



INCLUSION Project

Deliverable 5.5

Full evaluation: The test results

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Glossary

- ❖ AI – Artificial Intelligence
- ❖ AMB - Barcelona Metropolitan Area
- ❖ ATAF – Metropolitan Transport Authority of Florence
- ❖ BKK - Budapesti Közlekedési Központ (Budapest Transport Centre) the transport operator in the city of Budapest
- ❖ BMR - Barcelona Metropolitan Region
- ❖ CNP - Cairngorms National Park
- ❖ EU – European Union
- ❖ GP – General Practice (Doctor's Surgery)
- ❖ ICT - Information and Communication Technology
- ❖ INCLUSION - Towards more accessible and inclusive mobility solutions for European prioritised areas
- ❖ KPI - Key Performance Indicator
- ❖ LMS - Less Mobile Stations
- ❖ MaaS - Mobility as a Service
- ❖ NGO – Non-Governmental Organisation (non-profit organization that operates independently of any government)
- ❖ OSM - Open Street Map
- ❖ PA - Prioritised Area
- ❖ PL - Pilot Lab
- ❖ PT - Public Transport
- ❖ RSK – Rhein-Sieg-Kreis
- ❖ SMART - Specific, Measurable, Attainable, Relevant and Timely
- ❖ UNIABDN - University of Aberdeen
- ❖ VDAB – public employment service of Flanders
- ❖ VRS - Verkehrsverbund Rhein-Sieg
- ❖ VU - Vulnerable User
- ❖ WP - Work Package

0 Executive Summary

As set forth in the project proposal, the INCLUSION (Towards more accessible and iNCLUSIVE mObility solutions for European prioritised areas) project aims to “...understand, assess and evaluate the accessibility and inclusiveness of transport solutions in European prioritised areas, to identify gaps and unmet needs, propose and experiment with a range of innovative and transferable solutions, including ICT (Information and Communication Technology)-enabled elements, ensuring accessible, inclusive and equitable conditions for all and especially vulnerable user categories.” As part of this remit, a number of innovative solutions have been developed and implemented through real-life experiments in the project pilot sites (in Belgium, Germany, Hungary, Italy, Spain, and the UK) within Work Package 4. Work Package 5 has undertaken a quantitative assessment of the impacts and a qualitative process evaluation of the innovative transport solutions implemented in the INCLUSION pilot sites. Deliverables D5.1-Impact Evaluation Plan and D5.2-Process Evaluation Plan provide guidance to the pilot sites on the tasks and timings involved in the evaluation of the measures being demonstrated. Deliverable D5.4 presents the ‘Reference Scenarios’, which detail baseline situations before the INCLUSION measures have been introduced in each of the Pilot Labs. This Deliverable, D5.5, presents a description of the “during INCLUSION” phase for each of the measures that are being demonstrated in the Pilot Labs and provides results of the assessment comparing the “before INCLUSION” data with the “during/after INCLUSION” data collected by April 2020 for a set of identified key performance indicators. The impacts of the INCLUSION measures are evaluated from changes in directly observed data relating to the KPIs and supplemented by additional feedback provided by key stakeholders in the measure delivery. At each PL site, the results are interpreted in the context of the background changes, external factors and data validity considerations for each measure. This includes commentary on the influence that Covid-19 has had on the delivery and evaluation of each measure. Finally, the main findings and lessons learnt are presented, highlighting what worked well and what challenges were encountered that needed to be overcome.

The deliverable structure presents a separate Section for each pilot lab, providing an overview of the ‘during’ phase for each of the measures being demonstrated. For each of these measures, following the tabular structure introduced in D5.1 and reported for the baseline in D5.4, the specific objectives and associated key performance indicators (KPIs) are defined and both the ‘before’ and ‘after’ data for a set of KPIs is presented. The data collection sources, methods and timings are also included in the results tables. The observed impact of the measures, based on change in KPI values between ‘before’ and ‘after’ data collection periods, is discussed with consideration given to the scale of the measure implemented and the validity of the data (e.g. sample size, relevance of data to target group, issues with data collection / completeness). This includes highlighting issues relating to timings of demonstration periods and the impact of this on the observed impacts. Finally, the main findings and lessons learnt are summarised in the conclusions section and initial cross-site assessment is provided. This is explored further in *D5.6 Evaluation of findings and transferability potential at European level*.

1 Introduction to the INCLUSION evaluation

This section is a 1:1 copy from the corresponding document D5.4, Full Evaluation – the reference scenarios. Both documents should be comprehensible as stand-alone documents and therefore contain the same brief introduction to the INCLUSION project.

The main objectives of the INCLUSION project are to understand, assess and evaluate the accessibility and inclusiveness of transport solutions in European prioritised areas¹, to identify gaps and unmet needs, propose and pilot a range of innovative and transferable solutions (including ICT-enabled elements), and to ensure accessible, inclusive and equitable conditions for all and especially vulnerable user categories. The project addresses these objectives through a series of Work Packages (WP) as illustrated in Figure 1-1 WP interrelations. WP1 involves investigating the current conditions across a representative set of European prioritised areas and understanding the relevant needs of various vulnerable user and social groups, while WP2 assessed how novel transport solutions involving social innovation and ICT tools can help raise the level of accessibility, inclusiveness and equity of mobility in the reference areas and for the targeted users. WP3 has developed a large set of case studies involving different forms of geographical areas and transport contexts, demographic categories, population groups and mobility solutions. The case studies provide concrete experiences from various European sites and pilot initiatives involving both public and private transport providers and a variety of regulatory and business frameworks, as well as supporting technologies, organisational and operational conditions.

Complementary to this research, within WP4 a number of innovative solutions have been developed and implemented through real-life measures/interventions in the project's Pilot Labs (PLs). The target PL areas, in Belgium, Germany, Hungary, Italy, Spain, and the UK, provided direct access to a variety of different transport environments, socio-economic contexts, and cultural and geographical conditions. WP5 has undertaken a quantitative assessment of the impacts and a qualitative process evaluation of the innovative transport solutions implemented in the INCLUSION pilot sites. WP6 will frame the lessons learnt and derive transferable solutions as regards technological, social and organisational innovation and their combination into effective, efficient and affordable mobility solutions with viable socio-business models (i.e. models not only economically, but also socially, acceptable and sustainable).

The research and achievements obtained through case studies' investigation and innovation experiments is significantly enhanced and validated via external collaborations established in

¹ In the context of INCLUSION, prioritised areas are defined as those transport environments (area types) with gaps in transport infrastructure and/or service provision that significantly impact upon transport accessibility, inclusivity and equity, and where the challenges in serving target user groups and their mobility needs and requirements are greatest (this includes rural and remote and deprived urban areas).

WP7 through a Stakeholders' Forum, set up at the onset of project activities and comprising transport operators, local authorities, users' associations, and advocacy groups, from different EU member states. WP7 aims also to raise awareness and promote and disseminate the project results for the take-up of accessible transport solutions across Europe and beyond.

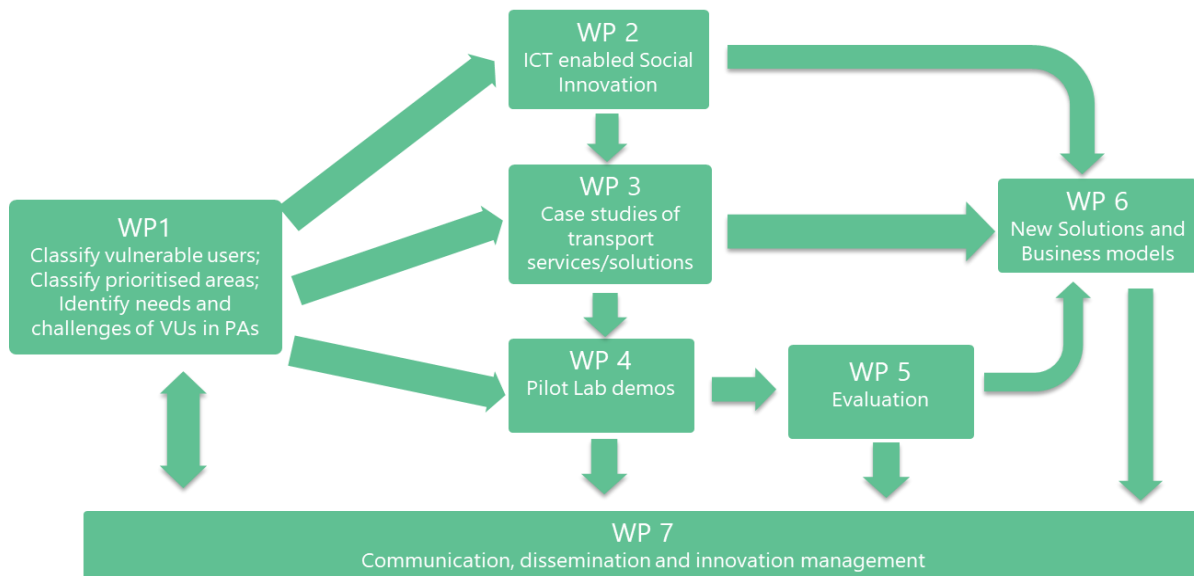


Figure 1-1 WP interrelations

WP5 defines a common evaluation methodology to assess the results and achievements of the INCLUSION Pilot Lab demonstrations (WP4), co-ordinates the collection of data and information on the measures in the different PLs, and performs a quantitative assessment of the impacts of the different innovations implemented in the PLs and a qualitative evaluation of the processes related to their implementation.

More specifically, WP5 is aimed at:

- Co-ordinating a common procedure based on existing best practice to collect and manage data across the PLs, analyse the data and achieve unambiguous and comparable results.
- Providing an independent assessment of such outcomes both at a local level and across the different PLs.
- Assessing the transferability at the European level of the innovations tested and validated in the PLs.

The Evaluation procedure adopted in the project is two-pronged, since it includes the assessment of both results and outcomes (*Impact Evaluation*) and that of the process of planning and implementation (*Process Evaluation*) of the measures within the PLs. The integrated interpretation of results from both assessments will provide the necessary understanding of the effectiveness of the INCLUSION measures.

Impact Evaluation

The aim of impact evaluation is to provide a clear, methodical approach for quantifying (through quantitative and qualitative analytical methods) the direct and indirect impacts of individual measures (introduced in the PL areas in WP4). For this to be possible, it is critical that measurable impact objectives be clearly defined. Figure 1-2 describes an approach to impact evaluation that can be applied for each measure. The full and detailed approach to the impact evaluation is presented in D5.1 *Impact Evaluation Plan*.

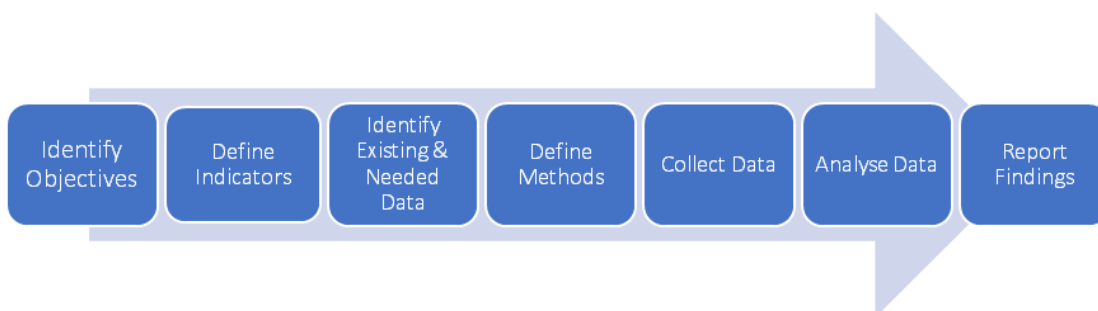


Figure 1-2 Approach to Impact Evaluation

Process Evaluation

Process evaluation involves the evaluation of the processes of preparation, implementation and operation of measures, including the roles of information, communication and participation. It aims to understand the mechanisms, barriers, drivers, actors and context conditions surrounding the design and implementation of each intervention and their influence on the measured impact. It also establishes if there are factors external to INCLUSION, that have had an influence on the measured impacts, or if there are any unexpected consequences/impacts generated by the INCLUSION interventions. This process requires continuous engagement and consultation with key stakeholders at both pilot site level and measure/intervention level. The D5.2 'Process Evaluation Plan' provides guidance on establishing the key stakeholders, along with advice on the timings and engagement methods (e.g. online surveys, semi-structured interviews, interactive drawing exercises, focus groups) to elicit the necessary process evaluation information. Findings from the process evaluation activity will be key to identifying the potential transferability of measures beyond a specific PL where a particular measure is implemented, as well as providing insight for further policy initiatives.

The main partners involved in the evaluation activities are illustrated in Figure 1-3. University of Aberdeen (UNIABDN) lead the Work Package and are also the leaders of the impact evaluation tasks. RUPPRECHT oversee the process evaluation. Each of the six PLs has a designated local evaluation coordinator, as identified in Figure 1-3, who was responsible for local data collection, survey design and delivery, stakeholder engagement, interviews and hosting focus groups. The local coordinators were assisted in designing and developing survey and interview materials to

support these activities by the following support partners: UNIABDN provided support to HITRANS in the Cairngorm PL; BUSUP supported MOSAIC in the Barcelona PL; MEMEX supported BUSIT in the Florence PL; RUPPRECHT supported VRS in the Rhein-Sieg PL. Two sites, Flanders and Budapest, do not have a designated support partner but received support where needed from UNIABDN and RUPPRECHT.

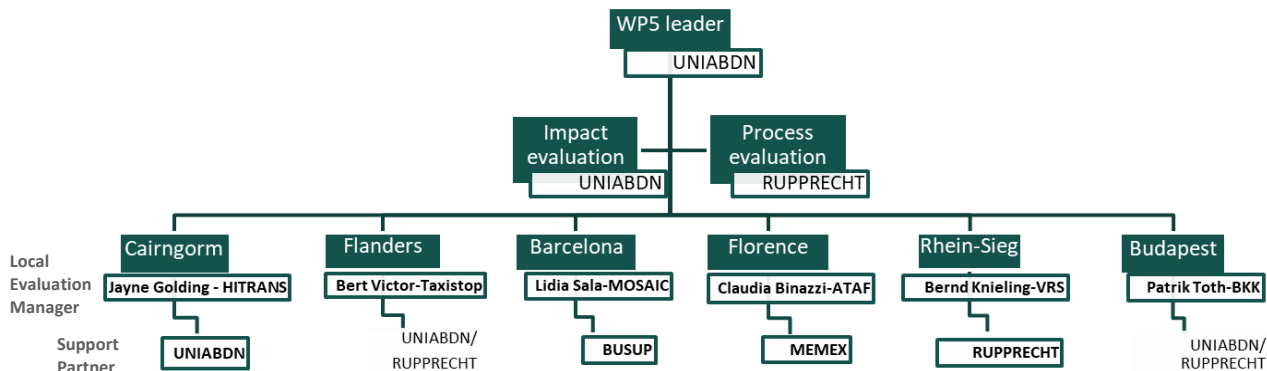


Figure 1-3 Roles of project partners in the evaluation

Figure 1-4 illustrates the originally planned timings for the main evaluation activities and the reporting requirements (Deliverables) related to these. As shown, the impact evaluation plan (D5.1) was completed in November 2018. D5.1 provides the guidance which Pilot Lab evaluation coordinators have followed in identifying and collecting the data necessary to conduct the impact evaluation for each of the measures being demonstrated.

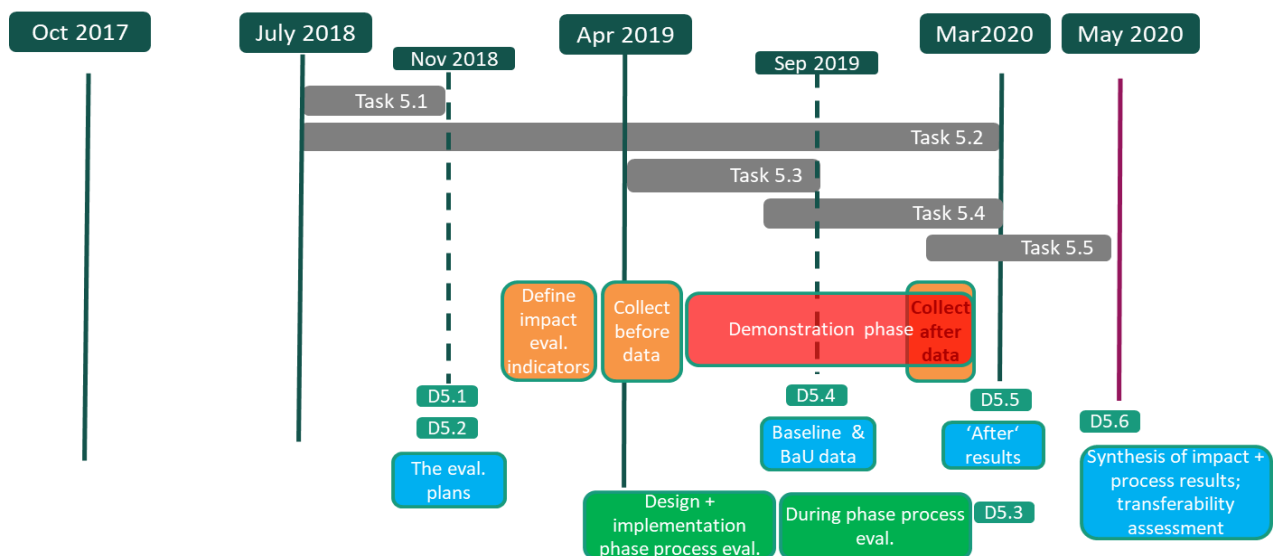


Figure 1-4 Originally planned timings of main activities in the evaluation

The results of the impact evaluation in combination with the process evaluation allow for important factors of success/failure to be identified within the context of the conditions in which the measures have been implemented. Cross-case analysis will also be conducted in Task 5.5 to find similarities and differences among the PL measures taking account of the widely

differing implementation environments and target user groups. This is crucial for identifying transferability recommendations, which will be reported on in D5.6 'Evaluation of findings and transferability potential at European level'. This deliverable will present a synthesis of both the impact and process evaluation results, highlighting key findings and good practices and assessing transferability potential of the measures.

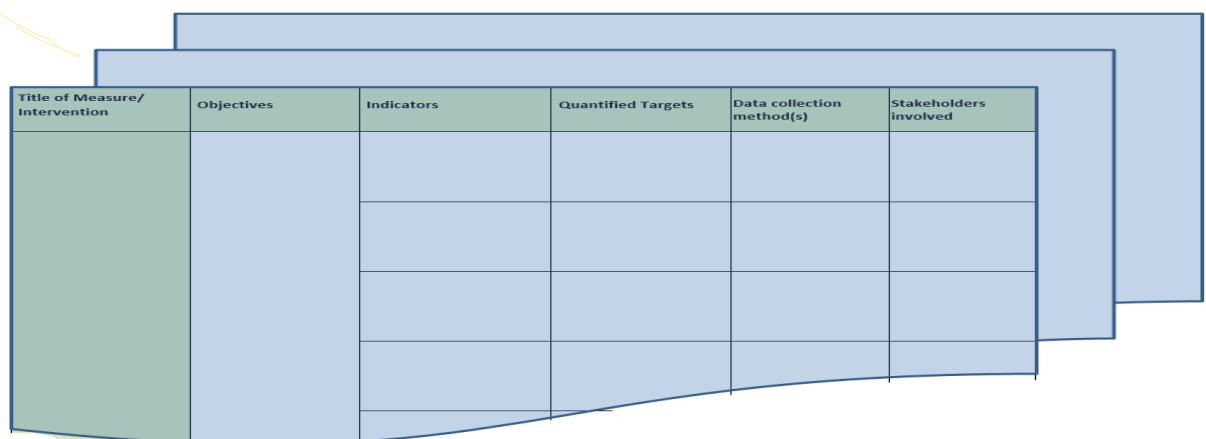
2 Methodology for identifying and collecting the impact evaluation data

2.1 KPI identification

The Impact Evaluation Plan (D5.1) defines the impact evaluation framework for PL partners to follow in order to collect the data necessary to conduct a meaningful evaluation of each measure/intervention being demonstrated. This framework helps PL partners to clearly define the objectives for each measure and to identify suitable corresponding indicators that allow measurement of the outputs and evaluation of the outcomes.

