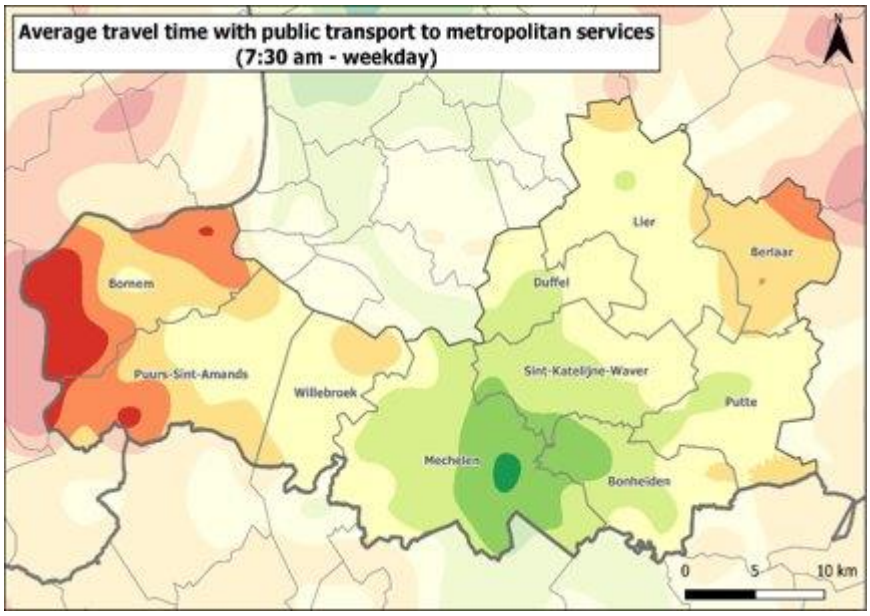


Figure 9: Average Travel Time to metropolitan services by public transport (7:30 a.m. on weekdays)

Metropolitan services (e.g. movie theatres, specialised medical treatment, larger shopping areas, and higher education) are hard to reach from Klein-Brabant. The survey by the University of Ghent thus pointed out that for the larger area Klein-Brabant was an area in which was eligible for a mobility solution (Figure 9).

2.4.2.2 *Experience of mobility poverty*

The survey also gave an insight in the reasons why people experience restrictions on travel. The nature of these restrictions is merely practical (Figure 10). It is striking that travel restrictions are mainly felt by respondents from generations Y (millennials) and Z (teens). These groups are supposed to be very skilled in finding information online and are supposed to be able to find solutions. We assume that they are willing to make more use of urban services and are less able to use the private car than other generations.

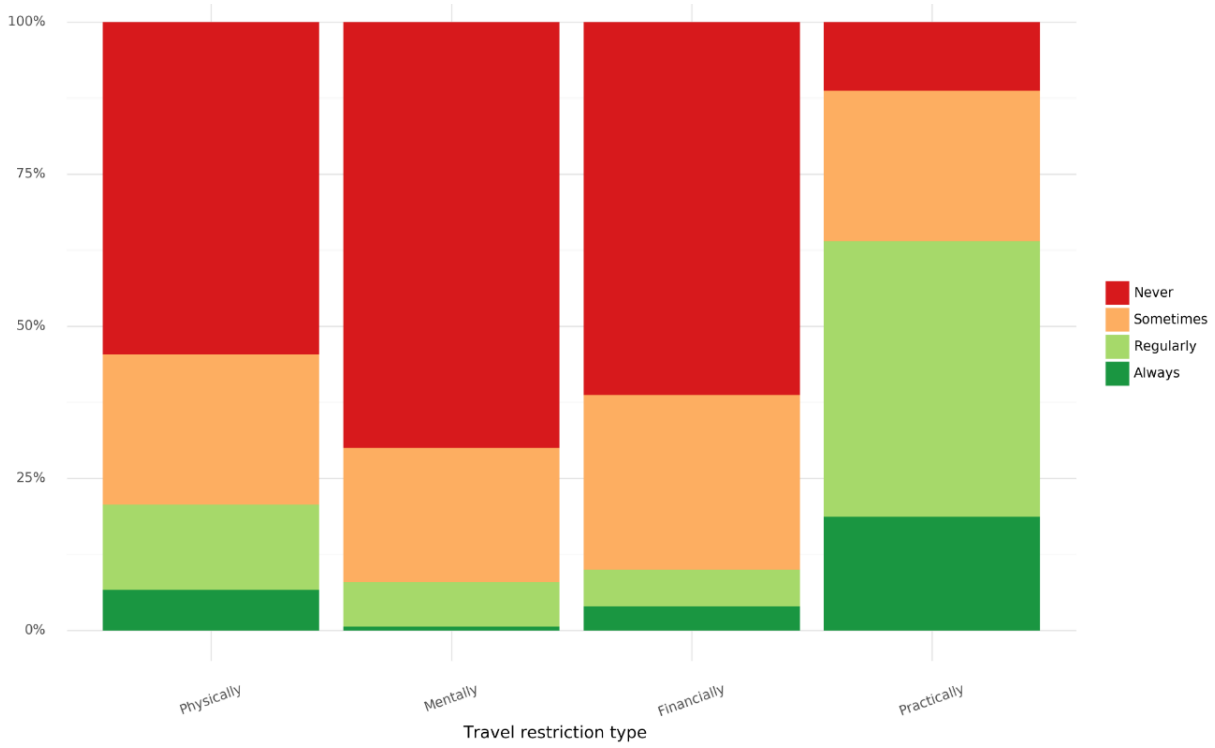


Figure 10: Frequency of the travel restrictions

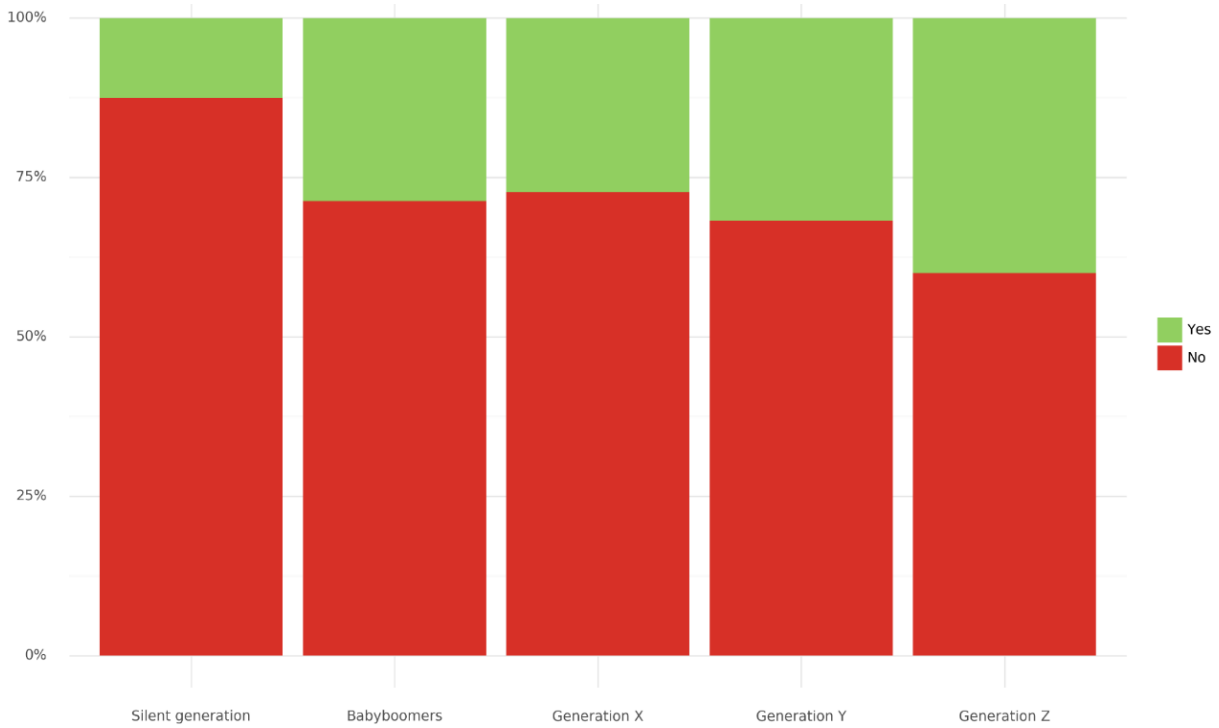


Figure 11: Feeling of travel restrictions per generation

2.4.2.3 The Belbus service

The Belbus is was an on demand bus service that was available in the Klein-Brabant area. Whoever wanted to use this service, could call an operator, register and book. Trips were between bus stops in a delimited area that roughly coincided with the Klein-Brabant area. Payment is performed with the same tickets that are used on any public bus in the Flemish Region. The Belbus service also exists in other areas in Flanders. There were no means to register or book online. That is the main difference with the Flexbus.

The survey made clear that most users were not very satisfied with the Belbus service. Moreover, many people never make use of this service. The Ghent University survey dug deeper into the

underlying reasons for this.