The framework consists of a set of tables for each measure/intervention that is to be introduced. A separate table is required for each measure/intervention. Illustration of the table template is provided in Figure 2-1. More detailed information regarding the methodology, definitions and guidance for completing these tables is provided in Section 5.2 of D5.1-Impact Evaluation Plan. The basic framework consists, for each measure, of:

- 1) the objective(s) associated with its introduction
- 2) related key performance indicators (KPIs) associated with outcomes and outputs
- 3) the target values related to each outcome or output performance indicator
- 4) the intended method of data collection
- 5) the stakeholders involved in the data collection/provision



Title of Measure/ Intervention	Objectives	Indicators	Quantified Targets	Data collection method(s)	Stakeholders involved

Figure 2-1 Illustration of the impact evaluation framework table template

In January 2019 (M16) all PL sites were provided with a set of empty impact evaluation framework tables (one table to be completed for each objective associated with each

measure/intervention) and detailed guidance on how to define measure objectives and identify suitable outcome and output KPIs (following the SMART guidance included in D5.1). An initial set of measure-specific impact evaluation tables were completed by the end of March 2019 (M18) following several iterations of feedback from UNIABDN and improvement by PL evaluation coordinators. It was necessary that these initial tables defining objectives, indicators, targets and data collection methods were kept under review as the pilot sites obtained a more concrete picture of exactly which measures were introduced in the demonstration phase of the project. Final versions of the impact evaluation tables were produced by May 2019 (M20) for all measures.

Note that although the KPIs specifically relate to each measure objective, there are a number of key indicators which broadly apply across measures at each Pilot Lab and which address the common INCLUSION project objective to: "Ensure *accessible, inclusive and equitable conditions for all and especially vulnerable user categories*". These common indicators relate to:

- Change in no. of uses / trips by target groups
- Change in no. of users from target groups
- Increase in access to services and activities (e.g. PT network / Social and Leisure activities / Work locations)
- Change in satisfaction with access to services and activities (e.g. PT network / Social and Leisure activities / Work locations)
- Change in satisfaction with services and/or information on services

These common indicators also answer the quantitative targets at the project level, as defined in Section 2 of the Description of Action, which relate to the impact evaluation. These targets associated with improved accessibility offered by public transport systems, are:

- 25% increase in number of trips involving transport connections to the PT network by target users at pilot lab sites (for measures where connected journeys are a desired outcome by users)
- Increase type of transport services available to the public at pilot site
- 40% increase in satisfaction with access to key services / opportunities for vulnerable users (at pilot site)
- 25% increase in number of trips made using PT (conventional or alternative PT) services by vulnerable users

The impacts from the measures described in the following Pilot Lab sections are evaluated against these project targets in Section 9: Conclusions.

2.2 Data collection: Activities and deviations from the plan

Having identified the set of KPIs for each measure, the next step was for the PL evaluation coordinators to identify the 'before' data required, how the data can be obtained, and timings

for data collection. It should be noted that not all KPIs require collection of 'before' data. For instance, if the measure being introduced is a completely new service, then there can be no 'before' data collection with users of the service. There was, however, the need for both before and after data collection relating to outcome indicators with the wider target group (i.e. non-service users). Furthermore, for both new services and enhancements to existing services, KPIs relating to output indicators are often only appropriate at the 'after' stage. The general guidance on the timings and types of data required was as follows:

- If measure is an enhancement / modification to an existing service
 - Before + After surveys (users of existing services)
 - Before + After surveys with wider target group (non-service users)
 - Before + After surveys with other actors (employees, e.g. BKK; volunteer drivers, e.g. MobiTwin; service providers, e.g. BusUp).
 - Before and After direct data on usage from IT platforms/Apps/tickets/tracking
 - Before and After data reported to IT platforms/Apps through user feedback
- If measure is a completely new service
 - After surveys (users of new services – including retrospective questions on how user made trip before new service)
 - After surveys with other actors (e.g. Bike shop owners in CNP)
 - After direct data on usage from IT platforms/Apps/tickets
 - After data reported to IT platforms/Apps through user feedback
 - Before + After surveys with wider target group (non-service users)

In April/May 2019 all PL evaluation coordinators were tasked with reviewing their KPIs for each measure and identifying which KPIs required collection of 'before' data. Following this, they reported on the data collection status for these 'before' data KPIs, identifying where indicator data was already collected and suitable/sufficient. Where 'before' data was not yet collected, PLs were required to indicate how this missing data would be collected, the actors involved, the design of data collection surveys and the timings for completion of surveys / other data collection methods. The final 'before' data collection surveys were completed by mid-July 2019. This corresponded to the original plan illustrated in Figure 1-4.

The demonstration phase for all the measures was originally scheduled to occur between July 2019 and February 2020. While some measures were delivered according to this schedule, delays were experienced in implementing several of the measures, for various reasons. These included political disruption, organisational disruption, priorities of local actors and issues in securing funding. These reasons for, and extent of, these delays for specific measures are described in the following Sections related to each PL and explored in more detail in D5.3 *Process Evaluation Results*.

According to the plan (Figure 1-4), the impact evaluation 'after' surveys were due to be conducted during February 2020 and reported on in this Deliverable (D5.5), '*Full Evaluation, the test results*' due Month 30 (March 2020). Because of the delays in implementing several measures, the 'after' data collection for these measures was delayed until March/April 2020 to ensure the delayed measures had a sufficient demonstration phase to attract users and influence changes in behaviours. For these measures, further delays and challenges were experienced in collection of 'after data' due to the impacts of the Covid-19 lockdowns across Europe from early March 2020. The specific effects of Covid-19 on the use of measures and the challenges in collecting 'after' data during the period of lockdown are described on a case by case basis in the following PL-specific sections.

Overall, the effect has been that the complete set of all 'after' data was delayed to the end of May 2020 (June 2020 for Florence), with the analysis and reporting completed by the end of July 2020. This corresponds to a four-month delay to the original planned timings illustrated in Figure 1-4.

The next 6 Sections present the impact evaluation results based on analysis of the data for each KPI collected 'before' and 'after' the demonstration phase. Where the demonstrations attracted insufficient users for a quantitative KPI based evaluation, a more qualitative assessment is undertaken based on more in-depth feedback from the limited users and other stakeholders involved, to explore reasons for low uptake and potential of the measure going forward.

Each Pilot Lab has a dedicated Section structured as follows:

- Short introduction to the PL area including description of the INCLUSION measures that were demonstrated within WP4 and subject to impact evaluation in WP5.
- Overview of timings of the demonstration phase and explanations for significant delays or changes to planned delivery.
- Assessment of the impacts against the main objectives and targets or expectations from the demonstration of the measure.
- Discussion on the impact of Covid-19 on the demonstration of the measure and opportunities related to Covid-19.
- Financial sustainability assessment.
- Main findings.

3 Rhein-Sieg region pilot lab (Germany)

Verkehrsverbund Rhein-Sieg (VRS), located in the southwest of North Rhine-Westphalia in Germany, provides its services in the region of Rhein-Sieg. The PL is in the Rhein-Sieg district, a partly rural and partly peri-urban district. It is an attractive region for families with young children because the real estate prices are lower than in Cologne or Bonn, and (most parts of) the Rhein-Sieg-Kreis (RSK) are well connected by train or car to Cologne (30km to the North-West) and Bonn (15km to the West), where many RSK residents work. In general, the population of the RSK is expected to increase around 5.7% by 2040.

The current transport available provides mid-sized cities with connections to Cologne and Bonn via regional trains. Rural areas are connected via bus lines and demand responsive bus systems (TaxiBus, AnrufSammelTaxi) to mid-sized cities. The routes of the bus-lines and demand bus systems are not specific to the needs of young families but instead are designed to reach the centre of a city. The whole area is part of the VRS, which means it offers a unique tariff system and a (more or less) harmonised timetable. The demand bus supplements or replaces scheduled PT services, particularly in the areas where passenger demand varies greatly.

The Rhein-Sieg INCLUSION PL is focussed on expanding services to families with young children and teenagers. This population segment in the region, and especially in the new housing estate, does not have sufficient access to public transport for their daily trips, especially for multipurpose trip chains (e.g. taking children to/picking up children from kindergarten, shopping for daily needs, commuting to their jobs). Consequently, most people use their own cars (for example, 87% of inhabitants older than 10 years use the car 2-7 times a week, while public transport is used by only 24% at a rate of 2-7 times a week).

The main gaps and need for improvement focus around the issue that the PT network is currently designed to meet the needs of commuters and students and is concentrated within and around the city centre (or to the main train station) in a more or less direct way. Therefore, the PT options for multi-purpose trips often taken by families with young children in the (peri) rural area are currently very limited. The main goal is to respond to the needs of families with young children and teenagers in one selected new housing estate (Hennef Im Siegbogen) by improving the integration of different means of mobility with public transport and extending the concepts for the implementation of similar measures in other regions of the Verkehrsverbund Rhein-Sieg. The Pilot Lab area of Hennef Im Siegbogen is shown in Figure 3-1.

Deliverable 4.2 *Innovation Pilot Lab Rhein Sieg - implementation and results – final version* describes in detail the measures that have been demonstrated, their designs and the measure implementation process. It also provides more detailed description of the characteristics of the Rhein-Sieg PL.

Following in-depth surveys with almost half of the households in the PL area, a number of measures for better meeting the needs of the target groups were identified, grouped into the areas of public transport and cycling. For public transport, the main focus was on improving bus service frequency and providing cheaper fares for short non-regular trips (i.e. targeting local trips and infrequent connections to rail services rather than daily commuter trips). For cycling, more and safer cycle paths and cycle facilities were identified as desired improvements.

Table 3-1 summarises the INCLUSION measures demonstrated and included in the impact evaluation for the Rhein-Sieg PL.

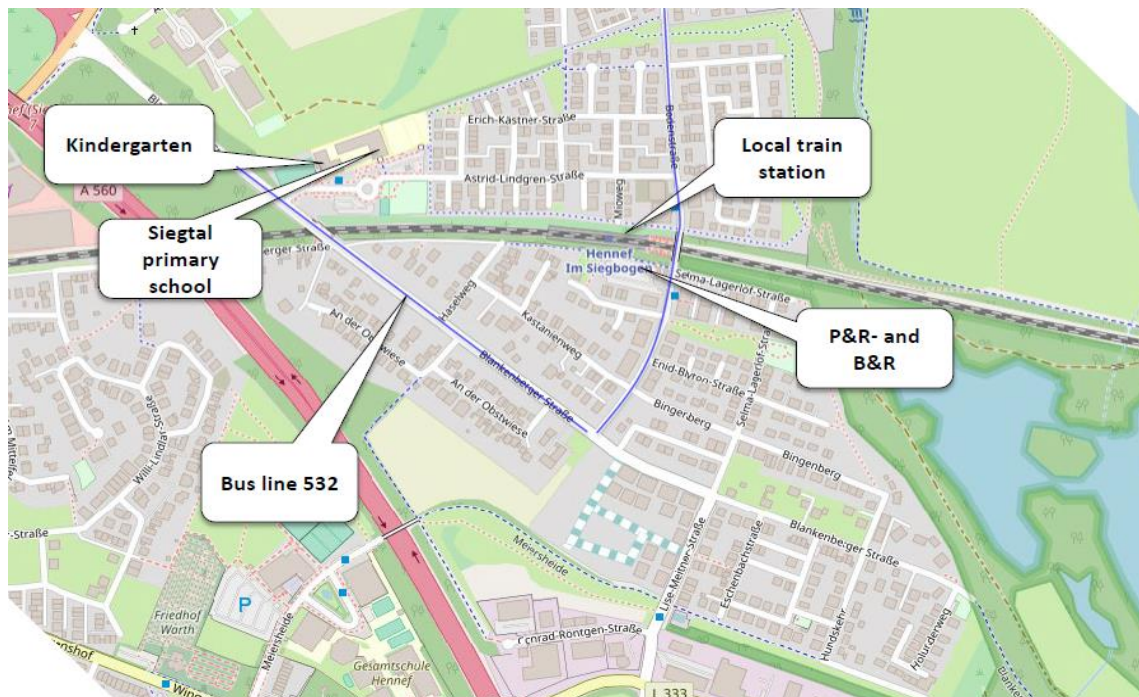


Figure 3-1 Map of Hennef Siegbogen pilot area

Source: VRS GmbH

Table 3-1 Overview of INCLUSION measures being demonstrated in Rhein-Sieg PL

Measure name	Description
Bus line 532 – Increased service provision in Hennef Im Siegbogen	<p>Bus Line 532 provides the backbone of public transport in the new Hennef Im Siegbogen development area as well as providing connections to the main rail services to Bonn and Cologne.</p> <p>Through INCLUSION, Bus line 532 will operate at double the current frequency (every 30 mins instead of every hour) and will extend the operating hours of the service during the afternoon and early evening, particularly important for school traffic, but also for leisure traffic such as trips to sports and club activities, visits to friends or relatives and the use of all kinds of leisure facilities such as cinemas, swimming pools, etc.</p>

Short-haul fare	A new lower fare has been introduced for short trips on the local bus line 532. This amounts to a 20% reduction in the previous fare for these trips and is applicable for most local journeys to school and for leisure purposes, complementing the increased service provision on line 532 to cater for these trips.
Forgotten paths	This measure involves the creation of new, better and safer cycle paths by identifying desired cross-connections and implementing designated cycle paths where this can be easily achieved. This includes shortened connections between, for example, schools, leisure facilities and public transport stops. The routes are included in the "Mobil-in-Hennef" map and marked and communicated in the new Hennef Im Siegbogen development area. Secondary schools as well as the tourist office of the city of Hennef have been informed comprehensively and precisely about the results and the "newly discovered routes".
E-Bike rental	E-bikes lent to people within the target groups on a weekly basis, for example, in order to enable their use to be integrated into everyday life.

3.1 Bus line 532 service improvements (increased frequency and reduced single fare)

3.1.1 Overview of implementation

The bus line 532 is the only public bus service operating in the Hennef Siegbogen pilot area. It connects the Hennef Im Siegbogen area to Hennef train station. During rush hours the buses run every half hour, otherwise every hour. The primary school Siegtal is always served on the route. Furthermore, there is a bus to the comprehensive school Meiersheide and a bus to the school centre Hennef Fritz-Jacobi-Straße. Especially during the late afternoon, between 4 and 7 p.m. on weekdays, the buses of line 532 operated only at hourly intervals. As a result, the waiting times for independent travel to sports training or other leisure activities were often very long. Parents who wanted to avoid having to wait long in public places for their children to start the respective activity were increasingly either bringing their children themselves by car or the children could not participate. In order to counteract this, the bus service was doubled during this period, i.e. the hourly frequency was changed to a half-hourly frequency.

Although there are many discount tickets available for weekly, monthly or annual travel by public transport, single journey bus fares were considered to be too expensive by many residents. In order to take this psychologically important ticket as a starting point and at the same time create a financial incentive for previous non-drivers or occasional drivers in public transport, the second measure was to reduce bus fares for single journeys using line 532.

The increased service provision for Bus Line 532 was introduced 28th August 2019 and operated with increased frequency and extended hours until Covid-19 lockdown had the effect of reducing all public transport service provision in mid-March 2020.

The implementation of the reduced bus fare on Line 532 was delayed until the middle of September 2019 due to conflicting operational priorities of the local bus operator. This has remained in place and will continue beyond the end of the INCLUSION project.

3.1.2 Impact evaluation

Increased service frequency

This section presents the impact evaluation for the improvements to line 532, the bus service that operates in a loop around the Hennef Siegbogen pilot lab area.

The main data collection tool was a 'before' and 'after' detailed questionnaire sent to all households in the Hennef Im Siegbogen development area. The survey was designed with close cooperation between VRS, Rupprecht Consult, the City of Hennef, and the municipality of Rhein-Sieg-Kreis and was designed by the market research department of VRS. The questionnaire was filled in by the person who has a general view of the household organisation and, where appropriate, is most concerned with the travel choices and regular routes of the children living in the household.

- The 'before' survey was distributed to 567 households in November 2018 and received a total of 247 household responses, which corresponds to a response rate of around 44%. The 'before' questionnaire contained questions on the current general and situation-specific mobility behaviour of all household members, in particular children in the household. It was also possible to provide open answers. The wishes and/or the largest problems associated with current mobility were also sought, separated by transport mode.
- The 'after' survey was designed to be consistent with the 'before' survey so that quantified changes in behaviour, mode choice frequency of use etc could be established, while adding additional questions to elicit an understanding of the reasons behind the observed changes. The after survey was distributed to 646 households at the beginning of March 2020 and had received 192 responses by the end of April 2020 - a response rate of 30%. It is thought that the Covid-19 pandemic has had an influence on the response rate for the 'after' survey; however, the number of responses is sufficient to adequately evaluate the impact of the measures introduced.

Comparing the 'before' and 'after' survey respondents there were no significant structural differences in sample composition. Almost two thirds of respondents lived in households with children. The average age of respondents was 43 years and just over 50% of respondents were female (slightly higher than for the before survey) and car ownership was marginally higher in the after survey.

For the first measure the main objective was to improve access to public transport in Hennef Im Siegbogen for families with children and for the children's own mobility. This was addressed

by increasing the bus service frequency on line 532 between 4pm and 7pm from 1 service per hour to 2 services per hour.

Table 3-2 presents the main impacts, derived from the before and after surveys with residents.

Table 3-2 Main impacts from increased frequency of bus line 532

Indicator	Target	Before	After	Impact
Change in no of trips by bus in Hennef by parents accompanying children	5-10% increase	1% (of trips to primary school)	5% (of trips to primary school)	+4% change in % of accompanied trips to primary school • 400% increase in number of trips
Proportion of children accompanied by parents using bus at least once a week for regular trips.	5-10% increase	19%	22% (33% for those that stated they used the measure)	+3% change in % of accompanied regular trips • 16% increase in proportion of accompanied regular trips
Proportion of unaccompanied children using bus at least once a week	5-10% increase	10%	14% (30% for those that stated they used the measure)	+4% change in % of unaccompanied children using bus at least once a week • 40% increase in proportion of unaccompanied children using bus at least once a week
Satisfaction with new mobility strategy in Hennef Im Siegbogen	5-10% increase of people who are very satisfied or satisfied by mobility offers in Hennef Im Siegbogen	15% very satisfied, 50% satisfied	18% very satisfied, and 52% satisfied (33% very satisfied and 57% satisfied for those that stated they used the measure)	5% increase in satisfaction for general mobility offer (25% increase in satisfaction for general mobility offer amongst those who used the increased bus frequency measure)

The after-survey results suggest that the number of trips using bus by parents accompanying children has increased for primary school, for visiting friends, shopping and cinema, but has reduced for trips to secondary school. 5% of parents now accompany their children to primary school using the bus compared to 1% in the before survey. Walking has also seen a significant increase. The proportion accompanying their children by car to primary school has decreased from 35% to 21%.

The proportion of accompanied children using the bus at least once a week has increased from 19% to 22% for all respondents. If we consider only those who stated they used the increased frequency measure, the proportion of accompanied children using the bus at least once a week

increases to 33%. This suggests the measure is a significant contributory factor in the increase in accompanied children using the bus at least once a week.

The proportion of unaccompanied children using the bus at least once a week has increased from 10% to 14%. If we consider only those who stated they used the increased frequency measure, the proportion of unaccompanied children using the bus at least once a week increases to 30%. Again, this suggests the measure is a significant contributory factor in the increase in unaccompanied children using the bus at least once a week.

Looking at trips more generally, the biggest increases in bus use have been for leisure trips and trips to the doctor, followed by shopping trips. No change is seen for commuting trips. This suggests that the changes to bus service (more frequent service in middle of the day and reduced single fares) have helped infrequent trip purposes such as those above but have had no effect on commuting trips. This would be expected, as morning commuting trips occur outside the times when the more frequent service was introduced and do not benefit from the reduced single fare as season tickets would be used.

Regarding the change in trips from car to public transport, the survey results showed a change in daily car use from 69% of respondents at the before survey to 62% of respondents in the after survey. The proportion of daily bus trips showed a small drop from 22% in the before survey to 21% in the after surveys. There has been a small reduction in daily cycle trips as well. This suggests that while there have been fewer daily car trips, it is possibly a result of fewer respondents making daily trips due to Covid-19 restrictions taking hold at the time of the after survey. All answers relating to daily trips at the after-survey stage must take account of the fact that the Covid-19 lockdown will have affected respondents' daily travel activity at the time the survey was completed. As a result, the data relating to daily trips in the after survey is not thought to be a reliable representation of normal travel behaviour.

The general satisfaction with the mobility strategy in Hennef Im Siegbogen has increased with those very satisfied increasing from 15% to 18% of respondents and those satisfied increasing from 50% to 52%. If we consider only respondents who stated they used the increased frequency bus, 33% are very satisfied and 57% satisfied with the new mobility strategy in Hennef.

Asking all respondents to grade the increased frequency bus service, 45% of survey respondents thought the measure was very good and 40% rated it good. This shows that the measure is viewed as positive even amongst residents who have not yet used the bus.

Awareness of the measure was 23% of respondents and 16% of respondents claimed to have used the new service either on a regular basis (5%) or now and again (11%).

Reduced Single Bus Fares

The second measure, reducing single bus fares by 20% on line 532, had the objective to improve access to public transport in Hennef Im Siegbogen for non-PT- or rare-PT-users. Table 3-3 presents the main impacts, derived from the before and after surveys with residents.

Table 3-3 Main impacts from reduced single bus fare on bus line 532

Indicator	Target	Before	After	
Change in no of trips by bus in Hennef by non-PT-users	5% decrease in non- bus users	16% of the participants of the survey answered that they never use PT	11% of the participants said they never use PT	5% decrease
Change in no of trips by bus by rare-PT-users	5% increase in infrequent bus users	8% of the participants of the survey answered that they use PT several times a month	16% of the participants of the survey answered that they use PT several times a month	8% increase
Satisfaction with new mobility strategy in Hennef Im Siegbogen	5-10% increase of people who are very satisfied or satisfied by mobility offers in Hennef Im Siegbogen	15% very satisfied, 50% satisfied	18% very satisfied, and 52% satisfied 21% very satisfied and 67% satisfied for those that stated they used the lower bus fare	5% increase in satisfaction for general mobility offer 23% increase in satisfaction for general mobility offer amongst those who used the reduced bus fare measure

It is difficult to attribute changes in use of the bus service solely to one measure (increased frequency) or the other (reduced fare). To some extent they both support each other, especially for infrequent bus users. As the reduction in bus fare only applies to single journey fares it does not provide any benefit for season ticket holders who are regular bus users. While acknowledging other factors may have also contributed, such as the increased frequency of service between 4-7pm, the change in numbers of non-PT users and change in numbers infrequent PT users, provide a good indication of the impact of the reduced bus fare measure. Table 3-3 shows notable changes in proportion of non-bus users between the before and after surveys (reducing from 16% to 11%) and in the change in infrequent bus users increasing from 8% to 16%. In the after survey, for those stating they use the bus several times a month 80% state they use the bus more often than 6 months previously while 20% stated they use the bus less often, so it is safe to claim that the changes implemented have been positive for non-PT users and for rare PT users.

Awareness of the measure was 16% of respondents and 13% of respondents claimed to have utilised the lower fare either on a regular basis (3%) or now and again (10%). The low awareness may be linked to the short duration of 4½ months in which this measure was active prior to

Covid-19 lockdown. With a longer demonstration period the awareness level is likely to increase. Whether this would translate into more bus use is not certain.

The general satisfaction with the mobility strategy in Hennef Im Siegbogen amongst respondents who stated they used the reduced single fare was 21% very satisfied and 67% satisfied.

Asking all respondents to grade the reduced single fare measure, 52% of survey respondents thought the measure was very good and 24% rated it good. This shows that the measure is viewed as positive even amongst residents who have not yet benefited from it.

3.1.3 Discussion on validity of the results

The measures relating to changes to bus timings and fares were due to be introduced at the end of the summer holiday (28 August 2019), however the reduced fare measure was not implemented until the middle of September 2019. This meant the measure had a shorter time to take effect before the 'after' data was collected in March/April 2020. In total there were 5.5 months where the demonstration of the reduced fare measure was active before the Covid-19 pandemic resulted in the temporary withdrawal of the bus service. The awareness of the measure was 16% of respondents and 13% of respondents claimed to have utilised the lower fare either on a regular basis (3%) or now and again (10%). The low awareness may be linked to this short duration of 5½ months in which this measure was active prior to Covid-19 lockdown. With a longer demonstration period the awareness level is likely to increase. Whether this would translate into more bus use is not certain.

As mentioned above the 'after' data collection survey was conducted in March and April 2020. From mid-March the Rhein-Sieg region was under lockdown due to Covid-19 and so mobility was severely restricted. Moreover, the actual lockdown was preceded by a phase of uncertainty lasting several weeks, during which the spread of the coronavirus had already unsettled the inhabitants, if not prevented them from carrying out certain activities. Answering a survey at this time may have led to unreliable data in the responses. Most survey questions were not thought to be impacted; however, some data from the after surveys was considered to be unreliable and has not been reported in the results. This is particularly a problem for questions asking about travel being 'used on a daily basis', since daily travel at the time of the survey would not reflect normal circumstances. Clearly undertaking a survey on normal travel behaviour at a time of major disruption is not sensible. Changing the wording of certain questions would have mitigated most of the issues with the data; however, the survey was distributed before Covid-19 took effect and so the questions were not adapted in any way.

3.1.4 Impact of Covid-19 and opportunities related to Covid-19

Covid-19 led to the temporary withdrawal of the bus line 532 in mid-March 2020. While this curtailed the demonstration duration by only a week or two, the more significant issues related

to the ability to collect data and the quality of the data collected (as described in Section 3.1.3) due to changes in travel behaviours for the weeks prior to lockdown.

The Covid-19 pandemic may have influenced the results in two ways:

- 1) It is possible that during this phase fewer people found the time and leisure to (re)participate in the survey, i.e. the number of completed questionnaires is lower due to the pandemic.
- 2) Furthermore, the pandemic may also have influenced the survey in terms of content, for example by obscuring the perception of the measures through the ubiquitous public discussion and reporting on the Covid-19 pandemic, or because the use of public transport was quickly considered as a possible place for transmission of the virus.

On relaxation from Covid-19 it is very likely that use of bus services will be perceived to be higher risk and will be avoided where possible. As the measures introduced were aimed at encouraging more bus use by infrequent bus users, for mainly non-essential trip purposes, it is probable that these trips will be avoided or undertaken using a different mode.

Nevertheless, the more frequent schedule does create more bus capacity and so the bus services can be less crowded for those that still require using them.

3.1.5 Financial sustainability assessment

It has not been possible yet to assess whether the costs to the bus operator of reducing single fares by 20% can be recouped through the additional passenger demand generated. This will be explored with the bus operator once Covid-19 has eased. Nevertheless, it can already be stated that the amount of possible revenue losses due to the reduced tariff is very small and is in no relation to the revenue losses caused by the pandemic. On the contrary, the current strategy of the transport companies in the VRS is not only to regain the confidence of existing passengers by offering improved services at more favourable conditions, but also to convince additional passengers to use public transport again in the long term.

A passenger count on bus route 532 was planned to be conducted in March 2020 in cooperation with the Rhein-Sieg district and Rhein-Sieg Verkehrsgesellschaft. The aim of the boarding and alighting count was to determine at each stop how many passengers board and alight and to compare this with older counts. The aim was to determine whether more passengers have been using bus route 532 since the introduction of the measures. This would also have determined the extent to which the newly introduced journeys on the 532 line were used in the afternoon when the increased service frequency was introduced. However, the Covid-19 lockdown resulted in the cancellation of this survey. Results from the survey would have enabled a proper financial assessment of the viability of the measure. However, by way of illustration, a 25% increase in passengers (i.e. new passengers) paying the single fare would be required to offset

the reduction in fare revenue from the reduced ticket price for existing customers (that pay single fares).

The additional costs arising from the extended travel offer on bus line 532 are covered by the responsible body, the Rhein-Sieg-Kreis, and are not limited in time. This ensures that the offer can be maintained in the future. In addition, it is in line with the new strategic orientation of the districts and transport companies in the VRS to significantly expand the public transport offer in a timely manner in order to achieve a change in mobility behaviour.

3.1.6 Main findings

- There has been a marked decrease in the percentage of respondents who said they never used PT (from 16% to 11%) and an increase in infrequent PT users (from 8% to 16%).
- There has been notable increase in regular accompanied trips by bus, especially to primary school (16% increase).
- There has been notable increase in unaccompanied children travelling by bus at least once a week (40% increase).

While it is difficult to be certain that these changes have been a result of the INCLUSION measures, the data is based on a large sample and the reported level of use of the measures gives credence that they are indeed a plausible contributor to the improvements reported.

Lessons Learnt include:

Key to the success of the measures has been establishing a comprehensive understanding of the needs of the target users prior to designing the interventions. The 'before' survey with a response rate of 44% of the population identified the shortcomings in the existing mobility offer for the target groups.

Based on VRS experience, it generally takes around 12 to 24 months to establish a new or extended offer in PT, partly depending of the scope of the communication measures. The time frame of the INCLUSION project did not allow for this length of demonstration period before evaluation and so the results may be underestimating the longer-term impact of the measures. Better promotion of the measures and a longer demonstration period would be likely to improve the awareness of the measures, which was relatively low at 23% for increased frequency and 16% for reduced single fare. The awareness-to-use ratio is high in both measures (70% and 80% respectively) suggesting the marketing may have reached those most likely to use the measure.

Both measures will continue to be implemented after the INCLUSION project ends and once Covid-19 restrictions allow. The longer-term operation will provide more robust understanding of the full potential and impacts provided by these measures.

3.2 Promoting Cycle Use (Forgotten paths and E-bike rental)

3.2.1 Overview of implementation

Surveys with residents identified a lack of information, at least among some users, about the existing offers for cycling in the urban area of Hennef, both with regard to the existence of individual routes and offers and the quality or condition of the respective offer. In order to counteract this deficit, a physical mobility map was developed in which all relevant mobility offers are bundled both cartographically and with further explanations and links. The Mobil-in-Hennef map is shown in Figure 3-2 and provides the user with all relevant information on local and regional mobility, with a focus on public transport and cycling. In addition, a radius around Hennef railway station has also been drawn in, showing which destinations can be reached by bicycle in around three to five minutes and by foot in ten minutes.

The Mobility Map including forgotten paths for cycling was completed by October 2019 and distributed to all households in the PL area along with an accompanying information leaflet in November 2019.

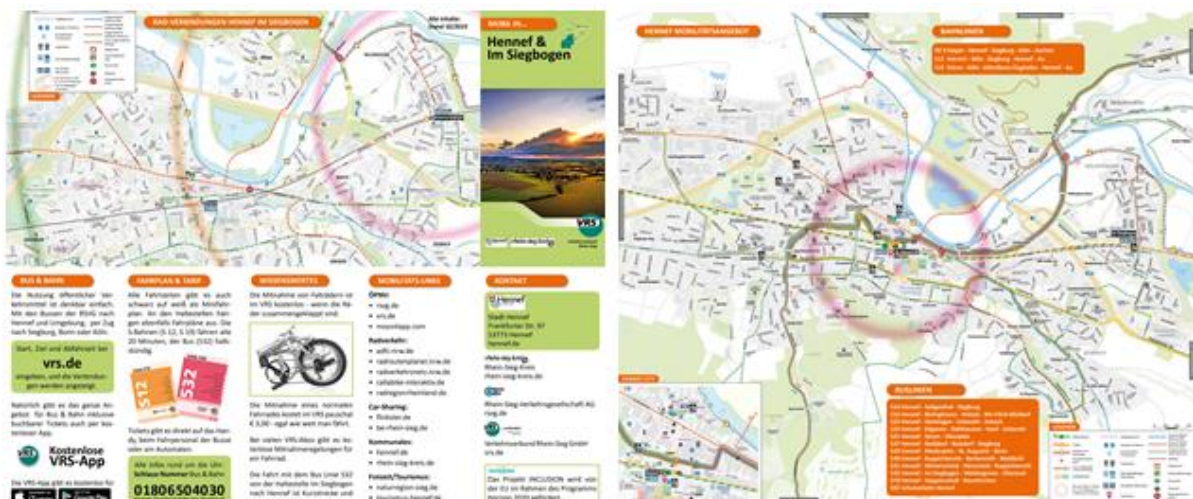


Figure 3-2 Mobil in Hennef map (front + back)

Source: VRS GmbH

For the e-bike rental, two e-bikes (pedelecs) were rented from a local bicycle wholesaler for the period from June to October 2019. These could then be reserved by telephone and in person for one or up to four weeks through a simple booking process. The costs for the users amounted to 5.00 € per week per bicycle. One ladies' and one men's bicycle were rented. The delivery and return of the e-bikes to users was carried out via the tourist information office of

the city of Hennef. All households in Hennef Im Siegbogen received a printed flyer with information promoting the e-bike hire measure.

3.2.2 Impact evaluation

The overall objective of the cycle related measures was to improve usage of bikes (and e-bikes) in Hennef Im Siegbogen.

The main data collection tool for the impact evaluation was the 'before' and 'after' detailed questionnaire sent to all households in the Hennef Im Siegbogen development area (see Section 3.1.2 for more details). In addition, more specific surveys were completed by the e-bike users when they returned the bikes. Data relating to 82 E-bike trips was collected identifying the purpose of the trips the e-bike was used for (see Figure 3-4 and the mode of transport the e-bike replaced (see Figure 3-5).

Mobility Map (including forgotten cycle paths)

Firstly, the use of bikes in general by families in Hennef Im Siegbogen is examined and the impact of the promotion of the forgotten paths network of cycle routes through publication and distribution of Mobility Maps to all households.

Figure 3-3 shows the choice of mode for different trip purposes for families when accompanying children from the before (wave 1) and after (wave 2) surveys. Multiple answers can be given as mode of transport may vary according to the day of week or time of year etc. However, they provide a reasonable proxy for modal share. To allow comparison between the before (wave 1) and after (wave 2) survey data the results need to be standardised against the total number of responses received. The mode share data in *When considering reasons given for change in mode to cycling*, a small number of respondents mentioned the good quality cycle path network. The most common reasons given were environmental reasons and for health; however ,many respondents changed mode according to the weather and season.

Table 3-4 is based on the data shown in Figure 3-3 but applying a standardised scale totalling 100%.

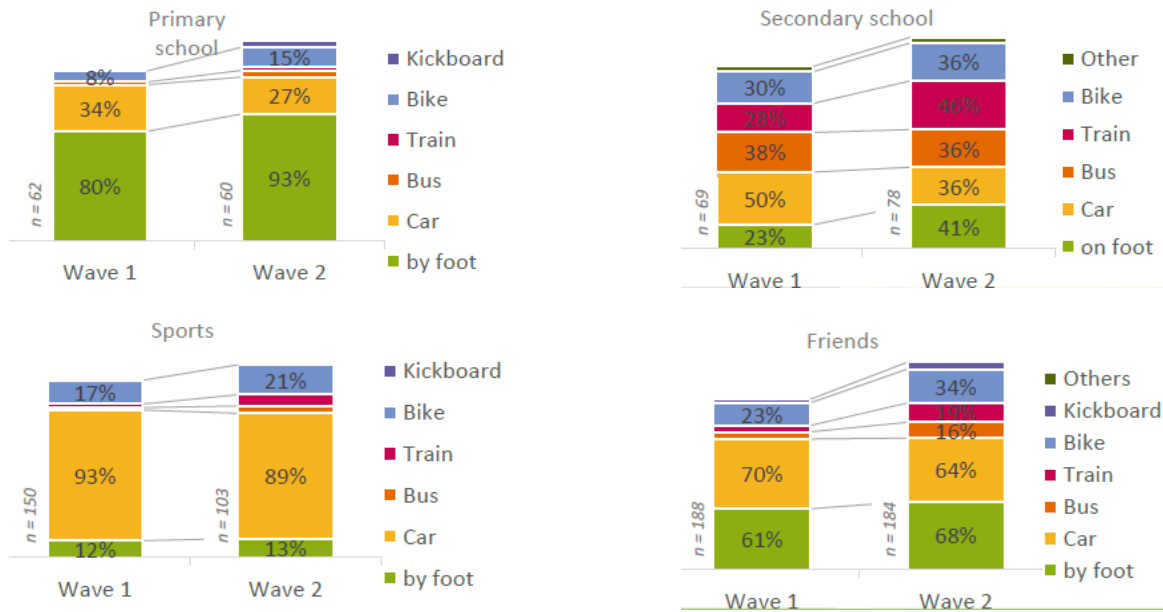


Figure 3-3 Choice of mode when accompanying children for different trip purposes

When considering reasons given for change in mode to cycling, a small number of respondents mentioned the good quality cycle path network. The most common reasons given were environmental reasons and for health; however, many respondents changed mode according to the weather and season.

Table 3-4 Main impacts from Mobility Map (forgotten paths)

Indicator	Target	Before	After	Impact
Change in trips by bike	5% increase in cycling trips	261 trips by bike were reported by 247 respondents ($261/247 = 1.056$ average trips per respondent)	224 trips by bike were reported by 202 respondents ($224/202 = 1.109$ average trips per respondent)	5% increase
Change in modal share of cycling	5% increase in cycle mode share for children or parents accompanying children	Primary school: 7%	Primary school: 11%	4% increase
		Secondary school: 18%	Secondary school: 18%	0% increase
		Sports: 14%	Sports: 17%	3% increase
		Visiting friends: 15%	Visiting friends: 20%	5% increase
Satisfaction with new mobility strategy in Hennef Im Siegbogen	5-10% increase of people who are very satisfied or satisfied by mobility offers in Hennef Im Siegbogen	15% very satisfied, 50% satisfied	18% very satisfied, and 52% satisfied	5% increase in for general mobility offer
			31% very satisfied and 47% satisfied with the Mobility map measure	13% increase for mobility map measure

Awareness of the Mobility Map measure was 15% of respondents and 5% of respondents claimed to have utilised the Mobility map now and again. The awareness for this measure is surprisingly low considering every household in the area was sent the Mobility Map via post.

Of those that stated they used the mobility map now and again, they were all users of bicycle or e-bikes, with the most common cycle trips being for leisure (75% of mobility map users) followed by trips to the doctor and for work (37% of users for each).

E-bike hire measure

The e-bike hire measure involved 2 e-bikes which were made available for hire on a weekly basis between June 2019 and October 2019. Data relating to 82 E-bike trips was collected from users and forms the basis of the impact evaluation for this measure.

Figure 3-4 shows that for the reported usage about 2 in 5 trips were to get to and from work, a third of trips were for leisure purposes and 1 in 5 trips were for shopping. 6% of trips involved accompanying a child (to school, the doctor/dentist or visiting friends).

Figure 3-5 highlights that over half the trips by e-bike were previously made by car and around a quarter were previously made by regular bike. 13% were new trips mainly made for leisure purposes.