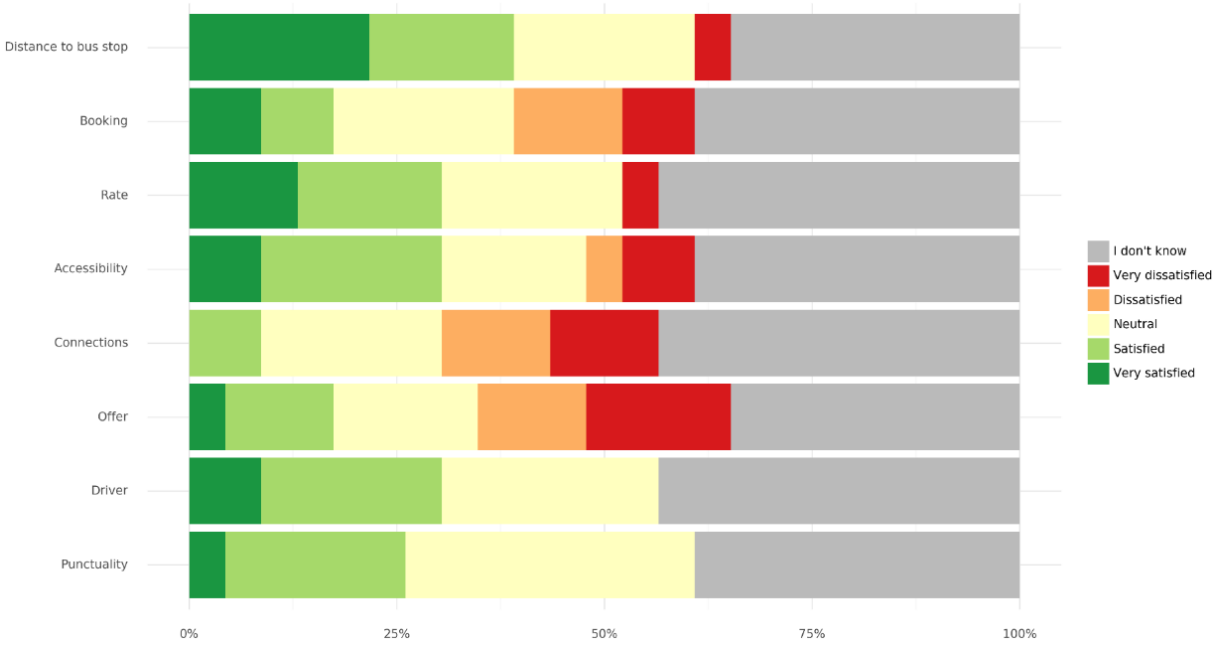


Figure 12: Aspects of satisfaction with the Belbus (by users)

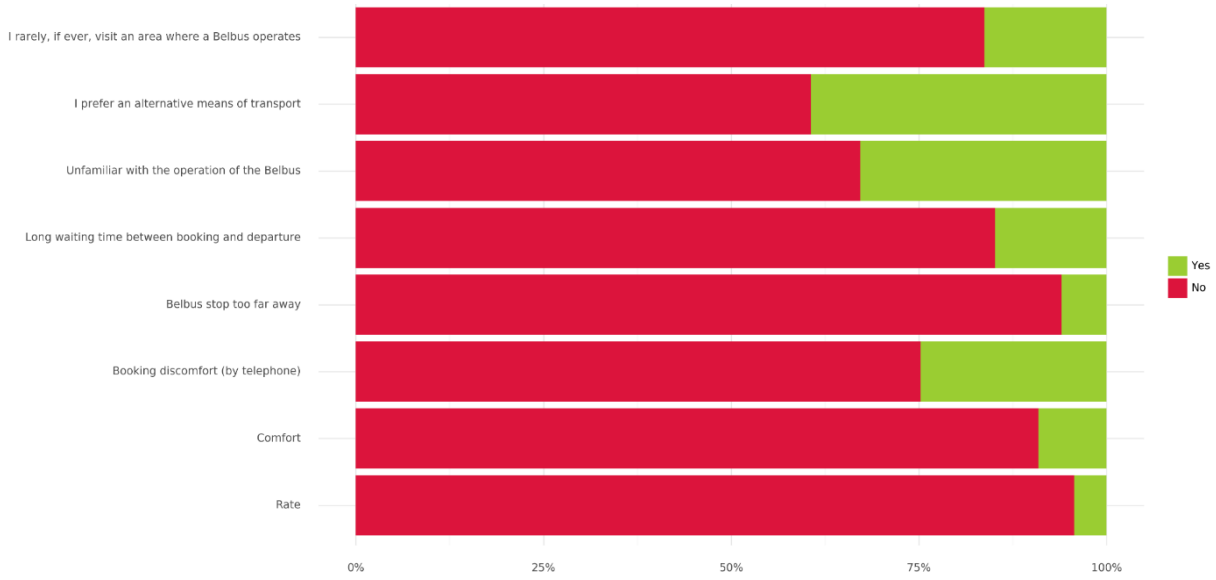


Figure 13: Reasons not to use the Belbus (by non-users)

In the group of users, as well as in the group of non-users, we could detect a dissatisfaction with the booking system. This was also an often heard complaint among inhabitants of the area. The operators making the bookings had a bad reputation. One of the employees of the public transport company confirmed that the telephone operator making the bookings had an impact on the number of trips.

This is where the idea of implementing an online booking system stems from, moreover since we detected that the younger generations, which are handy with online applications, experience restrictions to travel.

3 PILOT DESCRIPTION

3.1 Target groups

The user group of the Flexbus has not been surveyed specifically. The survey by the University of Ghent confirmed it is mostly an older public, not very well off, not highly educated. Another part of the users consists of teenagers. Most users are known on a first name basis by the bus drivers. This indicates that the users are a relatively stable group and that this group is hardly growing.

In the Segment Toolkit (Intelligent Energy Europe)[1] mobility profiles of the potential users are defined for targeting potential sustainable mobility users. Demographical characteristics of this group are mostly:

- Women
- Elderly people
- Young people
- Low-schooled people
- People working part time

The kind of trips people make most, are towards and from the train stations in Klein-Brabant. The Flexbus could thus be an aid to increase the number of combined bus-train trips over a longer distance by making the train stations more accessible.

Market research was not the main motive to start this pilot. The research served mainly to support a preference for action that already existed. It was interesting and important to do research in order to find confirmation that the booking system of the Belbus was limiting the full potential of the service. However, the signals that local aldermen picked up from the people living in their villages, were more decisive in the selection and concept of the pilot.

In this phase, following the MOVE-approach, we should have organised a co-creation session. The idea of a third party talking to customers of public transport provider De Lijn or voters for the local council was not welcomed. As a consequence, the potential users of the Flexbus were represented by the municipality and by the public transport provider. Other than that, several people in the IGEMO team live in the Klein-Brabant area and have gathered inputs from informal contacts.

This experience is a major lesson for anyone who would want to set up a co-creation session. We recommend that you check out if the group of people you would like to consult is important in any way.

[1] https://ec.europa.eu/energy/intelligent/projects/en/projects/segment#results

3.2 Organisation

Since this was a pilot, no new organisation or legal structure was set up. The pilot was implemented merely by a partnership of existing organisations (Figure 14).

Figure 14: Partnership

At a political level, the Regional Transport Board was responsible. The Flemish Region is divided into fifteen transport regions or "Vervoerregio's". This recently founded structure was set up to improve interadministrative cooperation. Each transport region council consists of representatives of various mobility stakeholders such as the Flemish public transport company De Lijn, the Agency for Roads and Traffic and the municipalities of the region concerned.

The existing public transport company (De Lijn) was responsible for operational elements: the contract with the bus companies, bookings (including the development of booking app), ticket sales, provision of information. The pilot has been implemented with the budget this company has for the Belbus. Limited budget has been added by the Flemish public authorities, for communication.

The municipalities played a key role at the local level: they provided information and took up ambassadorship towards citizens, gathered reactions by users and forwarded this feedback to the pilot team.

The role of IGEMO was to initiate the pilot and embed this experience in the project MOVE. For instance, the evaluation part of the pilot has been mostly carried out by IGEMO. IGEMO has put the partnership together and managed a process that allowed the pilot to be implemented. The role in communication was to co-ordinate the communication that was published by the other partners.

3.3 Communication

The Flexbus was communicated with budgets from the public transport company, the Regional Transport Council and the municipalities. The reason why IGEMO or the project MOVE, which could provide budgets for communication, could not communicate according to the communications guidelines. The bus company paid for operating the bus service and thus did not allow to have anything but their own communication on the busses or bus stops (Figure 15).

Figure 15: Communication on the bus stop and on the bus

The most successful communication efforts were made by the municipalities. These acted as ambassador of the Flexbus project. They used their regular means of communication: social media, a web site and the monthly magazine. The alderman of the Puurs-Sint-Amands municipality has actively been promoting the project at several meetings with locals.

Supplementary the Regional Transport Council has paid for a flyer and for a Facebook campaign.

As will be pointed out further in this paper, we consider the communication on the Flexbus as a key element in its success.


Succesverhaal rond Flexbus verlengd tot eind 2021

Een beetje zoals de belbus, maar dan makkelijker te boeken

Schepenen van Mobiliteit Saadet Gülhan (N-VA) en Alex Goethals (CD&V) bij de Flexbus.
© Wabo

Figure 16: Communication around the decision to prolong the service with the local alderman and alderwoman, who have acted as local ambassadors. Het Nieuwsblad, 5 March 2020. https://www.nieuwsblad.be/cnt/dmf20200305_04876372

3.4 The service

3.4.1 Service times

The service was delivered with two small busses, accessible for up to 15 people including one person with a wheelchair. The vehicles were deployed as follows.

Vehicle	Week days	Holidays	Saturday	Sunday
KB10	6 a.m. – 9 p.m.	6 a.m. – 9 p.m.	8 a.m. – 11 p.m.	10 a.m. – 7 p.m.
KB2	7 a.m. – 6 p.m.	9 a.m. – 6 p.m.	-	-

Figure 17: Children boarding the Flexbus

3.4.2 Bookings

Since the comfort and flexibility of booking seemed to be the problem of the Belbus service, we improved the possibilities to book in several ways. We made it possible:

- To book on Sundays (before not possible).
- To book online (before only possible by phone).
- To book until 30 minutes before the trip (before it was 60 minutes).

Bookings can be made through a web form or a call centre. In the trial phase, reservations with the app must be made during the opening hours of the call centre:

- Weekdays: 6 am to 7.30 pm
- Saturday: 7.30 am to 5 pm
- Sundays and public holidays: 7.30 am to 3 pm

When the trip required by a passenger is also delivered by the regular bus service within a time frame of 20 minutes before or after the required time, the passenger will be referred to the regular bus service. This is in order to avoid that a Flex Bus would drive behind a regular bus.

3.4.3 Ticketing

Tickets are the same as the regular bus service. Tariffs vary from 1 EUR to 2.20 EUR for one hour. Tickets are sold both online, on the bus, or at sales points. The tickets for 1 EUR are sold locally in Puurs-Sint-Amands and partly financed by the municipality as a third party. Bus passes from De Lijn were valid on the Flexbus.

Children under 6 years old travel for free but must always be accompanied by a paying traveller of at least 12 years old. There are numerous formulas to give access to needy, handicapped and elderly people at reduced tariffs or for free. All of these were valid on the Flexbus.

3.5 Financial aspects

3.5.1 Costs

The operations of the Flex bus were financed by the public transport company De Lijn. They were not entitled to give us precise data on the cost of the development of a web application, nor on the cost of operating the Belbus or the Flexbus. The only indication we received was that the cost is around 150.000 EUR per vehicle per year. This covers the cost of having the bus driven by a contractor, without overhead costs of De Lijn.

On this basis, we made the rough estimation of the costs in the table below. It appears that the Flexbus is 2.675 EUR more expensive, because of the higher fuel consumption, which is a result of the increase of user numbers.

The project cost could be estimated to around 15.000 euros.

Table 2: Itemised overview of costs, yearly, comparison Belbus and Flexbus

	Flexbus 1,5	**Belbus 1,5**
Depreciation of vehicle	€ 16.500	€ 16.500
Rent of the depot	€ 750	€ 750
Insurance of vehicles and passengers	€ 1.500	€ 1.500
Fuel	€ 7.924	€ 5.348
Electricity	€ 4.905	€ -
Charging infrastructure	€ 750	€ -
Vehicle maintenance and repairs	€ 825	€ 1.500
Technical inspection of vehicles	€ 75	€ 75
Cleaning	€ 7.283	€ 7.283
Driver's salaries and allowances	€ 145.659	€ 145.659
Vehicle registration		€ 1.500
Yearly road taxes		€ 100
Depreciation and maintenance of bus stops	€ 10.000	€ 10.000

Telematics	€ 750	€ 750
Backend informatics	€ 500	€ 500
Planning and organization	€ 9.711	€ 9.711
Dispatching	€ 29.132	€ 19.421
Uniform drivers	€ 750	€ 750
	€ 237.013	**€ 221.347**

The cost per passenger for the Belbus amounts to 21 EUR. This is comparable with the cost that was observed in the Breng Flex pilot in the Arnhem-Nijmegen Region in the Netherlands, which was around 20 EUR per passenger. The Flexbus Klein-Brabant is cheaper: 15.31 EUR per passenger, mainly since the number of passengers has significantly increased. From this analysis, it appears that the fixed costs are very high, whereas marginal costs per extra passenger are limited. This implies that an increase in the number of passengers can reduce the cost per passenger significantly.

Since a bus company, which will try to make profit, delivers some of the services, the cost could be up to 20% higher. This depends largely on the market and on the scope of the services delivered by private companies. This should be added to the overall cost.

Supplementary sources on costs and benefits of public bus services can be found in the following sources.

- CROW. (2015). Kostenkengetallen regionaal openbaar vervoer 2015. Ede: CROW. (CROW, 2015)
- Rebel Group. (2013). Standaardmethodiek voor MKBA van transportinfrastructuurprojecten – Kengetallenboek. Brussel: Vlaamse Overheid, Departement Mobiliteit en Openbare Werken (Rebel Group, 2013).

3.5.2 Revenues

There are three classic sources of income to pay for the services:

- Ticket sales to travellers.
- Advertising in and on vehicles and bus stops.
- Subsidies.

As already mentioned, the tariffs on the Flexbus were the same as for any public bus in Flanders. This means that the revenues from tickets are impossible to calculate precisely. If we make a rough estimate of 1 EURO revenue per trip, the Flexbus pilot would have had a revenue of 8 051 EUR over 6 months.
In the pilot, no use was made of the possibility to use advertisements as a source of income.

From the evaluation of a Flex Bus service in the Netherlands (Breng Flex), we know something about the willingness to pay (Haanstra & Al., 2018). The price for a trip was 3,50 EUR in that case. A survey form 2019 pointed out that 16% of the respondents would travel with Breng Flex for short trips if they became cheaper. A possible price increase to 5,00 EUR for longer rides is acceptable for one third of the Breng flex users. Only 7% say they are willing to pay more than 5,00 EUR (in 2017 it was 2%).

It is unclear from the pilot whether passengers are willing to pay more for the increased flexibility, but since few are making use of it, flexibility does not seem to be a valuable selling proposition.

4 EVALUATION

4.1 Objective

4.1.1 General objective

The objective in general terms is to attract new travellers so that the existing call buses are used more intensively. The expected passenger growth for the core network and the supplementary network in the Mechelen Transport Region is 8.5% compared to the current situation.[2] For the Pilot, this growth number was taken as a reference. The underlying objective of passenger growth is to achieve a modal shift in order to reduce the environmental and climate impacts of road traffic.

4.1.2 MOVE result indicators

However, in the project MOVE, the targets were defined differently. These are the measures and targets defined in the application of the MOVE project.

Indicator	Target	Unit	Definition
Reducing the use of private cars in local mobility streams	10	% reduction of the number of single local private cars trips of target groups individuals.	Based on the current car trips of the target groups in the partner regions, the project will reduce the number of single trips by 10 %. Baseline will be set at the start of the project.
Increase in the usage of sustainable mobility solutions	20	% increase in Number of passengers	Based on the data collected from the standing mobility solutions, the project will increase their usage by 20%. Number of passengers at project start will be used as baseline 0.
Increase social integration through mobility	20	% increase of yearly travel in Km using sustainable mobility solutions	Based on the current distances using mobility services performed by the target groups (elderly, mobility-poor, isolated communities), the project will increase their yearly travels in km by 20%. Baseline will be set at the project start.

[2] Hearing of the Flemish Parliament on the draft decree of the Flemish Government, regarding the basic accessibility. 1805 (2018-2019) no 1, presentation by Roger Kesteloot, Director General VVM De Lijn.. https://www.vlaamsparlement.be/commissies/commissievergaderingen/1299064#volledig-verslag

4.2 Reducing the use of private cars in local mobility streams

4.2.1 Baseline

For this indicator, a baseline of the number of car trips had to be established. To do this, we used data from the Onderzoek Verplaatsingsgedrag 5.1 (Declercq & Al., 2016), which is a large scale survey in the Flanders Region. It features a measurement of number of trips per day and a modal split. Combined with population statistics (Statbel, 2021), we could calculate the number of trips as follows:

Number of trips per day * 365 * population of the pilot region * modal share of the car = number of trips per year

We have looked into sociodemographic parameters that we could use to adapt the measurement for the whole of Flanders to the sociodemographic situation in the Pilot region. Unfortunately, only the distinction between men and women was available. It is interesting though, since there is a gender difference in both the number of trips and the model split. However, there certainly are other sociodemographic differences (e.g. age, income) for which data are unavailable.

This is how we have calculated the baseline for the number of car trips.

A. Trips per person per year (all modes)	
Men	1.033
Women	978
B. Population 2018	
Men	14.309
Women	14.920
C. Modal share car	
Men	81%
Women	79%
D. Trips by car during one year (= A * B * C)	
Men	11.944.107
Women	11.564.572
Total	**23.508.679**

This calculation makes abstraction of the fact that during a trip, more than one transportation mode could be used.

4.2.2 Reference

In order to calculate the reference, we used the following parameters:

- Number of trips during the pilot (September 2019 to February 2020): 7.014.
- Number of trips during the reference period (September 2018 to February 2019): 4.796.

These are measured values.

- A modal split during the reference period
  - sustainable modes: 11,0%
  - Bel/Flexbus: 65,1%

- Car): 23,9%

- A modal split during the pilot
  - sustainable modes: 0%
  - Bel/Flexbus: 100%
  - Car): 0%

These are assumptions. There is no way that we could gather data on how people travelled during the reference period. These assumptions are based on an expert opinion.