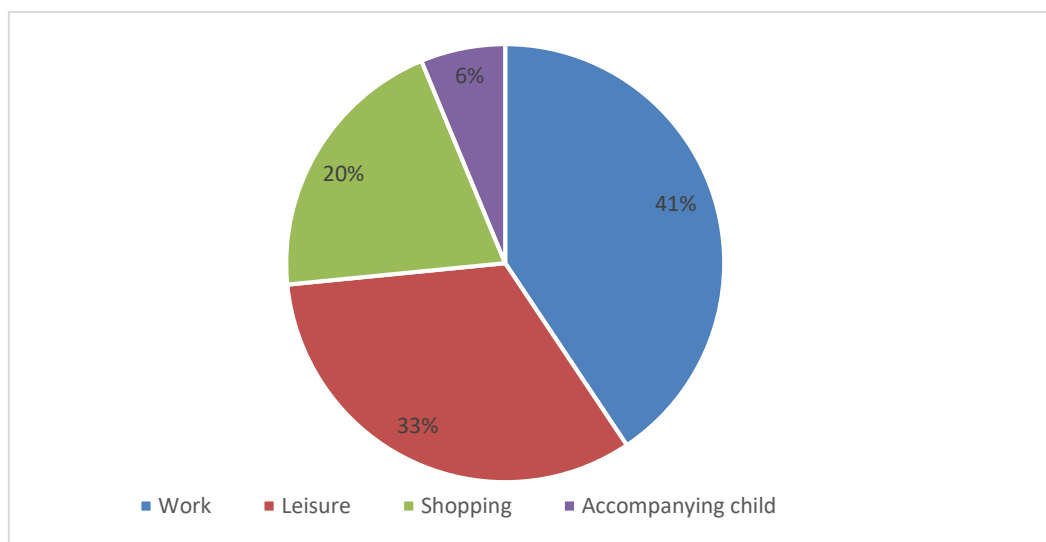


Figure 3-4 Reason for trip given by E-bike hire users

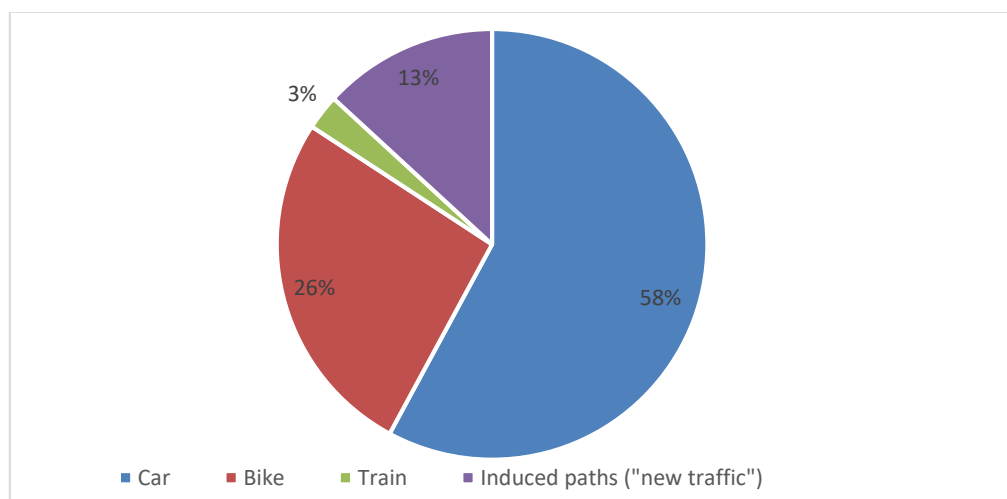


Figure 3-5 Mode of transport previously used for trips made with E-bike

More generally, results from the before and after surveys with the wider population of Hennef Im Siegbogen show that the number of users that had never used an e-bike reduced from 92% to 89%. While this change cannot be only due to the e-bike hire scheme, as this was very limited in scale, it does show that there is a growing awareness and acceptance of e-bikes in the community/society.

Awareness of the E-bike hire measure was 10% of respondents and only 2% of respondents claimed to have utilised the E-bike hire now and again. Although these figures are low, this is to be expected since the measure was small in scale (only 2 e-bikes) and only available for a limited time period (16 weeks).

Table 3-5 Main impacts from e-bike hire measure

Indicator	Target	Before	After	Impact
Change in users of e-bike	5% increase in users of E-bikes	92% of respondents had never used an e-bike	89% of respondents had never used an e-bike	3% increase in the respondents who have used an e-bike
Change in modal share of cycling - E-bikes replacing car trips	25% of E-bike trips to replace car trips	----	58% of e-bike trips were previously undertaken by car	58% e-bike trips replace car trips
	5% of E-bike trips accompanying children replace car trips	----	6% of e-bike trips involved parents accompanying children – all of these trips were previously undertaken by car	6% of e-bike trips with children replace car trips
Satisfaction with new mobility strategy in Hennef Im Siegbogen	5-10% increase of people who are very satisfied or satisfied by mobility offers in Hennef Im Siegbogen	15% very satisfied, 50% satisfied	18% very satisfied, and 52% satisfied	5% increase in for general mobility offer
			34% very satisfied and 36% satisfied with the e-bike hire measure	5% increase for e-bike hire measure

The individual feedback from those who used the e-bikes was overwhelmingly positive and suggest the trial would lead to more long-term changes in behaviour for those that experienced use of the e-bike. Selected quotes from users are included below:

"Thank you for the opportunity to test the bike. In my case it was a success. I will also get one based on the positive experiences made."

"Today I gave the e-bike back with a heavy heart. I think your campaign is a great thing because it enabled us to learn how an e-bike can support us in everyday life. Although we all have a normal bike in our family, it was amazing to see how often and how much we used the e-bike. Thank you very much for

"Thank you very much for the opportunity to test. My drive to work was 24 km one way, so very far. Accordingly, I had to choose the days on which I had enough time / energy after work so that I would not be short of time, etc. For me, the experiment was 100% worth

3.2.3 Discussion on validity of the data

Due to the small scale of the measure, there can be no impacts relating changes in behaviour of the wider population. Therefore, the impact of the e-bikes on those that used it has been assessed. These impacts are derived from the small numbers of users of the e-bikes and the recorded instances of the trips for which they used the e-bike. These highlight that the e-bikes were used to replace car trips for a large proportion of journeys. However, this finding is based on a small number of users and trips and so should be viewed as an indication of the potential of the e-bike service rather than irrefutable evidence. A much larger sample of users will be required to substantiate the findings presented through this small-scale demonstration.

3.2.4 Impact of Covid-19 and opportunities related to Covid-19

Covid-19 did not have any effect on the delivery of the e-bike hire measure since the demonstration period ran between June and October 2019. The Covid-19 crisis has presented some notable opportunities for public e-bike hire schemes. There is a real risk of a longer-term reduction in public transport services when Covid-19 restrictions are relaxed. Bus users may be reluctant to return to bus use due to concerns about travelling in enclosed spaces with others. E-bikes offer a safe alternative for many citizens once the Covid-19 restrictions are relaxed. However, far higher availability of e-bikes would be required for this to be realised.

3.2.5 Financial sustainability assessment

The mobility map of Hennef provides a low-cost solution to increase awareness of the sustainable and safe ways of travelling in Hennef. While the use of advertising was deliberately avoided in the production of the map, it could be possible to generate some revenues from local companies through placing adverts on the map. However, there is a risk that advertising devalues the content and the "seriousness" of the map and thus also the user's perception. In this respect, it becomes questionable, given the relatively low cost of producing such a map (especially with the free use of OSM data that is possible today), to introduce advertising.

The e-bike hire measure reduced operational costs by utilising the local tourist office to host the service. This was possible since the small scale and weekly hire placed limited additional demands on existing tourist office staff. If the scheme were to be scaled up significantly then alternative ways of hosting the service would need to be sought.

Hosting through the tourist office, alongside the trial nature of the service, resulted in the decision to lease rather than purchase the e-bikes. For the short-term trial this was the more economic decision, with maintenance of the bikes not becoming an issue. However, longer term delivery of an e-bike hire service would require an exploration of the full costs involved in delivering a scheme with leased versus purchased e-bikes, including associated maintenance and hosting costs.

3.2.6 Main findings

- Overall, there has been an increase in cycling trips of approximately 5%.
- Parents accompanying children by bike has increased for trips to primary school, sports activities and visiting friends.
- E-bikes have been very effective at replacing car trips for those that have used them.

Lessons learnt include:

Key to the success of the measures has been establishing a comprehensive understanding of the needs of the target users prior to designing the interventions: The 'before' survey with a response rate of 44% of the population identified the shortcomings in the existing mobility offer for the target groups.

Trends show there is growing awareness and interest in e-bikes in the Hennef area, suggesting potential for expanding the scale of this measure. However, larger scale implementation of the e-bike measure would require a different delivery model for hosting the service. This should be explored further.

The potential of e-bikes as an essential means of transport for everyday journeys (and not as sports equipment) is far from exhausted. In this context, the combination of bicycle/e-bike and PT also offers great potential if access barriers such as use, borrowing, and general availability are as low as possible.

4 Florence metropolitan area pilot lab (Italy)

The Italian PL was conducted in two distinct areas within the metropolitan region of Florence - the economic, cultural and social capital of Tuscany Region.

In the first area, the pilot activities have been carried out in relation to two suburban bus routes (nos. 30/35), which serve an area from the central railway station to the deprived Campi Bisenzio municipality in the north of Florence. This is a peripheral zone of Florence with many tenements inhabited by migrants and also social care centres. Therefore, migrants and modest income groups represent a large segment of public transport service users. The numbers 30 and 35 services are conventional fixed bus routes which are identical for most of the route, but which diverge at the end of the route. Although migrants are the largest number of users, the service is structured based on historical data without any particular attention given to the changing and specific needs of this user segment. This pilot study involved redesign of the routes to better respond to the demands of the migrant population combined with provision of information, including provision of on-board information monitors and a mobility App tailored to the needs of migrant users. In addition to this, crowdsourced user feedback by migrants on the operated service has been collected through the App.

The second target area is located in San Piero a Sieve, in the centre of the rural Mugello area, on the north-west boundary of the metropolitan conurbation. This rural area is characterised by sparse households and fragmented demand segments that present challenges in serving local mobility needs. Therefore, people with private cars use them for most or all of their trips, while others cannot easily reach Florence or other surrounding cities, resulting in reduced participation in society and increasing the risk of social exclusion. The users in this area are mainly represented by rural commuters (students and workers). This pilot study involves a better understanding of the specific needs and levels of use of the services by the identified user groups; improvement of PT service accessibility; providing information tailored to user needs; and improved multimodal travel information for journeys into Florence and main surrounding centres.

Deliverable 4.3 *Innovation Pilot Lab Florence - implementation and results – final version* describes in detail the measures that have been demonstrated, their design and the implementation process of the measures. It also provides more detailed description of the characteristics of the Florence PL.

The Florence PL is introducing three INCLUSION measures in the Campi Bisenzio area, summarised in Table 4-1, and a further two measures in the San Piero a Sieve area, summarised in Table 4-2. The INCLUSION measures are being coordinated by the public transport operator of Florence (ATAF).

Table 4-1 Overview of INCLUSION measures demonstrated in the Campi Bisenzio deprived urban area of Florence

Measure name	Description
Reorganisation of bus line 30	This measure involved the redesign of the route including addition of two new bus stops and a new timetable for bus line 30. This has been done to better meet the needs and demands of the growing migrant community living near to the bus route and to provide a better direct connection from the bus to the recently opened tram line.
Install on-board monitors for passenger information in the lines 30 and 35 for migrants	With the expected increase of migrant passengers on bus line 30 and line 35, this measure provided new on-board monitors for passenger information offering information tailored to the migrants needs.
Introduction of new functionalities on existing App ATAF for getting users' feedback in lines 30 and 35 for migrants	The existing ATAF travel information and journey planning app has been enhanced app by adding new functionality on operated services in terms of frequency, quality of the service, intermodal coordination and also new features to enable passengers to share feedback on their travel experiences. The added features are designed with migrant users' needs and capabilities in mind and have been tested on lines 30 and 35 where levels of migrant passengers are relatively high.

Table 4-2 Overview of INCLUSION measures demonstrated in the San Piero a Sieve rural area outside Florence

Measure name	Description
Change of the bus routes in the rural area of S.Piero	Reorganisation of the bus routes and redesign of the S.Piero Train Station to enhance interchange opportunities and improve PT accessibility.
Introduction of new functionalities on existing App ATAF for improving multimodal user information and for getting users' feedback in the rural area of S.Piero	This measure involved the enhancement of the ATAF travel information app to improve the multimodal user information for passengers making bus to train connections in the rural area of S.Piero. This includes provision of real time train information in the app and enhanced intermodal journey option information. The enhanced ATAF app also provided functionalities to collect crowdsourced users feedback on the operated service. This measure supports the reorganisation of the bus routes and train station design to encourage and facilitate more public transport connections.

4.1 Improving bus services for migrants in deprived Campi Bisenzio area in northern Florence

4.1.1 Overview of implementation

The Campi Bisenzio area is located 13km North-West of Florence city centre. A new tram line was opened on 23rd February 2019 connecting the edge of the area with Florence city centre. The tram line is illustrated with a yellow dashed line in Figure 4-1. The 'before' route for bus line 30 is shown with the green line in Figure 4-1 and passes 700m from the tramway. The redesign of bus line 30 was carried out in parallel to the finalisation of the tramway and brings the bus route closer to the tram stop in both directions. With the reorganisation, two new bus stops (one 150m from the tram stop and the other 270m) were identified in order to guarantee easier access to the tram service to enable fast onward journeys to Florence city centre.

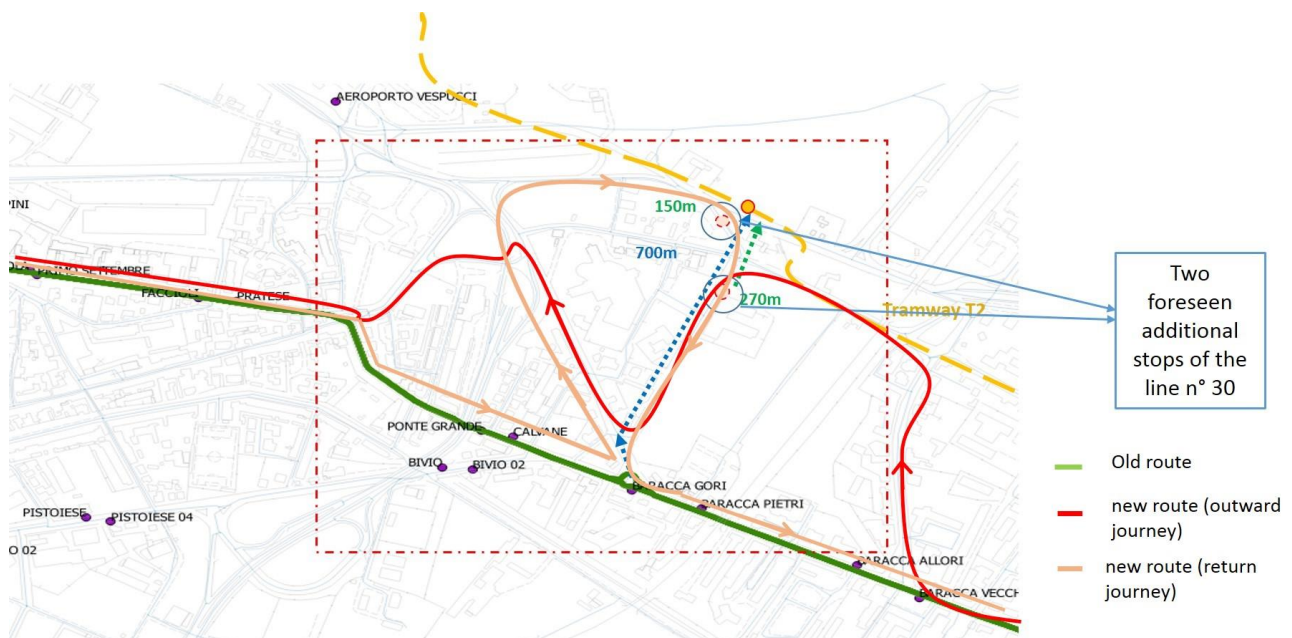


Figure 4-1 Map illustrating the reorganisation of bus line 30 with connection to the new tramway T2 (yellow dashed line)

Source: Busitalia

For the enhanced information, 30 new panels were installed in vehicles serving line 30/35 with an average of 2 panels for buses of 12m length and 4 panels for buses of 18m length. These installations took place between February 2019 and September 2019.

Finally, the enhancements to the ATAF journey planning app were planned to be introduced and delivered through the new release of the ATAF app in October 2019. However, the need to respond to migrant user feedback, obtained through the co-design process, and incorporate this in the new release resulted in problems encountered with the App software development company, specifically regarding the production time and costs. The new app release was delayed with a re-planned launch date of March 2020. However, the outbreak of Covid-19 and

subsequent lockdown in the Florence area caused the further postponement of the new ATAF app. The new ATAF app was finally launched on 8th June 2020, once Covid-19 restrictions had been relaxed and public transport services were back to operating with a regular timetable.

4.1.2 Impact evaluation

This section presents the impact evaluation for the reorganisation of bus line 30/35 to better meet the needs and demands of the growing migrant community in the remote and deprived urban area of Campi Bisenzio in northern Florence. This measure involved the redesign of the route of bus line 30 including addition of two new bus stops and a new timetable to provide a better direct connection from the bus to the recently opened tram line. Additionally, the information provided to passengers was tailored to better meet migrant needs and capabilities through additional on-bus information panels and simplified journey planning app information.

The data related to these measures has been collected using the following methodologies:

- 'Before' and 'After' passenger counts on bus line 30 in morning peak hours (between 07.30 and 09.00) on typical workday.
- 'Before' and 'after' surveys conducted by the bus operator (ATAF) with passengers on bus line 30. The 'before' surveys and counts were conducted in December 2018 and 'after' counts and surveys in November 2019.
- Data was also collected in 8 days, from 8th-15th June 2020, through a survey launched on the new ATAF app with a push notification. This survey was aimed at all users of the app and included a question to distinguish areas/routes where trips are made. This provided a third measure of satisfaction to give an indication of the impact the enhanced information has delivered. The number of survey responses received through the App for the Campi Bisenzio area was 295.

The main objective was to improve access to public transport in the area close to line 30/35 for migrants. Table 4-3 presents the main impacts.

Table 4-3 Main impacts from redesign of bus line 30/35

Indicator	Target	Before	After	Impact
Change in no of trips by bus on line 30 by migrants	5% increase in bus trips	100 migrant passengers/ morning peak in a typical workday, considering both directions	184 migrant passengers/ morning peak in a typical workday, considering both directions	84% increase in bus trips by migrants
Proportion of migrants who are making bus to tram connections for work		-----	Approximately 35% of migrant bus trips involved connection from bus to tram during morning peak A further 18% made bus to bus connections	----

Satisfaction with the public transport offer of users of line 30	10% increase of line 30 users who are very satisfied or satisfied by mobility offers	23% satisfied or very satisfied: - 4% very satisfied - 19% satisfied (December 2018 bus user survey)	39% satisfied or very satisfied ▪ 11% very satisfied ▪ 28% satisfied (November 2019 bus user survey – after infrastructure changes)	+16% change in proportion of passengers satisfied or very satisfied • 70% increase in passengers satisfied or very satisfied
			▪ 15% very satisfied ▪ 26% satisfied (July 2020 in-app survey – after infrastructure and enhanced information changes)	+18% change in proportion of passengers satisfied or very satisfied

The before data revealed that in a typical workday morning peak (07.30-09.00) there were 382 passengers on bus line 30 and 26.2% of those surveyed were of a migrant background (100 migrant passengers in morning peak). During the after survey the total passengers in a typical workday morning peak (07.30-09.00) was 683 with 26.9% of these migrants (184 migrant passengers in morning peak). This represents an 84% increase in bus trips by migrants following the redesign of the line 30 bus route.

Before the redesign the walking distance from the nearest bus stop to tramway bus stop was 700m (approximately a 9-minute walk). Following the redesign, the walking distance from the nearest bus stop to tramway bus stop is 270 m (3-minute walk) in one direction and 150m (2-minute walk) in the other. After the redesign a significant proportion (35%) of migrant bus trips on line 30 involved connection from bus to tram during the morning peak. A further 18% made bus to bus connections.

Regarding the quality of information, a focus group with representatives of migrants' associations and other interested stakeholders was held in April 2019. The participation of these stakeholders was very important for the success of the whole co-participatory process. In fact, they facilitated the contact with the target users and produced a "multiplying effect" for promotion and communication of the activities towards other target users. Two co-design laboratories with migrants were held in May 2019 and September 2019. During these meetings, migrants fed back qualitative information about physical touchpoints of the service, namely about the on-board information panels, the information displayed at the bus stops and at the bus shelter, sharing what they liked and what other information they would find useful if displayed on the panels. The second laboratory also provided an opportunity to get input from migrants on a demonstration version of the new ATAF travel information app. This second laboratory, organised in September 2019 and attended by 20 migrants, was held with the cooperation and at the offices of the association which manages projects of the Protection System for Asylum Seekers and Refugees, in order to attract more attendees. This participatory co-design led to several changes in the way information was presented to become more compatible with migrant user's capabilities and level of understanding.

The feedback from the focus groups and laboratory workshops was mainly qualitative and used to inform improvements to the information content of both the on-board panels and the app. Outcomes revealed that migrants were quite satisfied with the quality of information transmitted through the on-board panels and found it immediate and easy to understand. They particularly appreciate the indication about the next bus stop transmitted on the monitor as they are less familiar with the city and its landmarks so benefit from the visual prompts. Additional information they would find useful related mainly to ticketing, e.g. validity of the ticket, information on new types of ticket purchase solutions and clear information about the sanction in case of default. Regarding the ATAF mobility information app, the main feedback related to the need for simplifying the complexity of the information provided and replacing words with images and icons wherever possible, e.g. the use of smile to express the level of satisfaction. The need for an easy-to-use interface and use of user-friendly graphics was incorporated into the design requirements for the new ATAF app.

Overall satisfaction with the public transport offer in Campi Bisenzio was sought at three points in time. Firstly, before the service redesign was implemented, secondly after redesign was in place but before improvements to information provision were introduced, and thirdly after the new enhanced information was available through the in-bus information panels and the new ATAF app launch. Following the redesign, the survey responses indicate a change in proportion of those 'very satisfied' with the PT offer from 4% to 11% and from 19% to 28% for those claiming to be satisfied. After the provision of enhanced information there was a further, but smaller, improvement to 15% very satisfied and 26% satisfied.

4.1.3 Discussion on validity of the data

The timings of the demonstration period and its impact on 'before' / 'after' data collection has significance in the Florence pilot labs. Changes in bus routes in both pilot lab areas were introduced prior to the improvements made to user information, and so it is important in the collection of data to distinguish between i) the impacts due to the change in service design and ii) those impacts due to the improvement of user information. In particular, it is important to distinguish between satisfaction level related to the improvement of the service and the satisfaction level related to the improvement of user information. This is reflected in the impact evaluation indicator results defined in the above tables.

Concerning the re-design of line 30, the 'before data' was collected at the end of 2018. Since the new line started to be operational in February 2019, it was decided to carry out the 'after data' collection in November 2019 in order to guarantee an operational period of at least 9 months. After October 2019 the user information improvements were introduced, and a third data collection activity was undertaken in June 2020 via the in-app survey, to gauge further changes in satisfaction following the addition of improved information. Therefore, in order to distinguish between the impacts of the change in the bus line no. 30 and the impacts in providing improved information to users, specific questions relating to satisfaction were included in all three

periods of data collection. However, it is not possible to fully separate the impact from the redesign and that from the enhanced information from the survey data received, because the surveys are not necessarily from the same group of people and it was not possible in the more basic in-app survey to explore reasons for the answers given.

A second issue in the data collection was that common surveys conducted by the public transport companies were generally addressed to all users of the PT service to have a useful and thorough evaluation of the service from all passengers. Moreover, it is difficult to isolate specific target groups and obtain accurate answers only from them. To achieve the INCLUSION goal of improving the service for the migrant target group, BUSITALIA held focus groups and a co-participatory process with a number of travellers with migratory background in order to understand users' habits and spot their difficulties in using transport service and in understanding travel information. Given the difficulties in directly interacting with the end users (i.e. migrants and low-income people), representatives of different user associations have been involved through dedicated meetings since the beginning of the WP4 activities. This allowed the involvement of several "end users" and their active involvement through specific co-design laboratories. In particular, in order to ensure adequate feedback from users, the first focus groups with members of associations representing migrants was held in April 2019 and the first co-design laboratory was held with migrants in May 2019.

These activities aimed to identify the most significant issues that the migrant community perceived as barriers for using PT services and set out the "ex ante" situation. A second round of co-design laboratories was organised in September 2019 and November 2019. These meetings provided the occasion to collect information from migrants about satisfaction levels with the measures developed within the project.

It was also the case that most of the participants in the first co-design laboratory were young (20-30) and predominantly male, so the views of older and female migrants might not have been adequately captured. To reach out to these underrepresented groups when gathering the "after" data it was decided to hold the second meetings with the cooperation and at the offices of the association which manages projects of the Protection System for Asylum Seekers and Refugees. Furthermore, about one-third of migrants attending the co-design laboratories did not have a smartphone and therefore were not able to access and use the ATAF app or provide feedback through the app. Nevertheless, interesting feedback emerged and was taken into account in the release of the new app.

Prior to the Covid-19 lockdown, there were no significant external changes occurring in the Florence pilot lab sites that could impact on evaluation indicators during the short evaluation period.

4.1.4 Impact of Covid-19 and opportunities related to Covid-19

Covid-19 resulted in the introduction of lockdown measures in Northern Italy in mid-March. This resulted in all but essential workers being required to stay at home. It also meant a reduced timetable of bus services was provided on bus line 30/35 and reduced service on tramline T2.

Planned testing of the new ATAF app, which was due to be launched at the start of April, was delayed as a result of the lockdown. Lockdown rules were relaxed by the beginning of June and the new ATAF app was finally launched on 8th June 2020. The result of this was a much more limited timeframe for users to test and provide feedback on the app. As many citizens were still not travelling in June, the full potential use of the app is not truly reflected by the users in the 8 day period between 8th and 15th June 2020. Nevertheless, the total number of app users in the Campi Bisenzio area who completed the in-app survey was 295.

In the recovery from Covid-19, opportunities for the new ATAF travel information app relate to sharing with passengers information on the crowding levels of PT services, information about next service arrival times if a vehicle is crowded, and alternative travel options such as bike hire. Through the in-app passenger feedback functionality, passengers can report instances where safety and hygiene protocols are not being adhered to and notify providers and authorities where more capacity is required.

4.1.5 Financial sustainability assessment

The change in bus routing to connect to the new tramline has resulted in an almost doubling of passenger numbers in the morning peak period. These passengers generate additional fare revenues to help pay for the service enhancements. Perhaps more significant is the proportion of passengers now connecting from the line 30 bus onto other public transport to continue their trips into the city centre. This more interconnected PT network is increasing access to more job opportunities for migrants in the deprived area of Campi Bisenzio as well as encouraging more PT use and modal shift from car trips for other residents of the area.

4.1.6 Main findings

- The redesign of the line 30 bus service to connect to the new tramline has resulted in a significant increase in passenger numbers, including a significant increase in migrant users (+84% increase).
- Almost half of migrant trips in the morning peak now involve some form of connection (35% to tram and 18% to other bus services) at the new bus stops.
- Overall satisfaction with the public transport service amongst line 30/35 users has increased with 18% more passengers stating they are satisfied or very satisfied with the new service.

It is likely that about 10% of this increase can be attributed to the enhanced information provision.

Lessons learnt include:

Information communicated to migrants needs to be kept simple by using icons and images and avoiding lengthy text wherever possible. Understanding where they are in the city and what ticketing options and rules apply were identified as the most useful information to assist them in using the bus service.

Information provided through cartoon videos displayed on the on-board panels were found particularly effective: the information was clear, and the message correctly understood. The use of this tool could be further enhanced to convey more information on the correct behaviour to have on board the bus (e.g. leave the seat to persons with reduced mobility (elderly, persons with disabilities or pregnant women) or speak with low voices, get in the bus at the front door and get off at the central/rear door, etc.).

The testing procedure of the demo version of the ATAF app with the direct involvement of a group of target users representatives rather than just the involvement of the design and contracting people, proved to be a successful step in the process of the APP restyling and overall improvement.

The newly implemented functionality of the feedback survey through the new ATAF app was appreciated a lot by migrants as it gives them the possibility to anonymously express their opinions on the bus service, thus increasing their feeling of integration and motivation to use the bus service.

The new ATAF app functionality to collect crowdsourced users' feedback on the operated service could help identify possible gaps in the service provision or other specific users' requirements that need to be further explored. This is in fact a low-cost functionality that could allow the PT operator to obtain useful indications on the trips and the mobility demand, for example:

- target the analysis using different parameters, such as, for example, seasonality (winter vs summer), day (working days vs week days);
- collect further details on specific users' requirements, thereby saving money and efforts to carry out these surveys through traditional means.

4.2 Improving bus services for rural dwellers in the Mugello area to the west of Florence

4.2.1 Overview of implementation

The second target area is located in San Piero a Sieve, in the centre of the Mugello area, on the northern boundaries of the metropolitan conurbation and 30km from the Florence city centre. The vulnerable users in this area are rural commuters, especially young adults and those on low income. The measure involved redesigning the bus routes around the railway station in San Piero a Sieve to improve interchanges for intermodal journeys into the city of Florence and, related to this, improving the quality of information made available to public transport users especially relating to connected journeys.

The redesign of the bus routes involved changing the paths of the bus routes around the railway station and moving 2 bus stops to provide direct access to the railway station. Referring to Figure 4-2, before the re-organisation, bus lines (dashed grey line in Figure 4-2) either stopped at bus stop 1 or at bus stop 2, 300m away. The train station was on the other side of the railway line from both of these bus stops and it was therefore necessary for those travellers making a connection from bus to train to use a railway underpass to reach the train platform.

After the re-organisation all bus lines (solid red line in Figure 4-2) were unified to stop at a consolidated interchange hub (red point in Figure 4-2), located on the other side of the train line. This gave all bus lines direct access to the main entrance of the railway station and significantly reduced the walk distance required to make a connection. Not only did this improve the interconnection between bus and train, it also made bus to bus connections much easier. The development of the unified hub was implemented by the end of 2017.

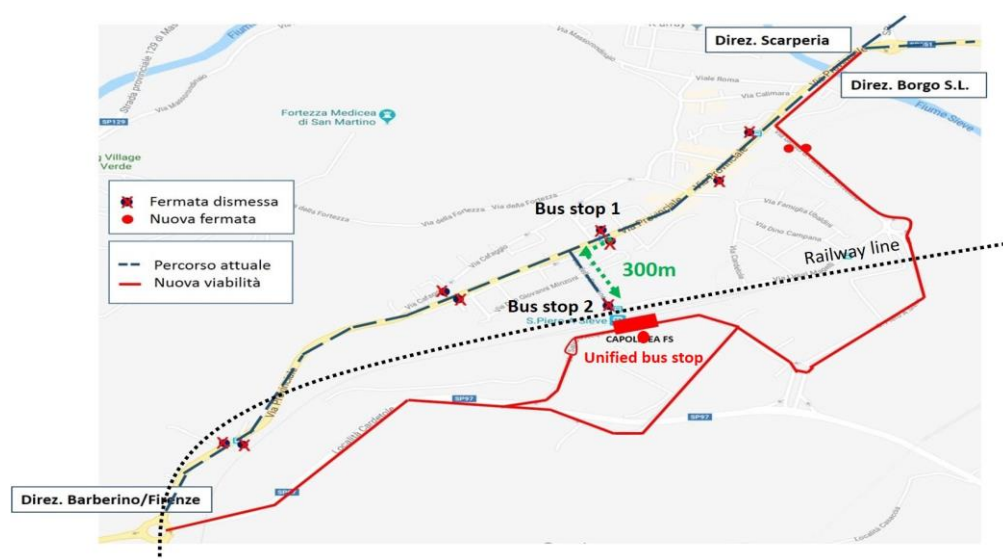


Figure 4-2 Map illustrating bus line reorganisation around San Piero a Sieve train station

Source: Busitalia

The second phase of the measure related to improving the quality of the information made available to public transport (PT) users, especially for those making journeys involving an interchange. This included installation of a smart pole at the interchange hub from which people can get the real transit time and other relevant PT information. The pole was installed in May 2019. It contributed to improve the quality of information of transport services provided to users and thus the users' satisfaction towards the PT service. Additional to this, the ATAF journey planning app was enhanced with new functionalities to improve the multimodal user information for passengers making bus to train connections. This included the incorporation of train timetable information in the app and improved identification of multimodal journey options. Functionality was also added to capture user feedback through the app in the form of an in-app feedback form/survey. The new ATAF app with these enhancements was due to be launched in October 2019 but was delayed due to problems encountered with the App software development company, specifically regarding the production time and costs involved in incorporating extra functionalities emerging from the co-design process. A revised launch date of February 2020 was planned but again postponed due to the Covid-19 outbreak. The new ATAF app was finally launched on 8th June 2020, once Covid-19 restrictions had been relaxed and public transport services were back to operating with a regular timetable. Despite the delays and the difficult period related to Covid-19, within 8 days of the official launch of the new ATAF app nearly 2960 total in-app questionnaires were completed across the Florence region (295 related to the Area of Campi Bisenzio and 64 related to S.Piero a Sieve area).

4.2.2 Impact evaluation

This section presents the impact evaluation for the reorganisation of bus lines 302/303 around San Piero a Sieve railway station and the provision of enhanced information related to intermodal journeys for passengers making connections.

The data related to the measure has been collected using the following methodologies:

- 'Before' and 'after' passenger counts on bus lines 302/303 in the morning, afternoon and evening peak hours (between 07.30 and 09.00; 12.00-14.00; and 16.00-19.00) on a typical workday.
- 'Before' and 'after' surveys conducted by the bus operator (BUSITALIA) with bus passengers on lines 302/303 in San Piero. The 'before' surveys were conducted in November 2017 and after surveys were conducted in March 2019 (for number of trips) and November 2019 (for satisfaction on the general service and interchange).

The main objectives were to improve the connectivity between different bus lines and the intramodality between bus and rail services, and to improve the quality of the user information on the bus and rail services in the rural area of S. Piero to rural commuters. Table 4-3 presents the main impacts.

Table 4-3 Main impacts from redesign of bus network connections

Indicator	Target	Before	After	Impact
Increase in the number of users of PT service in rural area of S. Piero	+3% increase with respect to the baseline	598 passengers across all peak periods (on-off passenger counts on typical workday – Nov 2017)	644 passengers across all peak periods (on-off passenger counts on typical workday – Nov 2018 after route redesign)	+7.7% increase in bus trips
Increase in number of trips involving transport connections (bus to bus; or bus to train) due to redesign of bus routes	+10% with respect to the baseline	5% of bus users connected with train and 6% connected with other bus services	7% of bus users connected with train and 13% connected to other bus services	+9% change in proportion of bus passengers making connection to other PT services <ul style="list-style-type: none"> • 82% increase in passengers who make a connection
Satisfaction with PT service in general	+10% claiming to be very satisfied or satisfied	51% satisfied or very satisfied <ul style="list-style-type: none"> ▪ 10% very satisfied ▪ 41% satisfied (December 2018 bus user survey – before bus route redesign changes)	59% satisfied or very satisfied <ul style="list-style-type: none"> ▪ 23% very satisfied ▪ 36% satisfied (June 2020 in-app survey – after bus route redesign changes and enhanced ATAF information app launch – includes intermodal information and train real time information)	+8% change in proportion of passengers satisfied or very satisfied <ul style="list-style-type: none"> • 15.7% increase in passengers satisfied or very satisfied +13% change in proportion of passengers very satisfied <ul style="list-style-type: none"> • 130% increase in passengers very satisfied
Satisfaction level with quality of information	+15% claiming to be very satisfied or satisfied	47% satisfied or very satisfied <ul style="list-style-type: none"> ▪ 10% very satisfied ▪ 37% satisfied (December 2018 bus user survey – before bus route redesign changes) 48% satisfied or very satisfied <ul style="list-style-type: none"> ▪ 11% very satisfied ▪ 37% satisfied (November 2019 bus user survey – after bus route redesign changes but before enhanced information provision)	84% satisfied or very satisfied <ul style="list-style-type: none"> ▪ 50% very satisfied ▪ 34% satisfied (June 2020 in-app survey – after bus route redesign changes and enhanced ATAF information app launch – includes intermodal information and train real time information)	+36% change in proportion of passengers satisfied or very satisfied <ul style="list-style-type: none"> • 75% increase in passengers satisfied or very satisfied +39% change in proportion of passengers very satisfied <ul style="list-style-type: none"> • 354% increase in passengers very satisfied

Based on the passenger counts during morning, afternoon and evening peak in a typical workday, there was a 7.7% increase in passengers after the reorganisation of the bus routes. Looking at the number of trips involving a connection, the proportion of bus users connecting to the train increased from 5% to 7%, while those connecting between buses increased from 6% to 13%. This represents an overall increase in passengers making a connection of 82%.

Unifying the bus stops for all bus lines at the entrance to the train station has made inter bus connections much easier: 54% of bus trips use line 302 which previously stopped 300m from the train station, while 46% of bus trips use line 303 which previously stopped at the wrong side

of the train line to access the railway station. The reorganisation resulted in a connection time saving of 4 minutes for line 302 passengers and 30 seconds for line 303 passengers (assuming pedestrian speed of 1.25 m/s). This represents an average connection time saving of 143 seconds for bus to train passengers and 240 seconds for bus to bus connections.

When passengers were asked about their satisfaction with the ease of making a connection, 7% stated they were very satisfied. When looking at which passengers were 'very satisfied', 95% of those making bus to train connections stated they were 'very satisfied' with their ease of making connections in the after survey (compared to 45% in the before survey). This outcome suggests the service redesign has been the main driver for the increase in satisfaction and that those who actually make connections are very positive about the changes.

Overall satisfaction with the public transport service in general shows an +8% change in proportion of passengers satisfied or very satisfied (from 51% to 59%) following the route redesign changes and enhanced ATAF information app launch (includes intermodal information and train real time information). Encouragingly the change in passengers stating they are very satisfied increased from 10% to 23%.

When asked about satisfaction with the quality of passenger information available, the survey before the service redesign was implemented showed 10% 'very satisfied' and 37% 'satisfied' with the information available. A second survey after the redesign including the provision of the smart pole at the interchange hub, but before the enhancement of the information app, showed very similar responses with 11% 'very satisfied' and 37% 'satisfied' with the information available. The enhanced ATAF app was launched in June 2020 and the feedback received through the in-app survey revealed a marked improvement in satisfaction with the quality of information with 50% 'very satisfied' and 34% 'satisfied' with the information available. (Note that at the time of the before surveys the original ATAF journey planning app was available, but this did not include the enhanced intermodal information and train real time information provided through the new ATAF app).

4.2.3 Discussion on validity of the data

The timings of the demonstration period and its impact on 'before' / 'after' data collection has significance in the Florence pilot labs. Changes in bus routes in the San Piero a Sieve pilot lab area were introduced prior to the improvements to user information, and so it was important in the collection of data to distinguish between i) the impacts due to the change in service design and ii) those impacts due to the improvement of user information. In particular, it is important to distinguish between satisfaction level related to the improvement of the service and the satisfaction level related to the improvement of user information. This is reflected in the impact evaluation indicators defined in Table 4-3. Although it can often take some time for new bus routes to establish themselves and attract new potential users, the before data was collected in November 2017 (sample 376) and the after data for the redesign evaluation was collected in

November 2018 (sample 335). This demo period has therefore been long enough to generate awareness of the new design and stimulate changes in behaviour. As no other measures or significant external factors had influence during 2018, the data collection is likely to capture and reflect the impacts due to the redesign of the bus routes.

As regards the improvement of user information, the new ATAF app was not ready to launch prior to the Covid-19 outbreak. As a result, it could only be tested once the Covid-19 restrictions on travel were relaxed and the bus and train services were operating to a normal schedule. This left a very short time (8 days from 8th to 15th June 2020) for testing the App and getting feedback from users. Furthermore, those travelling by public transport and using the App during the test period may not have represented the full range of travellers during normal circumstances. The total sample from the San Piero a Sieve area that supplied feedback through the in-app survey was 64. This is a relatively small response rate compared to the 532 survey respondents in the before survey on satisfaction held in November 2019. As a result, the stated increase in satisfaction with quality of information (+36% change in proportion of passengers satisfied or very satisfied equating to a 75% increase in passengers who are satisfied or very satisfied compared to November 2019) should be viewed with some degree of caution. However, due to the significant improvements in satisfaction ratings, there can be no doubt that the enhanced information available through the new ATAF app has resulted in an increase in the satisfaction levels of the passengers.

There were no significant external changes occurring in the Florence pilot lab sites that could impact on evaluation indicators during the short evaluation period. This includes no short-term plans of changes to other services/nearby lines that could affect the travel behaviour or attitudes of target users.

4.2.4 Impact of Covid-19 and opportunities related to Covid-19

As mentioned in section 4.1.4, Covid-19 resulted in the introduction of lockdown measures in Italy in mid-March 2020. This resulted in all but essential workers being required to stay at home. It also meant a reduced timetable of bus and train services. The planned testing of the new ATAF app, which was due to be launched in March 2020, was delayed as a result of the lockdown. Lockdown rules were relaxed by the beginning of June and the new ATAF app was finally launched on 8th June 2020. The result of this was a much more limited timeframe for users to test and provide feedback on the app. As many citizens were still not travelling in June, the full potential users of the app may not be reflected by the users in the 8-day period between 8th and 15th June 2020.

In the recovery from Covid-19, opportunities for the new ATAF travel information app relate to sharing with passengers information on the crowding levels of PT services, information about next service arrival times if a vehicle is crowded, and alternative travel options such as bike hire. Through the in-app passenger feedback functionality, passengers can report instances where

safety and hygiene protocols are not being adhered to and notify providers and authorities where more capacity is required.

4.2.5 Financial sustainability assessment

Concerning the financial aspects related to the ATAF app, the following key aspects should be underlined:

- the cost of the App software development and yearly maintenance is covered by Busitalia-ATAF and paid to the software provider with which ATAF has a direct contract.
- the App contents' daily management is performed by Busitalia-ATAF staff.