	Percent	Trips
A. Trips in project (measured)		
Reference		4.796
Project		7.014
B. Modal split Reference (assumption)		
Sustainable mobility	11,0%	527
Bel/Flexus	65,1%	3.122
Car	23,9%	1.147
C. Modal split Project (assumption)		
Sustainable mobility	0%	-
Bel/Flexus	100%	7.014
Car	0%	-
D. Avoided car trips (=		
In 6 months		1.147
In 1 year		2.293
Reference (= Baseline - Project effect)		**23.506.386**

4.2.3 Evaluation

We evaluate the reduction in the use of private cars in local mobility streams against the target as follows:

(baseline / reference) – 1
= reduction in the use of private cars in local mobility streams

The result of this is, -0,01 %. In comparison to the target of -10 %, seems to be a very bleak result, but we do have elements that seem to point out that the target largely overestimated the potential impact of the pilot.

- First, it is not easy to change people's behaviour in a short time span. Car users will probably not show much interest in the Flexbus. The fact that people still have to register as a customer and the fact that the booking application was web based and not a smartphone app, remain thresholds that could have kept large numbers of people from trying the Flexbus. Finally, we only have used 1,5 busses that offer 15 seats each. We would probably not have been able to accommodate everyone if 10% of the car trips by the target group would have been replaced by Flexbus trips.

- Second, we have used the entire population for the reference measurement because we do not have information on the number of trips by the target group. However, if we would reduce the reference to the actual target group, the effect would of course be higher.
- We have tried to reduce the baseline by only taking into account people under 18 and above 65 years old. This resulted in doubling the result from -0.1% to -0.2%. This brings us to the observation that every take that we could possibly have on delimiting the baseline to approximate the number of people in the target group, would be arbitrary and it would probably not bring the result achieved by the pilot significantly closer to the -10% target.

Finally, this is only a pilot. People did not have the time to fundamentally change their travel habits. Moreover, if we look at the number of trips, without the reference to the number of car trips, we have measured a heart-warming increase of 46%. This leads to the hypothesis that the target group of elderly, children etc. have reduced their number of car trips. Unfortunately, we do not have the data to test this.

4.3 Increase in the usage of sustainable mobility solutions

The result indicator, as defined by the MOVE application, left some ambiguity on whether the number of people transported or number of customers had to be measured. Luckily, we have monitored both during the pilot, and for both indicators, the result is an impressive increase.

4.3.1 Number of customers (baseline and reference)

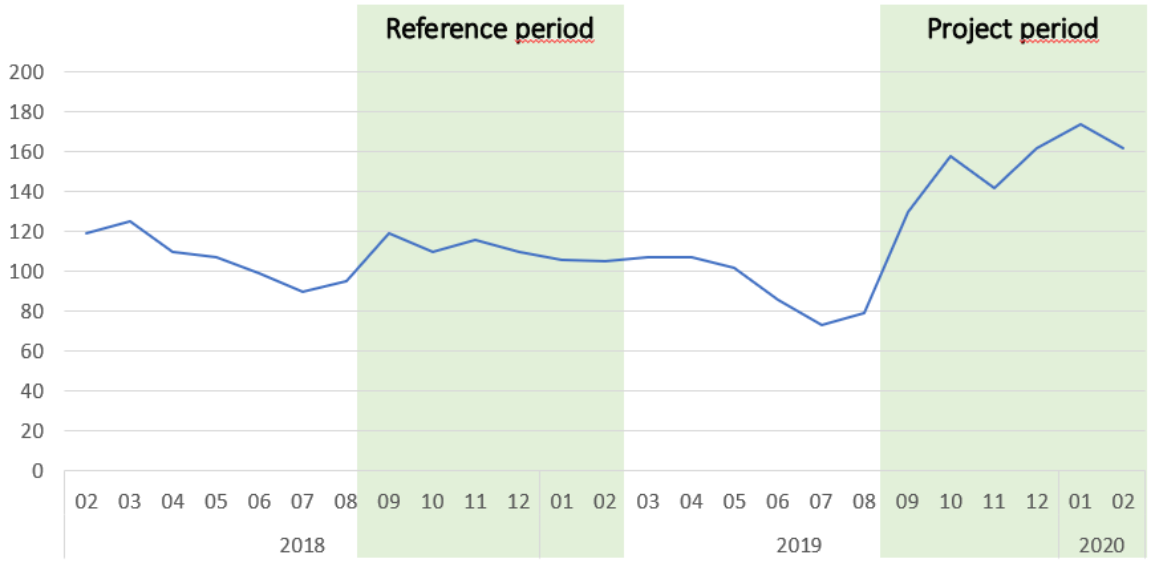


Figure 18: Number of customer accounts used to book

The number of customers was measured by the number of user accounts used to book the Flexbus. This number is up by 54% in the Project period (September 2019 to February 2020), in comparison to the reference period (September 2018 to February 2019).

Number of unique customers (measured)	
Reference period	208
Project period	320

4.3.2 Number of passengers (baseline and reference)

The number of passengers were up by 53% in the Project period, in comparison to the reference period.

Number of passengers transported (measured)	
Reference period	5.998
Project period	9.185

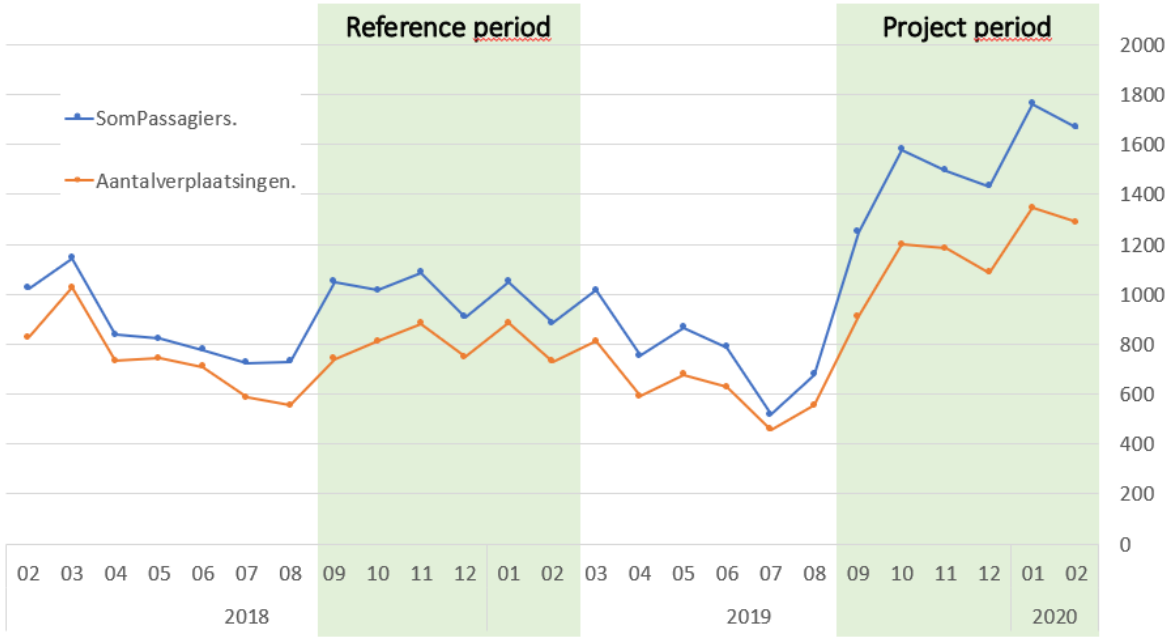


Figure 19: Number of passengers (upper line - blue) and number of trips (lower line - red)

4.3.3 Evaluation

The ambition of 8.5% growth in passenger growth for the Flexbus project was set too low by the Regional Transport Board. The MOVE-target of 20% passenger growth has appeared more realistic.

4.4 Increase social integration through mobility

The definition of the indicator is somewhat problematic. At first, one would say that this is an indicator of social integration, but then it appears to be measured in distance (km). The conceptual framework behind this indicator is not clear.

Moreover, due to the protection of personal data, we did not get access to the customer data that would allow us to analyse whether we reach the presupposed target groups (defined in 3.1). This is particularly regrettable, for the bus company that we have worked with, has access to very detailed data on the gender, age, possible disabilities, occupation etc. of the user group.

Another way to evaluate this indicator, would have been to survey people that are taking the bus or interview the drivers. The drivers could have been a valuable source of information because in the peri-urban or rural context in which the Flexbus operates, the drivers know most of the passengers

on a first name basis. Sadly, we were not allowed by the public transport company to interview the driver nor the passengers. Since we had to maintain a co-operative relation with the company, we have respected their wish.

What we can present here is:

- The number of passenger-kilometres
- The number of kilometres per passenger.

These are indicators that we measured while we were monitoring the pilot. We are aware that this hardly tells anything about the effect of the pilot on social integration.

4.4.1 Baseline

Reference period (September 2018 to February 2019)	
Number of passenger-km	34.080
Average of km/passenger	5,68

4.4.2 Reference

Project period (September 2019 to February 2020)	
Number of passenger-km	52.333
Average of km/passenger	5,70

4.4.3 Evaluation

The number of passenger kilometres has increased by 53,6 %. The average trip distance had more or less remained the same. People do not travel further because of the pilot, but more people travel more frequently. This leads to the hypothesis that the purposes of travel, remain more or less the same. We have no data on the purposes of travel within the Flexbus pilot.

Figure 20: Average trip distance (graph bars) Passenger km (upper line - green) and total distance covered by the bel/Flexbus (lower line - grey)

Insofar that the passenger kilometres are a good way to measure social integration trough mobility, the 20% target has been achieved.

4.5 In depth analysis

The objectives have largely been achieved, but it is still interesting to dig deeper into the data to gain a better understanding of how the Flexbus worked.

When we compare more in detail into the origins and destinations most often used by travellers, it is clear that the growth is larger between more densely populated areas, the village centres. Our hypothesis is that people living in more remote areas have organised their lives and transportation in function of the remoteness of their homes. More precisely, they travel less or they mostly take the car.

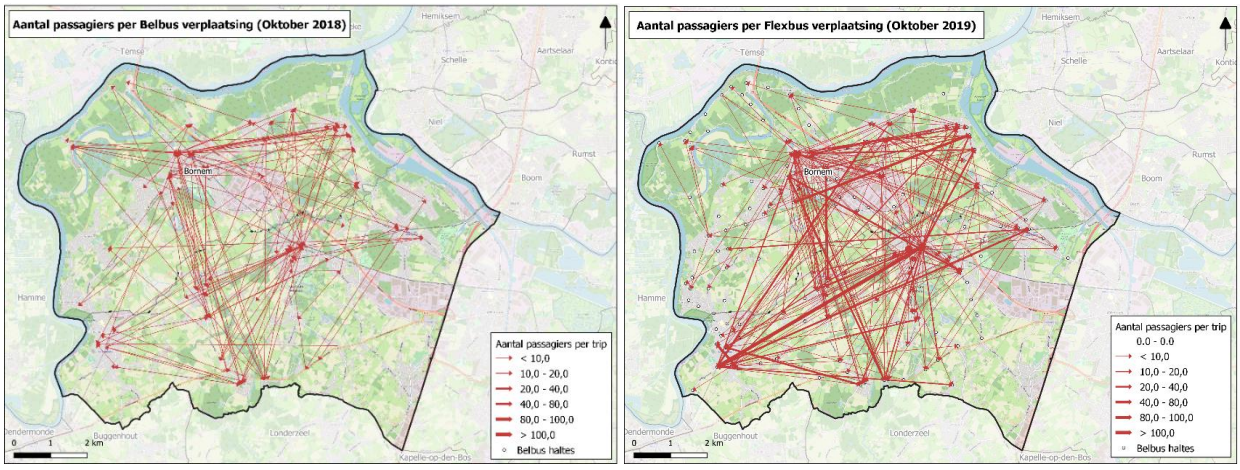
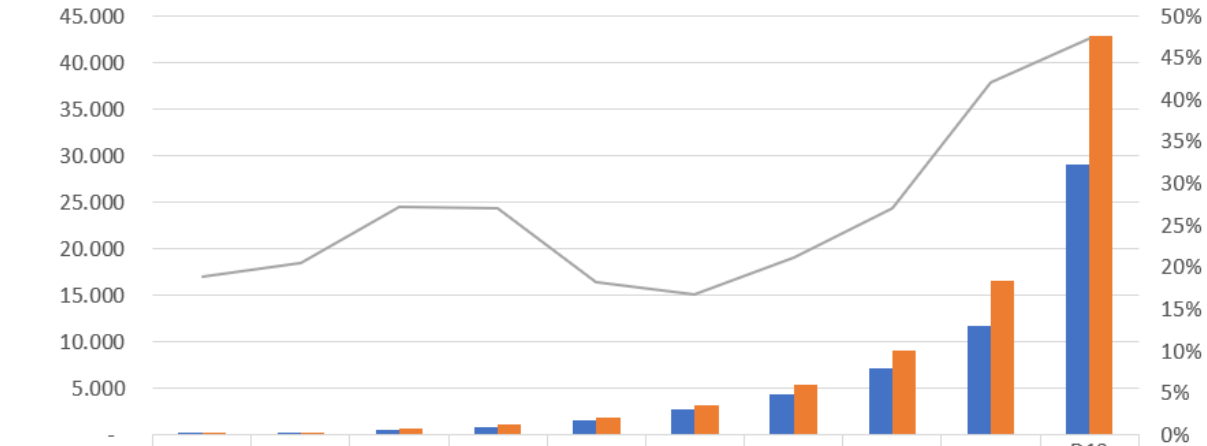


Figure 21: Origin an destinations in October 2018 (reference) and October 2019 (Project)

We did not get access to the customer data that would allow us to analyse whether we reach the presupposed target groups. What we could analyse is the extent to which people who were regular users of the Belbus, became regular users of the Flexbus.

The graph below (Figure 22) compares the number of passenger-kilometres per decile in the project and reference periods. It shows that the growth does not come from a large number of occasional users, but that it comes from regular users who make even more frequently use of the Flexbus.



	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10 (Max)
Period.Ref	72	220	476	858	1.531	2.638	4.360	7.072	11.662	29.046
Period.Proj	86	265	605	1.089	1.809	3.081	5.284	8.979	16.569	42.784
Groei	19%	20%	27%	27%	18%	17%	21%	27%	42%	47%

Figure 22: Decile distribution of passenger-kilometres, comparison of project and reference periods

The number of people that are using the possibility to book a short time in advance is very limited. On average only 20 bookings per month were made shorter than one hour in advance. Around one third of the bookings were made four hours in advance or shorter (Figure 23). The average time that bookings were made even increased from 7,63 days in advance to 7,85 days.

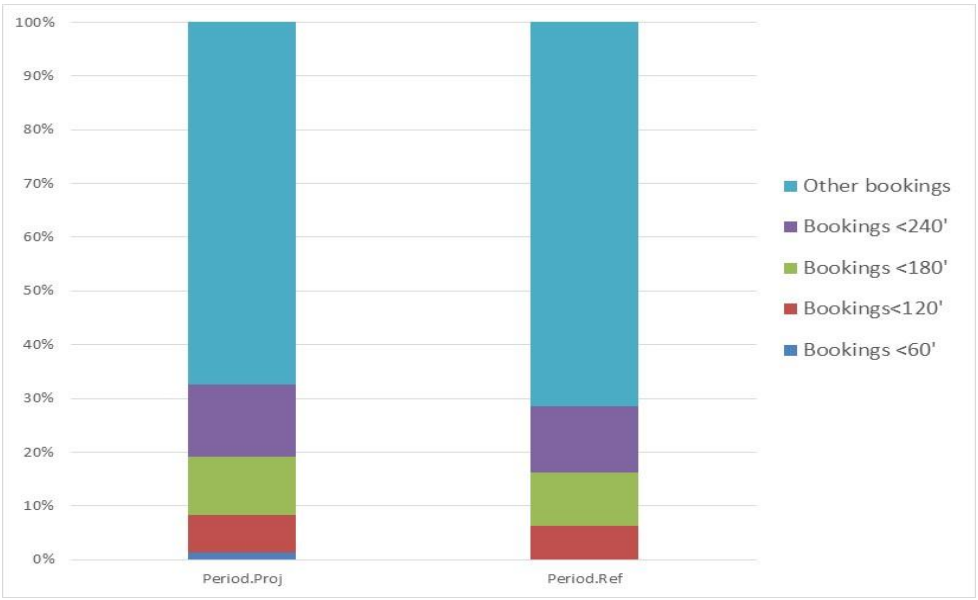


Figure 23: Distribution of time in advance that bookings were made, comparison of project and reference periods

Also from the moment of the day when people choose to take the bus, it appears that the Flexbus was used for regular weekday trips.

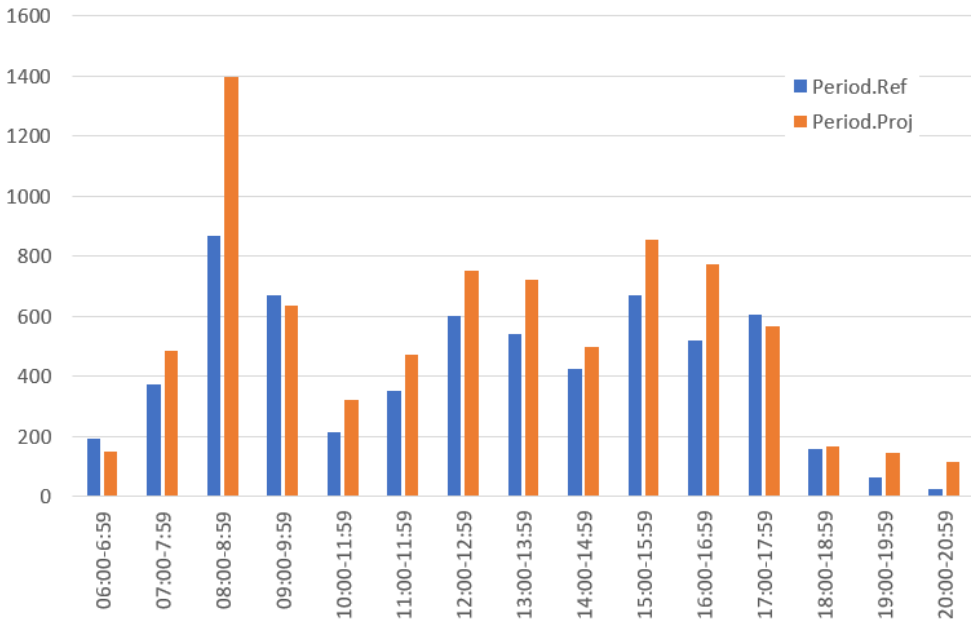


Figure 24: Number of passengers per hour of the day

We note that the number of trips doubled on Saturdays. It is likely that the purpose of this trips is other than work or school.