These two main costs are included in the contract that Busitalia-ATAF signed with the Local Authorities for the overall PT services.

The App has some specific “benefits” including the possibility to improve decision making based on analysis of the collected data (from the feedbacks on the quality of the services, to the identification of an origin/destination matrix for supporting the service planning revision).

The possibility to raise revenues through payment from users to access some specific ATAF app functions /services was not considered as the services provided by the App are considered to be an integrated part of the service. Instead, the possibility to sell some specific “views/analysis” of the collected data is still under consideration by the ATAF management board.

4.2.6 Main findings

- The redesign of bus lines 302/303 to establish a unified connection hub enabling better interchange between buses and with the train service resulted in an almost 8% increase in bus trips.
- The proportion of passengers on line 302/303 making connected journeys increased from 11% to 20%.
- The number of passengers stating they were satisfied or very satisfied with the PT services in general in the area increased by over 15%.
- The satisfaction with quality of information increased substantially with the launch of the new ATAF app which provided improved intermodal information and real time train information. The number of passengers stating they were satisfied or very satisfied with the quality of information increased by 75% from 47% to 84%.

Lessons learnt include:

The new ATAF app functionality to collect crowdsourced users' feedback on the operated service could help identify possible gaps in the service provision or other specific users' requirements that need to be further explored. This is in fact a low-cost functionality that could allow the PT operator to obtain useful indications on the trips and the mobility demand, for example:

- target the analysis using different parameters, such as, for example, seasonality (winter vs summer), day (working days vs week days);
- collect further details on specific users' requirements, thereby saving money and efforts to carry out these surveys through traditional means.

5 Cairngorms National Park pilot lab (UK)

Cairngorms National Park (CNP) (<http://cairngorms.co.uk/>) is one of the most popular tourism destinations within the Scottish Highlands, the most remote region in Scotland, and comprises an area of 4528 sq km. Although the local resident base is around 20,000, the area experiences more than one and a half million visitors per year for summer hiking and winter skiing. The underlying public transport infrastructure is fragile and includes fixed route bus and rail (both privately operated), some open access Demand Responsive Transport (operated by Community Transport and local authorities) and taxis.

The main aim of the CNP Pilot Lab is to improve accessibility to public transport for older persons, young adults, teenagers and tourists in CNP, with e-bikes and car clubs being the main measures that were planned to be implemented in INCLUSION to achieve this objective. Through INCLUSION, HITRANS, the regional transport authority, installed e-bike hubs in Aviemore and Grantown-on-Spey within CNP, as well as in Fort William to the South West of CNP. These e-bikes are intended for use by both tourists and local residents, with hope of a modal shift from private car to e-bikes for tourists and providing greater access for local activities and services for residents. The learning gathered from this initial roll-out will inform future plans for further sites. HITRANS also worked with car club operators in the area to encourage moving car club services into CNP to provide additional more sustainable transport services. The aim being that the e-bike and car club services will complement each other to replace certain journeys that are largely completed by private car use at present due to a lack of available services.

Complementary to this, HITRANS is also working with MaaS Scotland, Transport Scotland, local stakeholders and experts to assess if Mobility as a Service (MaaS) could work in CNP; particularly for tourists arriving in the area who wish to complete their journeys without the use of private cars. The car club and e-bike hire services would form a component part of the MaaS solution. This will form ongoing research throughout the pilot lab and will be evaluated through process evaluation at the end of the project.

Deliverable 4.4 Innovation Pilot Lab Cairngorm National Park - implementation and results – final version describes in detail the measures that have been demonstrated, their design and the implementation process of the measures. It also provides more detailed description of the characteristics of the Cairngorms PL.

The Cairngorms National Park was focussed on developing three INCLUSION measures, coordinated by the regional transport authority for the Scottish Highlands (HITRANS), and summarised in Table 5-1 and Table 5-2.

Table 5-1 INCLUSION measures demonstrated and subject to impact and process evaluation in CNP PL

Measure name	Description
Introduction of e-bike hubs at number of locations in CNP	The E-bike hire project in Speyside / Cairngorms, is focussed on implementing 3 small scale E-Bikes hubs in key gateways towns/transport interchanges for the national park. The goal is to promote modal shift and create a safer active travel environment for residents and visitors to travel within the National Park. The target users are elderly people, persons of reduced mobility, young adults and teenagers, local residents who suffer from fuel poverty due to high rural fuel costs, and tourists. The learning gathered from this initial roll out will inform future plans for further sites in these towns and also to new settlements building on learning and research gained from other current projects.

Table 5-2 INCLUSION measures developed and subject only to process evaluation in CNP PL

Measure name	Description
Integrating a car club with public transport and experiment with Mobility as a Service	Introduction of a small Car Club in Aviemore to meet mobility demand in that area. Strategies will be developed to promote and encourage use by young adults. The car club will form a component part of a wider MaaS system for the area. Main target users are persons of reduced mobility, young adults, local residents who suffer from fuel poverty due to high rural fuel costs, and tourists.
Improving multi-modal travel information services	Delivery of a regional, multi-modal information system using real-time data. Target users are elderly people, persons of reduced mobility, young adults, teenagers, local residents who suffer from fuel poverty due to high rural fuel costs, and tourists

Table 5-1 describes the e-bike hire measure which was fully implemented and has been subject to impact evaluation as described in Section 5.1. Table 5-2 presents two further measures which were developed within the INCLUSION project, but because of difficulties experienced in the delivery process were not fully operational in time to be subjected to impact evaluation. Both measures in Table 5-2 have been included in the process evaluation analysis to understand, in detail, the issues encountered and the barriers and challenges that led to delays in getting these measures operational in the CNP area.

Access to funding was the major barrier which resulted in delays to the implementation of the measures in Table 5-2. Lack of direct funding to HITRANS from central Government meant significant time was spent bidding for funds, without which the measures could not proceed. Eventually (in December 2019) HITRANS won public funding for a MaaS platform for the Highlands through the MaaS Investment Fund, which aims to encourage people out of cars and onto sustainable forms of transport. This includes 10 new car club locations, one of which will be a location in Aviemore. The car club location and provider for Aviemore has awarded and

the MaaS Platform will go live in August 2020 (too late in INCLUSION to assess the impact of this measure). However, the funding obstacles and hesitance of car club operators to take the financial risks and uncertainties associated with expanding their services in a deep rural area and allowing younger people to use their cars have been captured and documented in the process evaluation. A number of valuable lessons have been learnt and can be shared relating to getting this measure delivered in a deep rural area.

The improvements to real time passenger information incurred significant time delays. Extensive collaboration with several stakeholders was required to specify the system requirements for an area with mobile communications and transport infrastructure challenges, meaning 'off the shelf' solutions delivered in urban areas were not adequate. This resulted in additional costs and more time-consuming design. Bidding for funds from central Government in order to pay for delivery of the measure resulted in further delays. The procurement notice was issued in October 2019 and the contract awarded in January 2020, with the new system going live by mid-March 2020. However, this coincided with the Covid-19 lockdown which resulted in public transport services being curtailed and passengers remaining at home. As a result, there has not been the opportunity to undertake any impact evaluation for this measure. Again, in depth process evaluation has captured the detail behind the challenges and delays which have been experienced.

The evaluation of the measures in Table 5-2 can be found in Deliverable 5.3 *Process Evaluation Results*.

5.1 E-bike share service

5.1.1 Overview of implementation

Significant initial delays were experienced by HITRANS in securing the funding necessary to pay for the e-bike share scheme. The public funding body, Transport Scotland, (which is more accustomed to working with cities) was unwilling to fund a scheme in an area with a small resident population (3,600 inhabitants in Aviemore and around 2,000 in Grantown on Spey), despite the very high numbers of tourists (1.92 million people per year to Cairngorms National Park). Eventually, additional funding was secured from other sources, but the funders were very initially unwilling to allow partnerships with local bike shops for the delivery of the measure. Significant lobbying and advocacy were undertaken to rectify this, which took time and led to a significant delay in the implementation of this measure.

The delivery mechanism for the e-bike share scheme was through public-private partnership agreements between the transport authority (HITRANS) and local bike shops located in the main towns of Aviemore, Grantown-on-Spey and Fort William just outside the CNP area. Through this partnership HITRANS provided the financial support to purchase the e-bikes and

the local bike shops, owning suitable premises and employing office/admin staff and maintenance staff, host and operate the service.

The e-bike scheme was launched January 2020 and was operational for public hire until the Covid-19 lockdown in mid-March 2020. This was a much shorter than planned demonstration period and as a result, the impact evaluation results reported in this Section do not reflect the true potential of this service due to the more limited use of e-bikes expected during dark and cold winter months. Furthermore, a significant re-launch of the service with extensive marketing and promotion was planned for the Easter period to coincide with improved weather, lighter evenings and increased visitor numbers. However, the Covid-19 lockdowns from March 24th forced the closure of the bike shops and the freezing of e-bike hire. The planned promotion and service relaunch had to be put on hold. This closure has continued through the spring and into the summer months resulting in no further e-bike hires. It is important to recognise that the figures for winter hires, between January and March 2020, do not give a true reflection of the potential that the e-bike service offers. This must be borne in mind when interpreting the results presented.

5.1.2 Impact evaluation

The two measures which promoted and facilitated more public transport use, highlighted in Table 5-2, did not become operational during the INCLUSION demonstration period. As a result, they cannot be subjected to impact evaluation. Therefore, some of the initially identified impact evaluation indicators relating to public transport use became redundant. Furthermore, with a total of 46 users of the e-bikes (with all users completing a survey questionnaire) across the 3 locations where they were introduced, there was no noticeable impact on area-wide transport behaviour changes amongst wider target groups.

Taking the above into account, a more focused evaluation has been conducted with the relatively limited number of e-bike users but supplemented with feedback from other stakeholders involved in delivery of the service. This gives indications of the potential for such a service when it continues to be delivered in more favourable good weather conditions and helps identify opportunity for expansion of the service to other locations and more users.

The main source of data used to evaluate the impact of the e-bike hire service comes primarily from user surveys completed by users of the e-bikes when they complete their hire. These were distributed as paper surveys by the bike shops hiring the e-bikes and was also made available as an on-line survey for those who preferred to provide feedback at a later time.

Where relevant, data from area wide surveys has been used to provide background 'before' data for comparison and to elicit the impact of the e-bike measure. For instance, results from the e-bike user surveys analysed against results from the wider survey to assess if there is increased satisfaction with active travel offerings amongst the e-bike users compared with the wider population. Due to the small number of e-bike users this must be interpreted with

caution, however, it does give an indication of changed attitudes resulting from the provision of shared e-bikes.

Summary of main findings from e-bike user surveys

The main aim of the e-bike share service is to promote active travel and increase active travel options in CNP. A long-term goal is for residents to cycle more and to purchase their own e-bike as a result of experiencing use through the e-bike share scheme.

Despite the short demonstration period and taking place during winter months, there are indications from the user feedback received that the e-bike hire measure has potential to address the main aims of the measure. Table 5-4 summarises the user feedback related to the main aims of the e-bike share scheme.

Table 5-3 Summary of e-bike user survey responses from each Hub location

Location	Residents	Visitors	Total
Aviemore	18	5	23
Grantown	4	5	9
Fort William	13	1	14

Although numbers of users were limited, those that did use the e-bike were all very positive about the experience.

- For tourists, as expected, the overwhelming reason for using the e-bikes was leisure.
- For residents, leisure and health were the most commonly stated reason for use, with accessing work mentioned by 6 users (17% of residents).

Table 5-4 Summary of main measure aims against impacts observed

Measure Aim	Impacts
To increase active travel options in CNP for vulnerable users	5 resident respondents (15%) were over 65 and 20% were in the 56-65 bracket. A further 2 residents used the e-bikes to help recover from injury or to help with an underlying respiratory condition
For residents to cycle more	Over 65% of residents had never used an e-bike before, but all respondents stated they would use e-bikes again
For residents to purchase their own e-bike because of experiencing use through the e-bike share scheme	4 resident e-bike users have purchased an e-bike since hiring

It is particularly encouraging that the e-bike hire scheme has been used to access work and has been used to increase mobility options for mobility impaired and older users, especially as elderly users are least likely to hire e-bikes during cold winter months.

Also, it is of note that while all respondents to the e-bike survey either never used public transport or only used it occasionally, 3 out of the 11 visitors did access the CNP area by train and then used the e-bike to get around. Although this is a very small sample, the proportion of using e-bikes who accessed CNP using PT is much higher than the average proportion of all tourists using PT to access CNP (on average, only 3% of all tourists use public transport to access CNP - source: Cairngorms Visitor Survey 2014-15, Full Report, 1st July 2015). This suggests there is potential for the e-bike scheme to facilitate greater visitor access to CNP by public transport; however, more data is required to confirm the extent and reliability of this limited sample data.

Surveys with e-bike shop owners

The e-bike hire schemes were introduced at three locations in a public-private partnership agreement between the regional transport authority (HITRANS) and local bike shops in Aviemore, Grantown on Spey and Fort William.

In order to supplement the user feedback reported on above, interviews were conducted with the bike shop owners to establish a more complete picture of the benefits to bike shops, benefits to users, and longer-term opportunities and potential impacts foreseen by the bike shop partners. The results from these interviews and surveys are summarised in Table 5-5.

Table 5-5 Overview of feedback received from bike shop owners

Goal	Outcome
Business benefits	Enabled a bigger range of bikes on display and available for hire.
	Increased sales through talking, showing and allowing local people to trial the e-bikes. Between Jan and mid-March, 4 e-bikes were sold to persons who had hired an e-bike through the scheme.
Community benefits	Increased knowledge and awareness of cycling and e-bikes in the community.
	Health benefits of e-bikes and empowering users lacking confidence or with mobility impediments: <ul style="list-style-type: none"> In Aviemore, the bike shop has had people recommended to try e-bikes by the local GP (Doctor's) practice. The bike shop has been working on building a positive relationship with the GP practice.

	<ul style="list-style-type: none"> • Two customers, unable to cycle and suffering a lot of pain when walking after hip operation, hired e-bikes and realised they could become mobile and enjoy cycling again without pain. Both have now ordered an E-bike as a result of the hire scheme. • One older customer had a fear of cycling and not being able to make it home. Hired an e-bike which immediately removed this fear. Ordered an e-bike as a result. • Another customer had not cycled for years due to poor fitness and a back problem – found regular bike too difficult – Hired e-bike which took the stress out of cycling and enabled customer to become active again.
Improving engagement with vulnerable target groups.	<p>Plans are in place for greater promotion and referral for e-bike use through GP practices in Aviemore and Grantown-on-Spey and through the local Chiroprapist. This is particularly relevant to the more able elderly population and for those with certain mobility difficulties.</p> <ul style="list-style-type: none"> - <i>“With the new hospital due to open in Aviemore in 2021, we are keen to explore with health partners how we could better support and promote wellbeing and good mental health within our local community.”</i> <p>E-bike open days have been held at villages outside immediate bike shop location. One has been held which was well attended and another had been planned in April 2020 but had to be cancelled due to Covid-19. This raises awareness and provides opportunity to trial e-bikes for local residents in deeper rural settlements outside the bike-shop vicinity.</p> <ul style="list-style-type: none"> o A 76-year-old has said the e-bike has been his lifeline given that he lives in a deep rural area. The bike shop was able to deliver his e-bike to Laggan (40km from Aviemore). <p>Plans are being developed to link promotion to elderly persons through the local Community Transport Company and Day Care Centres, benefiting the more able elderly people that can access these services.</p> <p>To broaden this to as many vulnerable users as possible, the inclusion of e-trikes is being considered to enable many more elderly and mobility impaired persons to benefit from the scheme. The e-trikes can carry 2 passengers on the front with one cyclist, usually a volunteer from the Community Transport Company. The aim is to improve mental health and wellbeing and tackle loneliness and isolation, so will benefit service users and volunteers alike.</p>



E-Trike in use in Cairngorm National Park

Source: Badenoch and Strathspey Community Transport Company Newsletter, March 2019

Two of the bike shops are keen to further promote to younger age groups, working with local college and local teachers with free demo days. This will be pursued once again once Colleges and Schools re-open after lockdown restrictions are relaxed.

Generally, all the bike shop owners were very positive about the partnership arrangement and all very keen to continue the arrangement with HITRANS into the future. They all see the potential for growth and are keen to discuss opportunities to expand the arrangement to more target users and with more cycles.

5.1.3 Discussion on validity of the data

Given the difficulties of funding interventions, there was a very limited scope to assess general change in behaviour from target group populations. As discussed above, the two measures intended to promote and facilitate more public transport use across the region, highlighted in Table 5-2, did not become operational during the INCLUSION demonstration period. The e-bike measure, introduced at 3 locations, had a total of 18 e-bikes available for hire. The number of potential users of the e-bikes is limited by the capacity of the scheme and is not at sufficient scale to generate area wide behaviour change data. Compounding this was the limited time the e-bikes were available for hire: for 10 weeks from January to mid-March 2020. This coincided with the darkest and coldest period of the year in a higher altitude northern Europe rural area when daytime temperatures rarely exceed 5 degrees Celsius and it is dark by 4 p.m. This had a dramatic influence on the number and type of e-bike hires that were generated. The result of this was a limited number (46) of user surveys from persons who were generally more confident cyclists less deterred by the adverse weather. The short length of the demonstration period (10 weeks), but more the nature of the scheme, typically one-off hires, was not conducive to show longitudinal changes in habitual behaviours such as driving for a significant majority of journeys. Nevertheless, the data does highlight some longer-term intention for more

sustainable travel behaviour in that all users stated they would use e-bikes again and 4 out of the 35 resident users are known to have purchased an e-bike after their hire experience.

As a result of the above, the process evaluation and the bike shop owner surveys provide a more illuminating account of experiences within this pilot lab and provide valuable lessons for future operation and for transfer elsewhere.

5.1.4 Impact of Covid-19 and opportunities related to Covid-19

The outbreak of the Covid-19 pandemic had a significant effect on the demonstration of the e-bike share measure in CNP. On 16 March 2020 the UK Government advised everyone in the UK against "non-essential" travel and contact with others. The full lockdown commenced on 23rd March 2020. As a result, the e-bike share scheme closed to the public on 16th March 2020. The demonstration period had been active for only 10 weeks during the dark and cold winter period. This closure has continued through the spring and into the summer months resulting in no further e-bike hires. It is important to recognise that the figures for winter hires, between January and March 2020, do not give a true reflection of the potential that the e-bike service offers.

It was expected that there would be a surge in hires due to improving weather from April onwards. A significant re-launch of the service with extensive marketing and promotion was planned for the Easter period to coincide with improved weather, lighter evenings and increased visitor numbers, but this could not happen due to Covid-19.

However, the Covid-19 crises has presented some notable opportunities for a public e-bike hire scheme.

- Because the e-bikes are a shared public resource they have been made available to key workers in the area (police, health service, supermarket staff) to get to and from work during the lockdown. This is especially important while public transport services have been reduced or curtailed. The offer proved extremely popular with all bikes hired within a day. This has been a good news story to come out of the pilot and could potentially cause a modal shift, with users hiring the e-bikes for longer it could help to demonstrate the variety of journeys possible using an e-bike. Although this was not the outcome predicted it demonstrates the flexibility of e-bikes in the area and personifies the term "demand responsive transportation".
- The engagement with employers during the Covid-19 response has highlighted the benefit of working with businesses and promoting e-bikes through the workplace as a means of travelling to work. One example is the case of a farm worker in Laggan who has use of an e- bike for a week to allow him to help with lambing on a local estate.
- The current Covid-19 restrictions have created an opportunity for one local restaurant business in Aviemore. They have had to close the restaurant in Aviemore, but the owner

is cooking/baking and delivering from home. They are exploring the possibility of using an e-bike with trailer attached for the deliveries.

- There is a real risk of a reduction in public transport services and volunteer car services when Covid-19 restrictions are relaxed. These services offer the only mobility options for many vulnerable persons in rural areas who do not own a private car. E-bikes offer a safe alternative for many rural dwellers once the Covid-19 restrictions are relaxed. This is particularly important for more able older persons and those with underlying health conditions. Although the e-bike hire has been closed during the Covid-19 lockdown, the bike shops have received lots of enquiries from 60+ age group about hiring and purchasing e-bikes once they reopen.

5.1.5 Financial sustainability assessment

In the rural CNP area the demand from individuals for a shared e-bike service is not sufficient for commercially viable operation from private sector providers. For the public sector to set-up and manage the e-bike sharing service would require significant on-going day to day operational input and additional infrastructure or premises to establish hubs for hosting the service. This would require significant additional budgets and staffing, both of which are very limited in rural areas.