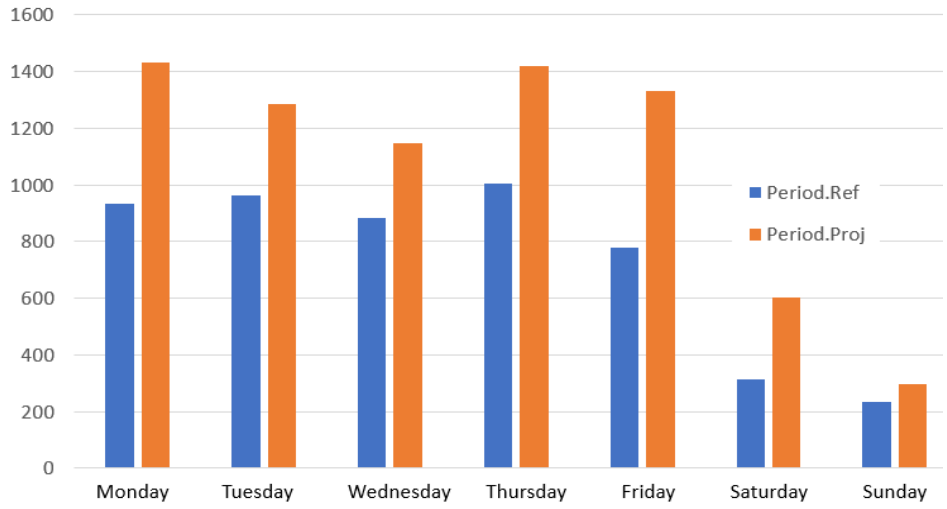


Figure 25: Number of passengers per day of the week

As it appears, the success of the project did not come as a result of the improved flexibility.

Our hypothesis is that, people (re)discovered the Flexbus as an option for transportation when the communication on the Flexbus started. In other words, the improved numbers of passengers probably are the effect of communication.

An important issue we wanted to keep in mind is that the Belbus was a cheap and easy transport solution for people in wheelchairs. A scenario we have thought of, was that if the project were successful, this could decrease the time available to pick up people in wheelchairs, which could decrease their comfort to use the Flexbus. Luckily, this is not what happened. The number of trips with wheelchairs remained the same (84 in the reference period and 88 in the Project period).

4.6 Climate impact

Since the MOVE-project has the greening of the transport sector in rural areas as an objective, we felt the need to assess the climate impact.

Such an assessment relies on a number of assumptions and key figures. We describe here step by step how this calculation was made.

The first step is an assumption on the modal split in the reference ant project situations. We assume that some trips made by the Flexbus were mad by bike or foot (11% of modal split in reference). To some extent the Flexbus has replaced trips made by car (24% of modal split in reference). This is based on the knowledge we have gathered from the survey, that the car is the main means of transportation in the area.

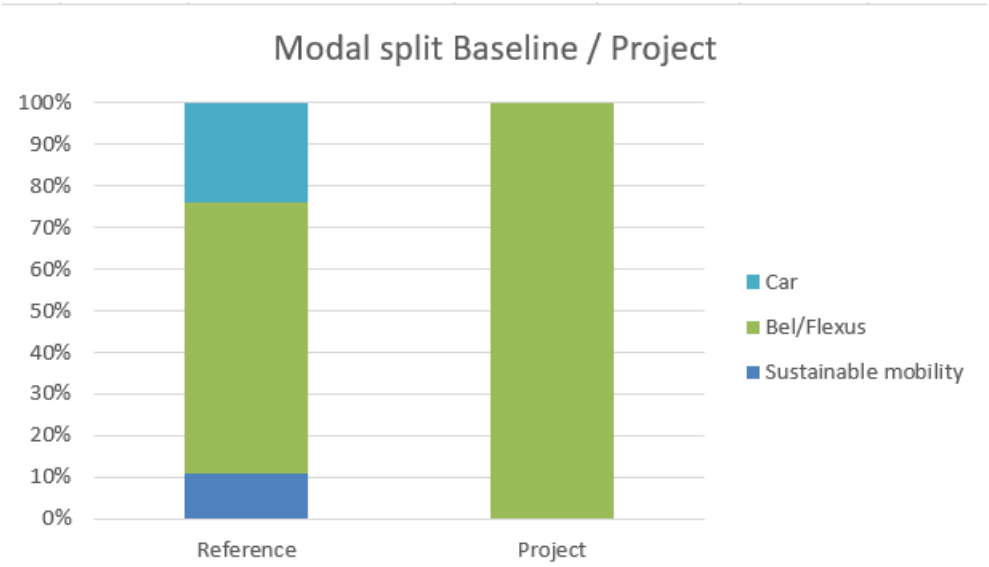
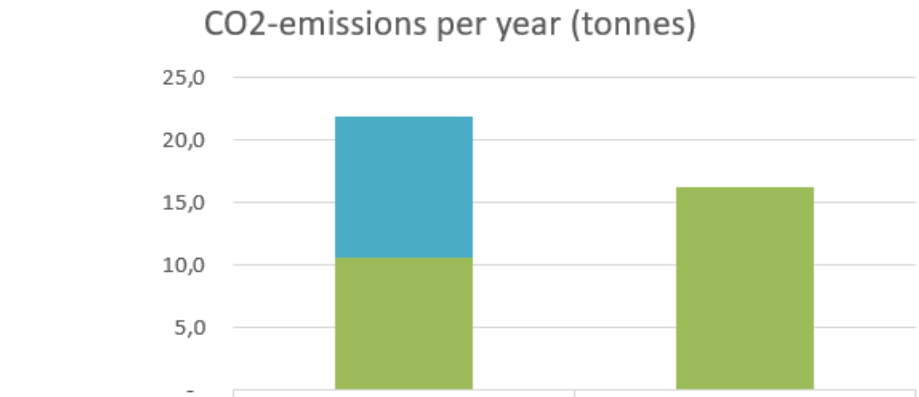


Figure 26: Assumed modal split in project and reference situations

The second step is to calculate the CO_2-impact per means of transportation. For sustainable modes such as bike and foot, we assume this is zero. For a car we count 166 g of CO_2per passenger kilometre and for a (diesel) bus, we assume 155 g of CO_2 per passenger kilometre.



	Reference	Project (diesel)
Car	11,3	-
Bel/Flexus	10,6	16,2
Sustainable mobility	0,0	-

Figure 27: Estimated impact of the Flexbus on CO_2 emissions, per year

This points out that the only stand for a reduction of 5,6 tonnes of CO_2. This is of course not a sufficient result as the cost of a tonne CO_2 within the ETS is around 60 euros (as we speak towards the end of 2021). To reduce a ton of CO_2 with this project costs roughly 2.500 euros per tonne.

We have fiddled a bit with the figures to see what happens if we change certain assumptions, but the result remains more or less the same. This poor result could be reversed if battery electric vehicles would be used. Under title 5.1.2, we will investigate this idea in more depth.

It should be noted that emissions of particulate matter (PM10, PM2,5) originate mostly from wear and tear of the tires, so these emissions will not change. The emissions of Sox and NOx have not been studied.

5 POSSIBLE IMPROVEMENTS

The Flexbus certainly is a way to offer public transport in areas where regular pace bus services on a fixed route are highly inefficient. The solution remains very costly, though.

5.1 Ways to cut costs

5.1.1 Use only one vehicle

The number of passengers per day amounts, roughly speaking, to 50. This is not a large number. During the pilot, no problems were detected with the availability of vehicles. The waiting time was on average only around 1 minute. As a consequence, the question was raised if the number of vehicles could be reduced from 1,5 to 1. Since the main cost component of the Flexbus is the labour cost for the driver, this is the main opportunity to cut costs.

It is a question whether it is possible to deliver the same service with only one vehicle. A quick calculation points out that the average number of passengers over an entire day can easily be serviced with only one bus. However, during rush hour (mainly between 8 and 9 a.m. on week days) the number of requested trips can amount to more than 7. If these trips are not combined, a capacity problem could emerge.

Arrival rate	7	per hour	Assumes Poisson process for
Service rate	8,0	per hour	arrivals and services.
Number of vehicles	1		

Utilization	**87,50%**
P(0), probability that the system is empty	**0,13**
Lq, expected queue length	**6,13**
L, expected number in system	**7,00**
Wq, expected time in queue	**0:52**
W, expected total time in system	**1:00**
Probability that a customer waits	**0,88**

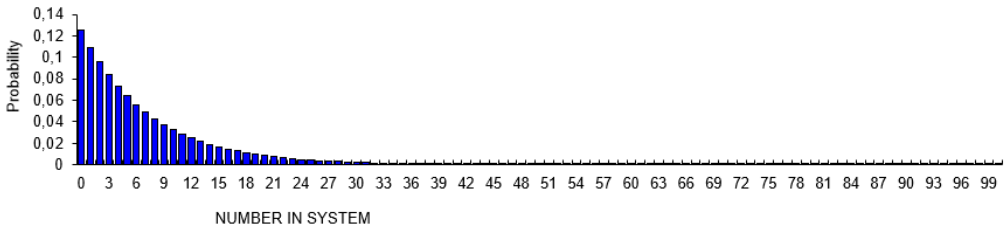


Figure 28: Waiting row simulation of 7 bookings per hour at a service rate of 8 per hour

Since trips are booked, it is possible to postpone some of them. Postponement of the requested trips, will considerably decrease quality of the service. However, the number of occasions where more than 7 requests for trips are made in one hour, are very limited.

Table 3: Itemised overview of costs, yearly, comparison 1 or 1.5 vehicles

	Belbus 1,5	Belbus 1
Depreciation of vehicle	€ 16.500	€ 11.000
Rent of the depot	€ 750	€ 500
Insurance of vehicles and passengers	€ 1.500	€ 1.500
Fuel (9l/100km at 1,35/l)	€ 5.348	€ 7.924
Vehicle maintenance and repairs	€ 1.500	€ 1.000
Technical inspection of vehicles	€ 75	€ 50
Cleaning	€ 7.283	€ 4.855
Driver's salaries and allowances	€ 145.659	€ 97.106
Vehicle registration	€ 1.500	€ 1.000
Yearly road taxes	€ 100	€ 100
Depreciation and maintenance of bus stops	€ 10.000	€ 10.000
Telematics	€ 750	€ 500
Backend informatics	€ 500	€ 500
Planning and organization	€ 9.711	€ 9.711
Dispatching	€ 19.421	€ 19.421
Uniform of the driver	€ 750	€ 500
	€ 221.347	**€ 165.667**

The cost reduction is considerable: - 55.680 EUR per year.

5.1.2 Use electric vehicles

One of the possibilities to reduce costs is to choose for electric vehicles. The investment cost for these vehicles is considerably higher than that of diesel busses, but operating costs are expected to be considerably lower.

The cost of a hydrogen bus is considerably higher than that of fossil powered buses. In addition to the costs of the bus itself, the filling station has a major impact on the costs of using hydrogen buses. The marginal cost of filling stations is lower as more buses use a filling station. Since the number of buses in this case is very low, the marginal cost of a filling station is very high and it is therefore not sensible to further investigate the possibility of driving hydrogen buses.

An electric model which is appropriate for the service, is the electric Fiat Ducato offered by Tribus. It can accommodate up to 8 people or 6 wheelchairs, or a combination of these. This vehicle has an action radius of 220 km, which should be enough for the purpose.

Figure 29: the Fiat Ducato by Tribus

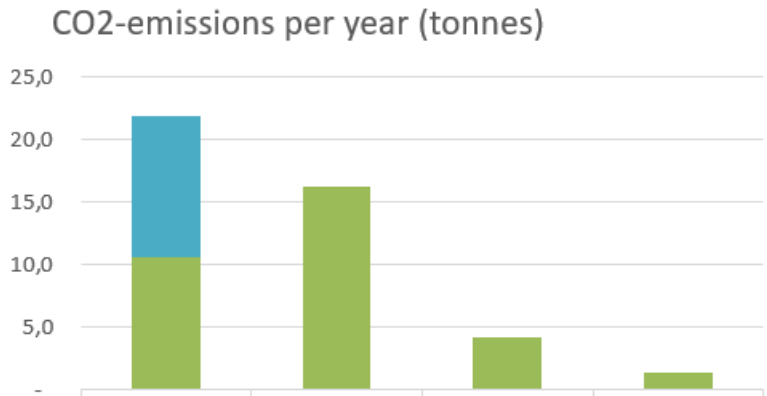
We estimate that the cost of a Flexbus consists of the following items. The costs indicated are very rough estimates. The most important cost is the driver's wage. The costs below are calculated with depreciation terms of 5 years. The assumption that the service will be delivered by using a single vehicle is made.

Table 4: Itemised overview of costs, yearly, comparison diesel and electric propulsion

	Diesel	**Electric**
Depreciation of vehicle	€ 11.000	€ 12.100
Rent of the depot	€ 500	€ 500
Insurance of vehicles and passengers	€ 1.500	€ 1.500
Fuel (9l/100km at 1,35/l)	€ 7.924	
Electricity (0,40 kWh/km at € 0,19/kWh)		€ 3.270
Depreciation of charging infrastructure		€ 500
Vehicle maintenance and repairs	€ 1.000	€ 550
Technical inspection of vehicles	€ 50	€ 50
Cleaning	€ 4.855	€ 4.855
Driver's salaries and allowances	€ 97.106	€ 97.106
Vehicle registration	€ 1.000	
Yearly road taxes	€ 100	
Depreciation and maintenance of bus stops	€ 10.000	€ 10.000
Telematics	€ 500	€ 500
Backend informatics	€ 500	€ 500
Planning and organization	€ 9.711	€ 9.711
Dispatching	€ 19.421	€ 19.421
Uniform of the driver	€ 500	€ 500
	€ 165.667	**€ 161.063**

In this pilot we made use of diesel busses. In the case of electric busses, a higher cost for the depreciation of the vehicle (but also a higher residual value), the depreciation of charging infrastructure for electric vehicles is included. On the contrary, a number of taxes and the maintenance costs are reduced. The total reduction of costs amounts to € 4.604 EUR yearly.

The climate impact of the project has been poor, as pointed out under 4.6. The use of electric vehicles could improve that impact. This impact depends of course on the kind of electricity that is being used. If electricity comes from mixed sources, the emissions can be decreased with an extra 12 tonnes compared to the project (which already achieved a reduction of 5.6 tonnes). If only green current were to be used, the emissions could be even 2.8 tonnes lower, a decrease with 14.9 tonnes in comparison with the emissions during the project.



	Reference	Project (diesel)	Grey current	Green current
Car	11,3	-	-	-
Bel/Flexus	10,6	16,2	4,2	1,4
Sustainable mobility	0,0	-	-	-

This still is a limited reduction of CO2-emissions. Given that the price of a tonne of CO2 since 2012 varies between 3 and 9 EURO per tonne, the cost and effort to achieve this reductions is too high. If a Flexbus however becomes part of an entire new approach of people mobility, the climate impact could be much higher.

5.1.3 Reduce the service hours

Another way to reduce costs, would be to limit the times when the service is offered. Figure 24: Number of passengers per hour of the day

We note that the number of trips doubled on Saturdays. It is likely that the purpose of this trips is other than work or school.

and Figure 25 show that the Flexbus is used very little before 7 a.m. and after 18 p.m. and on Sundays. Since the wages of the drivers are one of the most important costs, it would mean a serious reduction of costs to reduce service hours. Moreover, overhead costs, cleaning, dispatching, management and maintenance would be reduced likewise.

If the service hours of the Flexbus would be reduced by two hours on Saturdays, Sundays and Holidays, this would mean a cost reduction of over 6.000 EUR a year.

5.1.4 Combining with transport for target groups

In Flanders, there are several organisations that offer transport services for the disabled and the elderly. Mostly, these services work with volunteers. Moreover, some social organisations (retirement homes, social economy…) have their own means of transportation (cars, vans), which

usually drive small distances. Therefore they are costly and it is interesting to replace these vehicles by electric ones. There lies a huge opportunity to pool forces, vehicles and investments into one service that delivers all the transport these organisations need. At the same time these vehicles can be used for multiple purposes. There are several experiences in the Netherlands where services for target groups are combined with services for the general public.

In the analysis phase of the pilot, we had a meeting with a large group of stakeholders working in care and social economy. They are very much interested to pool the capacities of several transport services, since budget cuts are making it hard for them to keep on organising their own transport services.

The main conclusion from this meeting was that there should be a common dispatching capacity. This is something that we could not deliver as a pilot. The difficulty is that you do not start from scratch. There are contracted driver, paid and volunteers, that would have to be put into a complete different organisation. It is not possible to try something like that for a few months.

The Flemish government is working on tools and on an operational entity that can this kind of dispatching services. Of course, this would have a cost of its own, but it opens up the possibility to increase efficiency of several services. If, for instance, some of the travel requests in the late hours of the day or in weekends could be delivered by volunteers, the staff costs could be reduced considerably. We have brought this to the agenda of the Regional Transport Council, and this way we try to bring this under the attention of the Flemish government.

Technology versus organization

When we started the project, many of the mobility solutions seemed to have a strong technological component. While we were carrying out the project, it appeared that most of the problems we encountered were not of a technological, but of an organizational nature.

An example in the pilot of the Flexbus was the possibility of integrating several bus services that we have explored. This could considerably reduce the number of drivers needed, of vehicles and of staff supporting, dispatching and maintaining buses. It meant that voluntary drivers would have to deliver services to regular passengers during late hours, and that professional drivers would assist handicapped people not only to get in the bus, but in some cases to get from their front door to the bus. These seem to be small adaptations to how drivers operate, but legally and from an organisational perspective, these drivers work under entirely different legislations, systems of funding, insurance, not to speak of the overhead needed to perform such an integration. It could not be done within the context of the pilot, but also in a perspective of reform on a longer term, integration of these bus services is an organisational challenge.

5.2 Additional sources of revenue

5.2.1 Revenues from publicity

Neither the Belbus nor the Flexbus have any income from publicity. Since the area where the Flexbus operates is not densely populated, and since the number of passengers is limited, the income out of publicity is not expected to constitute an important source of revenue. Moreover, overhead costs would have to be made to attract business willing to advertise, to produce, attach and replace the advertisement posters or stickers, and to manage the publicity.