The solution that was delivered for CNP was to establish a public private partnership with local bike shops that already existed in the main towns of the CNP area. Through this partnership the public-sector partner (HITRANS in the CNP case) provided the financial support to purchase the e-bikes and then partners with local bike shops that own suitable premises and employ office/admin staff who can host and operate the service.

While there is still the requirement for some public-sector funding, the overall cost of delivering the service is significantly reduced compared to the cost of the public sector providing the service on its own. The private sector bike shop subsumes the operating cost of the bike hire within their existing premises and staff costs and only receive public sector payments to cover bike/vehicle maintenance costs. Their motivation is to increase the number of people cycling, who may then go on to purchase their own bike from the shop. The users of the hire service may also purchase cycle accessories from the shop.

Apart from the reduced overall cost of delivering the service, there are several other advantages of this set-up:

- The financial support provided by the public sector offers the leverage to ensure the e-bike service is designed and delivered with certain vulnerable user needs in mind.
- Using existing bike shops with their own in-house maintenance capability results in a much lower cost than buying in maintenance services from elsewhere, especially in rural areas where little competition exists.

- Local Bike shops have an established presence within the community and can act as the local champion, continually promoting e-bikes within the community and establishing partnerships with local health service providers and local businesses. This is a significant advantage over a stand-alone on-street hire service.

To ensure that the on-going operational costs of the e-bike service are sustainable, while remaining affordable to lower income local users, the bike shops are developing different pricing for tourist use and for locals. Daily charges for tourist hire range from £40-£55 per day with slightly lower half day rates. It is anticipated that these high charges for tourist hires can be used to cross-subsidise longer term and low-cost hire to local residents so that the operational costs and revenues are cost-neutral. It will take a full season to establish the discounted pricing and conditions for local hires, but this is a medium-term goal. At present, all three shops provide locals with an hour long hire for free on a trial basis, but all three shops are keen to establish longer-term low-cost hire during winter months for locals. Currently only one shop has introduced a week-long winter hire for the equivalent daily hire price in summer. It is also expected that in the summer the bikes could be made available for local use, at low cost, in early morning and late afternoon /evening with the middle of the day reserved for the premium cost tourist use. This could support work trips and evening health/leisure trips for locals while generating revenue from tourist use to cross subsidise discounted local hires.

5.1.6 Main findings

The e-bike share service has empowered:

- more able old persons to enjoy active travel for health and leisure purposes (15% of resident users were over 65 and 20% were 56-65 years old);
- persons with certain mobility impairments or health conditions to aid recovery/maintain fitness; and
- younger persons and those suffering from transport poverty to access work by providing an affordable travel option that fosters independence.
- Public-private partnership with local bike shops provides a successful and cost-effective mechanism for delivering e-bike sharing schemes in rural areas.

Lessons learnt include:

- Public sector financing to purchase the e-bikes provides the leverage to ensure vulnerable users and locals can benefit from the scheme.
- Using local bike shops to host the service reduces operating costs, provides in-house maintenance and increases promotion and engagement within the local community.

- Importantly, bike shops act as the local champion, continually promoting e-bikes within the community and establishing partnerships with local health service providers and local businesses. Another advantage over a stand-alone on-street hire service.
- Generating revenue from tourist use provides an opportunity to cross-subsidise discounted local hires but there may be conflicting demand between tourists and residents for e-bike hire during summer/tourist high season.
- Short term hires are good for tourist, leisure and health/fitness related trips. Longer term hire of several weeks are better for accessing work and can help young people or unemployed access job or training opportunities for the duration of a course or until they can afford to purchase their own form of transport.
- In the recovery from Covid-19, the e-bike share service offers a much safer form of transport than collective travel options and will be an increasingly valuable part of rural mobility and a key transport supply option within Mobility as a Service solutions.

6 Flanders region pilot lab (Belgium)

The Flanders pilot lab is led by Taxistop, a non-profit organisation focussed on promoting and delivering mobility solutions that respond to people's needs and offer them alternative solutions to save time and money. They operate across Belgium, with much of their activity centred on the Flanders region. The Flanders area of Belgium provides a mixture of urban, peri-urban and rural geographies. A number of issues are currently affecting transport accessibility in the area for vulnerable groups of the population.

The focus of the Flanders Pilot Lab is to test new technologies to make two specific target groups more mobile. Deliverable *D4.5 Innovation Pilot Lab Flanders - implementation and results - final version*, describes in detail the measures to be demonstrated, their design and the implementation process of the measures. It also provides a more detailed description of the characteristics of the Flanders PL. Table 6-1 summarises the INCLUSION measures being demonstrated and included in the impact evaluation for the Flanders PL.

Table 6-1 Overview of INCLUSION measures being demonstrated in Flanders PL

Measure name	Description
Deliver enhanced MobiTwin app to older, disabled and mobility impaired users	Taxistop is the founder of the Less Mobile Stations (LMS) service where it provides door to door transport, provided by 2900 volunteer drivers, for 31,000 less mobile elderly people in Flanders. The members can call the station to book a trip at least two days in advance of travel. Since Taxistop wants to provide more innovative solutions for sustainable and inclusive mobility, they are organising the roll-out of the MobiTwin app in Flanders. The MobiTwin app will offer a digital version of the Less Mobile Stations service which matches trip requests for door-to-door transport (in real-time) for older persons and those with mobility impairments with trip offers from volunteer drivers. This provides more convenience for volunteer drivers and a more responsive service for passengers. Taxistop delivered the app at two LMS stations (Ghent and Oudenaarde) where both driver and member have access to the app.
Tailor Olympus app MaaS solution to (un)employed people with low incomes who have a migration background	Taxistop is working together with different partners (NGOs, app provider and private business) to offer a Mobility as a Service (MaaS) style mobile travel information app for (un)employed migrants with low or no income. The focus is on making the job market more inclusive and accessible for migrants for whom it is difficult to find a suitable job. This target group experiences large barriers to using transport options other than a privately-owned car. The barriers include: language, cost or lack of knowledge about PT possibilities. This PL investigates whether a tailored version of the existing MaaS Olympus app can offer a feasible solution when applying for a job with companies that are located in areas that are difficult to reach and the jobseeker has no car of his/her own. This will involve provision of a fixed budget to be used on transport services available through the MaaS platform and simplified language and information presented through the app.

6.1 The MobiTwin app

6.1.1 Overview of implementation

An in-depth description of the implementation of the MobiTwin app is provided in *D4.5 Innovation Pilot Lab Flanders: implementation and results – Final version*.

The basic functionality of the MobiTwin app was developed prior to April 2019 and then underwent a test/co-design phase in consultation with LMS volunteer drivers and LMS members, which continued through the launch of the App in October 2019 and until January 2020. A campaign to recruit drivers to the LMS service and joint promotion of the MobiTwin app with a rebranding of 'Less Mobile Stations' to 'MobiTwin' took place across Wallonia and Brussels in July 2019 and later in Flanders in January 2020. In addition, MobiTwin was continuously promoted by Taxistop at local LMS member days between February 2019 and November 2019.

The demonstration was planned to run from October 2019 through until April 2020; however, this was curtailed due to a lack of interest from LMS volunteer drivers and passengers, and increasingly limited support from LMS employees. From January 2020, the focus moved from demonstration to understanding barriers to use and reluctance to use the App from members, volunteer drivers and LMS staff.

6.1.2 Impact evaluation

The MobiTwin app was available for use in Ghent and Oudenaarde between October 2019 and January 2020. The Less Mobile Stations service in Ghent has 189 members and 28 volunteer drivers, while the Less Mobile Stations service in Oudenaarde has 160 members and 22 volunteer drivers.

Although the new MobiTwin app was developed and available for use during the demonstration phase, there were no actual successful use of the app. The reasons for this are analysed below. In total there were 25 downloads of the app by drivers and LMS members, but only 3 volunteer drivers who downloaded the app were willing to use the app (2 in Ghent and 1 in Oudenaarde). However, without LMS members actively using the app it was not possible to properly test the app with these volunteer drivers. As a result, the impact cannot be evaluated against the key performance indicators identified for the measure.

Instead, a different approach to the evaluation is undertaken whereby we examine the objectives and expectations and whether these were realistic or indeed needed. An evaluation is also made of what went wrong in the implementation and what lessons can be learnt both for the MobiTwin app going forward and for more general application of technology solutions to certain vulnerable user groups. To be able to conduct such an evaluation, from January 2020 the focus moved from demonstration to understanding barriers to use and reluctance to use

the App from members, volunteer drivers and LMS staff. This was achieved through analysis of extensive surveys with LMS staff, 183 volunteer drivers and 112 LMS members across Flanders to understand the need for the measure and examine the potential demand for the measure in the demonstration area. This was then supplemented by continuous feedback from LMS members to LMS staff and one-to-one interviews with LMS staff and volunteer drivers on experiences with the MobiTwin app itself.

The first objective of the measure was to *"introduce a new technology (real-time MobiTwin app) to elderly and disabled target groups to make leisure and social activities more accessible, provide a service that is more responsive to user needs and to provide for urgent trips."*

While the real-time MobiTwin app was developed and made available for use by volunteer drivers and by LMS members, it was not actively used by either group. The analysis presented in

Table 6-2 explores the reasons for this.

Table 6-2 Analysis of reasons for low uptake and use of MobiTwin app

Reason for low use	Analysis
Were the target users technology ready?	<p>The 'before' survey conducted with 112 members and 183 volunteer drivers, from LMS services across Flanders, revealed that:</p> <ul style="list-style-type: none"> o 50% of LMS (passenger) members used computers or smartphones on a daily basis, with only 33% claiming they can work well with the latest technologies and 64% are not interested in new technologies. o Around 75% of volunteer drivers used computers or smartphones on a daily basis, but only 39% claimed they are comfortable and can work well with the latest technologies and 56% are not interested in new technologies. o The current preferences for requesting a trip amongst LMS members are by telephone (53%) and in person (27%) with only 13% preferring a website or app. o For volunteer drivers there is less reliance on telephone (28%) with 53% preferring to make themselves available via e-mail and 16% by website or app. <p>So around 33% of members and 39% of drivers actually would consider that they have the capability to use the new technology, but only 13% of members and 16% of volunteer drivers claimed they would prefer to use new technology for organising their trips.</p>

<p>Was the real-time capability needed by the target group?</p>	<p>The 'before' survey conducted with 112 members and 183 volunteer drivers, from LMS services across Flanders, revealed that:</p> <ul style="list-style-type: none"> o 50% of LMS (passenger) members used computers or smartphones on a daily basis, with only 33% claiming they can work well with the latest technologies and 64% not interested in new technologies. o Around 75% of volunteer drivers used computers or smartphones on a daily basis, but only 39% claiming they are comfortable and can work well with the latest technologies and 56% not interested in new technologies. o The current preferences for requesting a trip amongst LMS members is by telephone (53%) and in person (27%) with only 13% preferring a website or app. o For volunteer drivers there is less reliance on telephone (28%) with 53% preferring to make themselves available via e-mail and 16% by website or app. <p>So around 33% of members and 39% of drivers actually would consider they have the capability to use the new technology, but only 13% of members and 16% of volunteer drivers claimed they would prefer to use new technology for organising their trips.</p>
<p>Was there demand for the MobiTwin app in the demonstration area?</p>	<p>In total there are 349 members within the Ghent and Oudenaarde LMS services. If 13% of these preferred to use new technologies to arrange their trips this equates to 45 members. Now only 21% of these stated they had a need for transport with a shorter notice period than already offered (7% of members stated they had any need for transport within the hour. 14% stated they needed transport within a day). This represents between 9 and 10 members who would be likely to benefit most from using the MobiTwin app and who would be willing to test the app.</p> <p>Feedback from LMS members highlighted the main reasons given for not using the app:</p> <ul style="list-style-type: none"> o Missing the personal contact (with LMS staff) o Fear of the technology o Don't want to change their habits o Age o Health and physical/mental ability o No ownership of smartphone or computer <p>On the volunteer driver side, 20% stated they were available on a daily basis and 50% were available several times a week. Having a system that would easily allow them to share the times they are available does seem to have merit, especially where these times are not fixed from week to week.</p>

	<p>For Ghent and Oudenaarde there are a total of 50 volunteer drivers. If only 16% preferred to use technology for arranging their trip offers this equates to 8 drivers. Now if 70% are offering trips on a daily basis or several times a week they would be likely to benefit most from the MobiTwin app and so we can assume they would be most likely to use it. This represents between 5 and 6 drivers who would be likely to benefit most from using the MobiTwin app and who would be willing to test the app.</p> <p>The main reasons given by volunteer drivers to not test the app included:</p> <ul style="list-style-type: none"> o Too difficult o Don't want that responsibility. Matching the trips should stay with the LMS staff o No ownership of a smartphone <p>The above demand analysis suggests that there would only be around 10 members and 5 volunteer drivers that would gain benefit and be willing and able to test the app in the demonstration area. During the demonstration, 25 LMS members and volunteer drivers downloaded the app, but only 3 volunteer drivers actively offered trips using the app. It seems that the numbers involved in the two test locations (Ghent and Oudenaarde) were not large enough to generate sufficient volunteer drivers or LMS members willing to test the app. However, the more fundamental problem was that only a small proportion of the target group had the capability to use the app and only a small percentage of these had the desire to test the app as it did not provide sufficient benefits to the users.</p>
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The second objective of the measure was to *“make the workload more bearable for the employees of the Less Mobile Stations who are currently matching requested trips by calling volunteers (with the MobiTwin app, the matching happens automatically)”*.

Analysis of the surveys from 98 LMS providers across Flanders revealed that 64% of the LMS's consider the search for a volunteer driver to match to a trip request is their most time-consuming task. It is clearly an important issue where the LMSs would benefit from a more effective and efficient solution.

In the pilot lab areas: the Ghent LMS service matches, on average, 43.5 trips per week to volunteer drivers; the Oudenaarde LMS service matches, on average, 39 trips per week to volunteer drivers. This is a fairly typical workload for LMSs across Flanders. Around 30% of LMSs deal with 0-20 trip requests per week, 40% with 21-50 requests per week and another 30% with more than 50 requests per week. Perhaps the LMS with higher numbers of requests per week would benefit more from the automated matching provided by the MobiTwin app.

To fully understand the potential reductions in workload that MobiTwin offers it is necessary to explain the processes involved in handling trip booking requests and driver availability offers.

- Prior to MobiTwin, volunteer drivers contact the LMS office (mainly by email but also phone) to inform them of their availability for the upcoming week. This needs to be done at least two days in advance. The LMS staff then enter this into their central booking platform. When a trip is requested by a member (usually by phone or in person), the LMS employees look at the available volunteers on their central system. If a match is found, the LMS employees must call the matched volunteer to double check if they are still available. If no match is found the LMS staff start to contact volunteers to try and find someone who is available. This is one of the reasons why members must request their trips at least 2 days beforehand. However, because the LMS member is usually making the request by phone or in person there is scope for some form of discussion to find out if the member has a preference for any of the available volunteers.
- With MobiTwin, most volunteer offers and member requests will continue to be made in the above way. However, some volunteer drivers will make their offers only through MobiTwin. Also, some trip requests will only come through MobiTwin. This means that there needs to be seamless integration between both the MobiTwin system and the LMS central booking platform – in order that members using MobiTwin can see all driver offers on both systems, and also in order that LMS staff can also see on the central platform any driver offers only input via MobiTwin for anyone who calls the LMS office. Although the integration between MobiTwin and the LMS Central Booking System is established, while LMS members or volunteer drivers continue to use different mechanisms for requesting bookings / offering availability there still requires intervention from the LMS staff.
- For instance, if a member phones the LMS office with a trip request and the LMS staff search on their central booking platform they should see all volunteer offers, including those input via MobiTwin. If an offer entered by a volunteer via MobiTwin is selected by the member then the LMS staff member can simply submit this request to their system and it can be communicated to the volunteer via the MobiTwin app. However, there is a final confirmation exchange between volunteer and member which now also needs to happen via the LMS staff member. A similar challenge comes when a member is making a trip request using the MobiTwin app and selects a volunteer offer that was made by phone and exists on the central booking platform. The LMS staff need to intervene to contact the volunteer as they are not using the MobiTwin app. Therefore, while there is still a significant proportion of LMS members requesting lifts by phone, there will still be the need for many interventions from LMS staff even if most of the volunteer driver offers are submitted from the

MobiTwin app. As a result, the LMS workload is not significantly reduced until a majority of both users and volunteers are using the app.

So, with very low numbers of LMS members or volunteer drivers utilising the app, there is a need for the LMS staff to intervene in most cases. Given that the intention is to remove the 48 hour advance notice period, rather than reducing workload for the LMS staff, this will in many situations generate a more stressful working environment for LMS staff. Feedback from LMS's during the demonstration period highlighted the doubts that the LMS's had regarding the integration of the MobiTwin app with their existing central system. They expressed concerns that it didn't seem realistic for employees to keep up with all the rides if short notice booking was allowed.

Other concerns that LMS employees had were that members and volunteers not familiar with the newest technologies, including the most vulnerable members, will be left behind, which is contrary to the main goal of the LMS's to engage the most vulnerable people who usually fall by the wayside. Right now, every trip request and trip dispatch happens through a phone call and/or email or in person. The social contact is very important for the members to have someone they can rely on and for the volunteers to stay motivated. Working through an app can contain the risk of losing the social contact with members and volunteers.

The members gain a lot through the social company with volunteer drivers. However, the privacy of volunteers needs to be protected at the times they do not make themselves available – this is done by the LMS staff who act as an intermediary between member and volunteer. The MobiTwin app shares some personal information of the driver to maintain the flow of a trip, thereby losing this privacy barrier.

The third objective of the measure was to *“expand the LMS to more people with mobility issues (such as young people, or people in poverty) and increase the pool of volunteer drivers.”*

This third objective is a longer-term goal. Certainly, broadening the target user group for LMS to younger people would increase the pool of persons with willingness to use new technologies. Increasing the pool of volunteer drivers requires much more effort in the form of marketing and promotion, but also offers the potential to attract younger volunteers who may perhaps be more inclined to volunteer their time and offer trips to social and leisure activities in which they may share an interest with the LMS member. Again, the possibility to use the MobiTwin app would be much more attractive to this cohort of volunteers.

6.1.3 Impact of Covid-19 and opportunities related to Covid-19

As the MobiTwin demonstration had already been re-focussed from on-going demonstration to try and understand the reasons for poor uptake and use, the Covid-19 pandemic from mid-March 2020 did not affect the demonstration; however, further planned workshops and focus groups with volunteers and members and with LMS staff, to better understand the shortcomings of the measure, could not be held.

The outbreak of the Covid-19 pandemic did have a major impact on the LMS service in general causing the shut-down of LMS services. Firstly, all travel except essential trips was banned. This meant travel for social and leisure purposes was not permitted. Secondly contact with persons from outside the same household was not allowed and so sharing a car with a volunteer was not possible. Thirdly, the target group of elderly members are the most at risk from the virus and so even as lockdown rules become more relaxed, there is reluctance and reservations from both volunteers and members to come into contact and share vehicles.

Opportunities presented include the greater need for home delivery of food and medicines to members' homes and the repurposing of volunteers to provide this service. Although this is not supported by the MobiTwin app, it could be something that is being considered as an additional feature in future.

6.1.4 Financial sustainability assessment

The delivery of the LMS service is already a low-cost solution being based on the use of volunteer drivers. The main costs come in the form of staff time for the LMS office staff who coordinate and manage the service. The MobiTwin/LMS service is mostly delivered to cities and townships who manage the operation at a local level within their own region. The staff of the LMSs are already employees of the Townships and cities that are using the service.

The MobiTwin app is a technology tool designed to provide real-time transport options to members, but also has the potential to automate the matchmaking and booking process between volunteer drivers offering their time and LMS members requesting trips. This could reduce the staff resource required for providing the LMS service. As 64% of the LMS's consider that the search for a volunteer driver to match to a trip request with is the most time-consuming task they undertake this could result in significant efficiencies, where LMS staff time could be diverted to recruiting new volunteers, or to other activities. However, in its current form and due to the low user base amongst the elderly membership it is not clear the extent to which savings could be realised.