5.2.2 Revenues from third beneficiaries of transport services

Income could generated from third parties such as:

- **Local commerce**. Owners of shops and market stalls, and catering industries are benefitting from the fact that customers are able to reach their commerce. We clearly see a higher number of Flex bus travellers on market days. Since the value of the goods is not very high, and since enterprises in Belgium already pay taxes to be able to benefit from infrastructure and public transport, it seems unlikely that local commerce could become a contributor to the Flex Bus.
- **Social services and medical facilities**. Facilities that rely on clients of patients coming over, are benefitting from the available transport services. It would be interesting to investigate how the booking of a medical appointment could be linked to the transport of patients or clients. If value is added to the service, it could become a source of income. This would require a further development of the Flex Bus service.
- **Cultural and sports event locations**. Similarly, the Flex Bus could be linked to local stage performances or sports events. This could open these events up to a public that would normally not attend these occasions, which supports the objectives of sports and culture. This requires the development of an additional service, often in the later hours. It should also be integrated with a campaign to get people that suffer from transport poverty to attend these events.
- **Real estate services**. Since the accessibility of real estate adds to the value of it, this could be a source of revenue. But again, since enterprises in Belgium already pay taxes to be able to benefit from infrastructure and public transport, it seems unlikely that local real estate agents and developpers could become a contributor to the Flex Bus.

5.3 Additional improvements

5.3.1 Relate to the future network of Mobipoints

A Mobipoint is a recognizable physical place in a town or a village where a diverse range of transport options is available. This already is the case with the environment of train stations, but with the arrival of new transport services, there is a need to create places where the switch between modes of transportation can be made, for instance from the shared bike to the shared car of from the private bike into a shared taxi. These modes of transport are geared to each other and are preferably supplemented with extra services (e.g. a parcel machine, public toilets, or a comfortable waiting spot). The Mobipoint is also optimally organized spatially. The purpose of the Mobipoints is to facilitate combined trips: access to and transfer between the various transport options. In July 2020 the Flemish minister of transport has declared that Mobipoints will be funded all over Flanders.

Very little research is available on the effect of Mobipoints, but it could very well be that they will stimulate a more active search for alternative mobility solutions. Furthermore, they could increase trust in public transport and in flexible solutions like the Flexbus. If the Flexbus increasingly becomes a standard part of the services offered in Mobipoints, new people will find their way towards it. The Mobipoints are thus seen as a potential catalyst for success of the future Flexbus.

5.3.2 Improved communication & marketing

As mentioned, communication and promotion efforts had a positive effect on passenger growth, increasing efficiency, and revenue. We highlighted the successful role of local municipalities promoting the Flexbus project.

We can speculate this was partly since some behaviour change communication techniques are more readily available and effective for local government.

- **Trusting the messenger** - Local government satisfaction is high in the Flemish Region. Bornem and Puurs-Sint-Amands have above average satisfaction rates at municipal level, 86% and 79% respectively compared to a 76% average satisfaction rate[3] across Flanders. Whereas satisfaction in De Lijn is decreasing, standing at 62% in 2018. Local municipalities used their regular means of communication: social media, web site and the monthly magazine, being ambassadors to the project. It's likely this was a stronger signal of trust in comparison to regular communication channels of De Lijn and hence more effective towards passenger growth.
- **Promoting a sense of self-efficacy** - Behaviour change comes about when people feel that they can accomplish and sustain it. Placing them more at the centre of the planning, implementation, and evaluation of new practices contributes to the development of a sense of collective and self-efficacy. Even if co-creation *strictu senso* with users was not possible, local governments can be considered relatively close proxies as they actively gathered reactions by users, forwarded this feedback to the pilot, which resulted in concrete changes (e.g. addition of Breendonk within the service area) and thus likely improved the sense of self-efficacy.
- **Using existing social networks** - Influencing behaviour change within existing social networks often means having insiders within these social networks— people who are trusted— buy into a proposed behaviour as well as promoting and modelling it. Such insiders may be early adopters of the proposed behaviours, community leaders, and/or positive deviants who have spontaneously practiced the desired behaviours. For example, the alderman of the Puurs-Sint-Amands municipality, actively promoting the project at several meetings with locals & existing networks of senior citizens, likely contributed significantly to passenger growth.

Experience of the Flexbus project indicate that a more active role for local municipalities in communication and promotion of on-demand public transport is a cheap way to improve cost-efficiency and deserves more attention in the planning phase.

6 CONCLUSION

The Flexbus certainly is a transport solution with a great potential for rural areas. It remains however, that the organisation of collective transport in rural areas is a costly affair. There should be good reasons for a public authority to spend money on such costly solutions. These are:

- To provide transport services that are accessible by people who have no access to private means of transportation.

[3] 2017 figures https://gemeente-en-stadsmonitor.vlaanderen.be/naar-de-cijfers

- To reduce the ecological footprint of people transport by providing greener alternatives for the private car.

We have looked into way to deliver the service in a more cost-efficient way and with an increased performance on the ecological level. This has resulted in the following figures. These figures have to be used with appropriate caution, since they are highly dependent on the geographical, political and demographic context of the Klein-Brabant area. Moreover, a number of assumptions had to be made in order to fill in knowledge gaps.

Table 5: overview of costs and ecological performance (yearly)

Type	Belbus	Flexbus	Flexbus	Flexbus
Status	Tested	Tested	Scenario	Scenario
Number of vehicles	1,5	1,5	1	1
Engine	Diesel	Diesel	Diesel	Electric
Cost per passenger	€ 20,61	€ 14,72	€ 10,29	€ 10,00
Number of passengers	10.738	16.102	16.102	16.102
Total Cost	€ 221.347	€ 237.013	€ 165.667	€ 161.063
Emissions (tonnes CO2E)	21,85	16,22	16,22	1,4 to 4,2

From Table 5 it appears, that it is more interesting, both from a cost perspective as from an ecological perspective, to invest in the greening of vehicles than to invest in a modal shift towards the Flexbus.

From the perspective of mobility poverty, the Flexbus contributes in a very positive way to a solution of the problem, especially since very affordable subscriptions are available, with formulas for the less well off. The main improvement that could be made, is to extend the service for the disabled to a service where door to door trips or door to railway station/ bus stop would be made possible.

7 EPIOLOGUE

Online booking has become standard throughout the Flemish Region and in many parts of the country, Flex busses will become operational from 2022 onwards. The Flexbus pilot not only has been adopted by the Regional Transport Board of the Mechelen region (Vervoerregio Mechelen), many other regions in Flanders will be implementing Flex busses from 2023 onwards.

De Standaard Meest recent Binnenland Coronacrisis CurieuzeNeuzen in de Tuin Buitenland Meer ▾

HASSELT

Flexbusjes moeten witte vlekken in openbaar vervoer dichtrijden

De 42 Limburgse gemeenten zijn het eens geworden over de invulling van het 'Vervoer op Maat'. Flexbusjes moeten de witte vlekken dichtrijden die door de hervorming van het openbaar vervoer ontstaan.

Timmie van Diepen
Dinsdag 2 maart 2021 om 3.25 uur

De bekende bellbus van De Lijn verdwijnt en wordt vanaf december dit jaar vervangen door flexbusjes van een privéfirma. Over de tarieven is er nog veel onduidelijkheid. © Raymond van Beygaerden

Figure 30: Announcement that Flex busses will be used in future public transport plans in the region of Limburg, De Standaard, 2 March 2020

8 VERWIJZINGEN

CROW. (2015). *Kostenkengetallen regionaal openbaar vervoer 2015.* Ede: CROW. Opgehaald van https://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjonoK0hebWAhWIaFAKHUq-A88QFggoMAA&url=http%3A%2F%2Fwww.crow.nl%2Fpublicaties%2Fkostenkengetallen-regionaal-openbaar-vervoer-2015&usg=AOvVaw1xZGvxCREIqn4Kfhru84CC

Declercq, K., & Al. (2016). *Onderzoek Verplaatsingsgedrag Vlaanderen 5.1 (2015-2016), Tabellenrapport.* Hasselt: Instituut voor Mobiliteit. Opgehaald van https://www.vlaanderen.be/mobiliteit-en-openbare-werken/onderzoek-verplaatsingsgedrag-vlaanderen-ovg/onderzoek-verplaatsingsgedrag-vlaanderen-5

Haanstra, A.-M., & Al. (2018). *Tweede Monitoring- & Evaluatierapportage Breng flex.* Arnhem/Nijmegen: Hogeschool van Arnhem en Nijmegen.

Rebel Group. (2013). *Standaardmethodiek voor MKBA van transportinfrastructuurprojecten – Kengetallenboek.* Brussel: Vlaamse Overheid, Departement Mobiliteit en Openbare Werken. Opgehaald van https://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi1mu-UhebWAhURKlAKHXhdCAoQFggoMAA&url=https%3A%2F%2Fenot.publicprocurement.be%2

Fenot-war%2FviewNoticeDocument.do%3FnoticeFileId%3D386621&usg=AOvVaw0t9JldH2x7BJfdvPw7O

Statbel. (2021, november 5). *Structuur van de bevolking*. Opgehaald van Statbel, België in cijfers: https://statbel.fgov.be/nl/themas/bevolking/structuur-van-de-bevolking#figures