6.1.5 Main findings

Main findings from the LMS employees' feedback were:

- Taxistop was very dependent on the LMS's since they have direct contact with and a very good insight on the needs and wishes of volunteers and members. However, there was a lack of trust in technology from LMS staff. This stifled the uptake of the App by volunteers and members.
- The employees of the LMS have hesitated to introduce the app to their volunteers and members because it could decrease the social contact with the users of the service.
- Often there is a negotiation process between the passenger and LMS employees in order to find a match to drivers. This is more difficult to replicate in the MobiTwin app.
- Many of the target group within the demonstration were not digitally connected. The vast majority of target users (LMS members) are not sufficiently tech savvy to adopt this type of app.
- LMS providers need to retain their role as human intermediary coordinating between elderly members seeking trips and volunteer drivers offering trips.

Main findings coming out of the LMS member and volunteer driver feedback are:

- the LMS members do not need an instant booking capability – only 7% stated that they had any need for transport within the hour,
- LMS members will not use an app – only 13% stated that they would use new technology to organise their trips,
- personal contact between the LMS members and staff remains important for both social and practical purposes,
- some volunteer drivers see benefits in removing the 48 hour notice period,
- the LMS service (without the MobiTwin app) remains popular with most of the responding members reporting satisfaction with their access to social and leisure activities: 36% claim to have more access to activities because of the LMS service, 50% claim to feel safe during a trip and 93% claim to be sure to reach their destination with the LMS service.

The main conclusion is that the solution needs to fit the abilities and speed of life of the target group. Ultimately the MobiTwin app was applied to solve a problem that wasn't needed by the target user group and did so by introducing a technology that wasn't useable by the target user group. The focus for future enhancements should be around the benefits that the app can deliver to the volunteer drivers and LMS staff. Co-creation with these stakeholders to meet their needs and requirements is key.

Opportunities for the app do exist where there is a younger and more technology ready target group and for trips where instant response to requests is important. A critical mass of both drivers and users is required for the technology/matching to be effective. This will never be

reached with the LMS members' target group but could be attainable with younger cohort of volunteers and passengers.

Lessons learnt include:

- Ensuring the privacy of volunteer drivers is important. Several volunteers shared their concern on their privacy with the app. Currently all the communication prior to the trip happens through the LMS employees. This gives volunteers a certain amount of privacy and distance in the face of members who get too attached to a driver. When a request occurs through the app, members and drivers have to share some information (such as a phone number), in case of emergency. This can then result in unwelcome contact from the member at other times.
- Another important lesson is the fact that surveys, and especially online surveys, are not accessible and trustworthy enough for this target group. This target group often experiences situations that are considered 'normal' or 'easy-going', as complex or scary. This is why more in-depth insights on the mobility needs are necessary. Focus groups can be a good alternative for the surveys if the location of the sessions is considered as accessible or convenient for the participants. One-on-one interviews may be the most suitable way to collect data from less mobile and elderly people. Creating a dialogue and building up trust relationships with every stakeholder can have a positive impact on presenting new solutions. This conversation should start as early as possible in the process of creating new solutions.
- Co-creation can be a helpful tool to present new technologies to vulnerable target groups. By involving all stakeholder from the first step of creating new solutions and including them as a part of the creation, a stronger feeling of belonging and owning something can be created. This lesson sits perfectly with the principle of empowerment: put more effort into creating conversations, involve the users and encourage them to come up with solutions in the process rather than creating solutions for them.

6.2 Tailored Olympus app

The Olympus Mobility app is an already existing MaaS app that is provided by employers to be used by their employees. The app covers the whole of the Flanders region and integrates all public transport options and bike sharing in one app. For the INCLUSION project, Taxistop worked with the Olympus app developers to simplify the interface and introduce some new functionalities/features to allow its use by low income and migrant job seekers. The workplaces suited to migrant workers are often located in rural areas while many job seeking migrants live in the more urban areas. The PT journeys can be relatively long and expensive. A specific feature introduced was a personal mobility budget of €30 provided automatically through the app to

approved migrant job seekers. Depending on what kind of transport they use this could cover the cost for a maximum of 10 trips.

6.2.1 Overview of implementation

The app adaptations were introduced prior to April 2019 and this was followed by a period (May - Aug 2019) where Taxistop worked with NGOs (via the STEP2 project) who provide direct support to migrants looking for work. This involved producing supporting materials to help migrants understand not only how to use the app but also how to use the transport services available through the app. User manuals for the app and for the transport modes available through the app were produced in English, Dutch and French. In addition, videos were produced to visualise key aspects of a transport journey including ticket purchase.

During Sept-Oct 2019 the app was presented through info / training sessions to the support partners on how to use and present the app to potential users. This pilot was very dependent on the STEP partners because of their expertise and experience with thousands of job seekers a year from all over Flanders, most of whom are migrants. The STEP partners functioned as a bridge between Taxistop and the job seekers. Taxistop had to invest a significant amount of time and effort in personal contact and building trust relationships with the support partners.

The testing phase ran from Nov 2019-March 2020. It was curtailed slightly earlier than planned due to Covid-19.

6.2.2 Impact evaluation

The main *objective for the measure was to* improve access to job opportunities for migrants through increased awareness and use of mobility solutions by (un)employed migrants (with low income).

There were three sub-objectives from the measure demonstration:

- Engage with the target group and raise awareness of the Olympus app through intermediary support organisations.
- Reach 100 (un)employed migrants with low income to use the app
- Show that the app removes barriers in accessing job opportunities faced by migrant job seekers

In total, the number of people downloading the app did not reach the target of 100 unemployed migrants. During the demonstration, 20 low income persons downloaded the app and 14 of these actively used the app to search for transport options to reach job opportunities. However,

² <http://www.manpowergroup.be/nl/2018/03/27/inclusie-op-de-arbeidsmarkt-het-moet-van-beide-kanten-komen-manpower-groep-intro-web-en-compaan-brengen-hun-expertise-samen-werkzoekenden-en-werkgevers-vinden-elkaar-in-inclusieve-uitzendarbeid/>

only 5 of these were migrants and ultimately only 2 were successful in accessing a new job with the transport solution provided through the app.

With such low numbers of app users and uses, a KPI based impact evaluation is of little value. Instead we present for each objective the related output and outcome indicators and explore the possible reasons that contributed to the low uptake of the app by the target users.

The first objective of the measure was to *“engage with the target group and raise awareness of the Olympus app through intermediary support organisations”*.

The target was for at least 4 information sessions to be held with NGO employees of the STEP partnership in which they would receive training about the app. This target was met with a total of 45 employees from several NGOs trained on how to use the app and how they can provide/present the app to potential users. From these 45 people there were 3 from Compaan VZW and 2 from RiseSmart who were actively involved in recruiting and supporting migrant job seekers in the use of the app. Compaan VZW and RiseSmart are non-profit organisations that help vulnerable groups find their way to the labour market. They provide training for job applicants and recruit users. They also provide insights on the needs and the wishes of the target group. They are not solely focussed on migrants.

The original STEP partnership, which originally had committed to providing engagement with the target group of migrant jobseekers, collapsed in Spring 2019 due to internal issues. The STEP project consisted of a group of organisations offering support services to migrants seeking work and training. STEP had agreed to promote the Olympus app to their clients, collect data on their travel behaviour and attitudes, and train them on the use of the App. Much groundwork with the STEP partner organisations and their employees was lost. The search for new partners took a lot of time and effort. Information sessions were delivered to the employees of the new organisations; however, many of them were not as engaged with the Olympus app as the previous organisations. A further reorganisation of the STEP partnership further disrupted the info-sessions with some already trained staff no longer involved or in positions to recruit migrant jobseekers to use the Olympus app. The process evaluation explores in more detail the difficulties encountered as a result of the collapse of the STEP project and examines the role and importance of partnerships with organisations that support vulnerable groups when delivering these types of measure.

The new partners found it a challenge to fit the promotion and assistance for the Olympus app in their current workload. This led to the small number (five) of persons trained in promoting and providing assistance on use of the Olympus app being active in this role. This undoubtedly led to the lower than expected number of users of the app.

The second objective of the measure was to *“reach 100 (un)employed migrants with low incomes to use the app.”*

The target to reach 100 (un)employed migrants to use the app was not reached. In total there were 20 downloads and 14 users of the app with low incomes, 5 of these being unemployed migrants.

The 5 employees actively promoting the Olympus app came from two organisations, Compaan VZW and RiseSmart, both of which help vulnerable groups, including but not exclusively migrants, find their way to the labour market. This explains why 5 of the 14 users were migrants while the other 9 were low income but non-migrant users.

Given that there were 20 downloads and 14 users of the app from 5 Compaan VZW and RiseSmart employees actively supporting the app demonstration, it is not unreasonable to assume that if all 45 trained staff had been actively supporting the demonstration, and had a sole focus on migrants, the target of 100 users may well have been achieved.

Other factors limiting the use of the app during the demonstration included some potential users that were interested in using the app not being able to because they didn't have mobile data on their smartphone or because the app wasn't compatible for all devices. Another issue was the fact that the login was too complicated for the users: the login name was sent through email, while the password was sent through a text message. These barriers were communicated to the app providers, but no actions were taken further to overcome this barrier.

The third objective of the measure was to *“show that the App removes barriers in accessing job opportunities faced by migrant job seekers.”*

One of the targets related to this expectation was that 25% of migrants using the Olympus app would access job opportunities they otherwise couldn't get to without the App. Of the 5 migrants using the app to search for transport options to job opportunities, 2 of these actually accessed a job opportunity through the app. This represents 40% of the migrant users; however, the sample sizes are far too small to draw any general conclusions from this. For these 2 users it was confirmed that the personal mobility budgets enabled them to use the transport options indicated by the app which they otherwise could not afford. The €30 budget enables free transport access for around 10 trips, giving a week of free transport to work. After this time, the user would be expected to pay for their own travel using income from their job. Feedback received from users and support staff was that the €30 budget was often not enough to use the train on a continuous level for a long-distance roundtrip. To include more continuity, Taxistop provided a second budget of €30 as an additional incentive for testing the app.

Interviews with the small number of users of the app concluded that mobility is not the biggest problem faced by migrants to access the job market. Language and experience are bigger barriers that are being experienced. While it was confirmed that the app increased knowledge on how to get to job opportunities, the other barriers in accessing opportunities were more insurmountable. Several employees of the NGOs (through info-sessions and interview) also confirmed that transport is the final barrier to be removed, and most people they work with are not yet at this stage.

6.2.3 Impact of Covid-19 and opportunities related to Covid-19

Because of the collapse and restructuring of the organisations in the STEP project supporting migrants, there was a delay to the recruitment of migrants to test the app and there was a smaller than expected number of trained support staff active in recruitment and assistance processes. As discussed above, many of the support staff that received training were no longer in post or in direct contact with the migrant jobseekers. By March 2020 these issues had been largely overcome with some extra support staff given training and enthusiastic about promoting the Olympus app to their clients. An example of this was one local champion: an employee of Compaan VZW that was very eager to present the app to potential users. The employee got very engaged and recruited extra users to test the app. Unfortunately, this collaboration had to stop because of the restrictions due to Covid-19. Just as the recruitment was gaining momentum everything had to stop. This has meant that fewer migrant job-seekers could be recruited to test the app (i.e. none in March – May 2020) and that gaining feedback from those who had used the app became more challenging as feedback relied on face-to-face contact through the support organisations.

Covid-19 has also meant that fewer jobs are available, fewer jobseekers are travelling and fewer public transport services are available to use. The main difficulty being that the personal support required by migrants to locate potential opportunities has been unavailable during the Covid-19 lockdown.

In a general sense, the inclusion of bike-sharing services within the Olympus app gives migrant users information on safe modes of travel that they may be able to utilise if distances and locations are compatible. This may be potentially beneficial in some circumstances in the recovery from Covid-19 if sharing confined PT services is discouraged.

In terms of the evaluation, apart from restricting the number of users of the App, the Covid-19 lockdown has meant that planned feedback sessions through focus groups and in-depth interviews were not possible after mid-March because support staff were not available and migrant users could not be reached.

6.2.4 Financial sustainability assessment

While the €30 budget definitely added value in removing immediate cost barriers to migrants accessing job opportunities, it does not provide a long-term solution to making transport more affordable for migrant users. Through the demonstration, it became apparent that the VDAB (public employment service of Flanders) also had some discounts on public transport for jobseekers that were not included in the app. This barrier was turned into an opportunity by the Olympus Mobility app provider contacting the VDAB for collaboration. This meant including the discounts (that are legally regulated) in the app.

6.2.5 Main findings

- Establishing and maintaining good relationships with the organisations that support vulnerable groups is essential when delivering a new technology measure.
- Disruption to the support organisations, compounded by the Covid-19 lockdowns, has presented significant barriers to the successful delivery and uptake by the migrant target group of this measure.
- Migrant users need extra one-to-one support, training and encouragement to become confident to use the technology. This is time and labour intensive.
- Where 'local champions' within the support organisations emerge who are enthusiastic about the technology, uptake by the migrant target users was evident and the app was beneficial.
- While the €30 personal mobility budget definitely added value in removing immediate cost barriers to migrants accessing job opportunities, it does not provide a long-term solution to making transport more affordable for migrant users.
- Although the app increased knowledge on how to get to job opportunities, other barriers in accessing opportunities, such as language and work experience, were more insurmountable.

Lessons learnt include:

- The importance of one-to-one, in-depth conversations. This can provide richer insights on the role of transport in the lives of job seeking migrants and other mobility needs. One-on-one interviews can also guarantee a feeling of safety when the users know that there is a human being behind the technology they can rely on. It is important to be conscious of the positioning and role of the new technology. Technology should be seen as something extra for support in addition to human interaction and not as a full replacement of it.

- Extra effort should be put into involving the target group as being a part of something bigger. This target group often feels left out of how things are decided in society. Giving them a chance to participate in a co-design process can be seen as giving them a voice and the feeling of being heard. This can result in more dedication to get to know new technologies and also the willingness to use them.
- New technology should also be available without the need to own a smartphone. Although a large proportion of the target group owns a smartphone, often they don't have access to mobile data or the app is not compatible with their device. Furthermore, the process of accessing the technology must be kept as simple as possible. Interviews with migrant job seekers revealed that although some found the usability of the app acceptable, they encountered difficulties in downloading it and the process to login presented a barrier to use for some.
- It should not be forgotten that a solution can be defined in several ways for this target group, which is not necessarily a new technology. Often, it can be very useful to start from an already existing and well-known solution. The advantage here is that the target group already has a certain degree of experience and vision on how this solution can be made more accessible and comprehensible. Sometimes better comprehension can be a solution by itself. For example, having an awareness and understanding of their rights to certain transport discounts can have a major impact on daily travel behaviour.

7 Barcelona peri-urban area pilot lab (Spain)

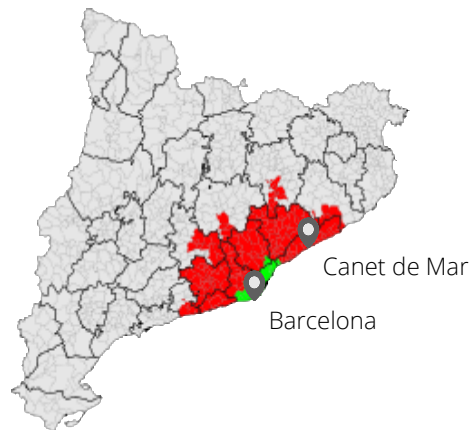
The focus of the Barcelona Pilot Lab is to reduce territorial accessibility barriers due to poor or inflexible transport experienced by residents from peri-urban areas of Barcelona and neighbouring towns/rural areas to attend cultural events located in peri-urban areas of the Barcelona Metropolitan Region. Target users are occasional groups of travellers (particularly young people), moving as individuals or small groups, travelling to common destinations such as music festivals. The pilot covers the peri-urban area of Barcelona Metropolitan Region (BMR), differentiating 4 sub-areas:

- Area 1 (First zone): comprising other municipalities (outside Barcelona) in an official union of adjacent cities and municipalities called Barcelona Metropolitan Area (BMA), with a population of 3,220,071 in an area of 636 km² (Residential, Business, Leisure and Tourism).
- Area 2 (Second and Third zone): considered as an urban and metropolitan adjacent area. It forms a belt of cities: Vilanova i la Geltrú, Vilafranca del Penedès, Martorell, Terrassa, Sabadell, Granollers, Mataró and their respective areas of influence. The Catalan government projects the interconnection by means of the Orbital Railway Line (Residential, Business, Leisure and Tourism).
- Area 3 (Fourth, Fifth and Sixth zone): considered a territory of consolidated expansion. In the area, the expanse is of a radial type, spreading across fluvial corridors or depressions, as in the case of Manresa, Igualada and Vic, or continuing to the coast, as in the case of Blanes and El Vendrell (Residential, Business and Agriculture).
- Area 4 (Seventh zone): Includes long distance trips to other metropolitan and/or urban areas located outside of zone 6 but inside Catalonia; i.e. Lleida, Girona, Tarragona, etc.

The current transport situation prioritises public transport infrastructure investment in urban centres, which are more densely populated and amenable to public transportation with frequent, regular stops. There is a mounting demand for transport services to, from and around peri-urban areas. Public transport authorities generally provide radial routes linking peripheries and the metropolitan centres. However, radial routes do not always meet the needs of citizens in outlying areas, since they are inflexible and often infrequent; thereby, forcing people to use cars.

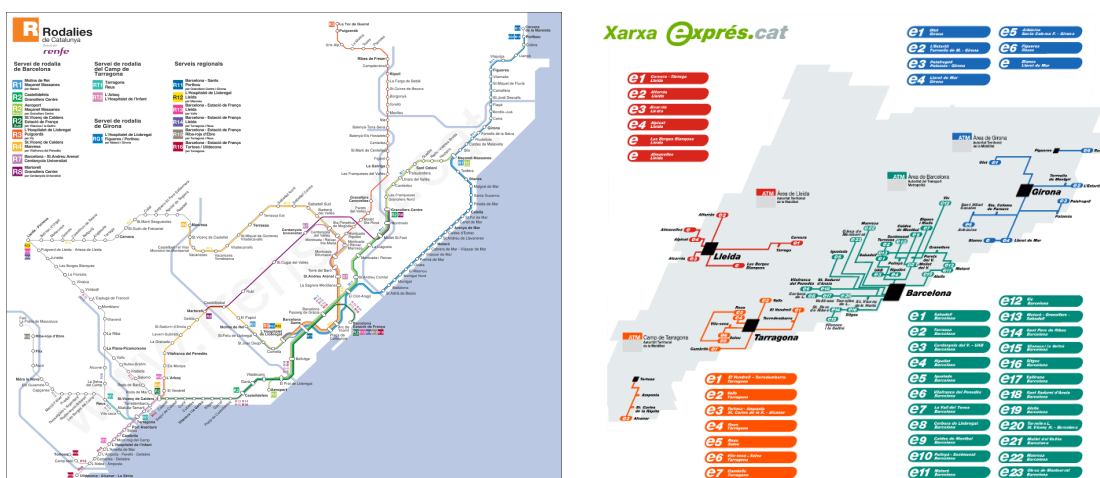
The Barcelona Pilot Lab is focused on one specific music festival, Canet Rock (<http://canetrock.cat/>). This festival takes place every summer in the village of Canet de Mar, located 45km north from Barcelona, within the fourth zone of the BMR (see Figure 7-1). The event gathers more than 20,000 attendees every year. Public transport is essentially limited from the peri-urban areas or non-existent from most rural areas, so the car is perceived as being the only option, despite private car use being more expensive and less sustainable. Figure

7-2 shows the extent of the rail network and the express bus network illustrating the lack of rail services outside the main intercity corridors and the disconnected nature of the bus network between the festival site and the population to the south.



Source: https://commons.wikimedia.org/wiki/File:AMTU_EMT.svg#/media/Fitxer:AMTU_EMT.svg

Figure 7-1 Map of festival location in relation to Barcelona Metropolitan Region



Source: Rodalies de Catalunya (<http://rodalies.gencat.cat/>)

Source: Exprés.cat (<http://expres.cat/>)

Figure 7-2 Existing public transport services. On the left the rail network and on the right the express bus services

Currently, there is no historical information on demand for travel to the festival, how it is structured, and how it can be served by flexibly adapted services; the only very limited information having been obtained through (outdated) surveys. The focus of the Barcelona PL is on applying ICT methods and tools to investigate the target groups' transport demand through information-mining from Social Networks and on organising transport services that adapt dynamically over time to meet the identified mobility needs and demand and improve transport accessibility. The goal is to enhance bus operators' technology and knowledge to

provide innovative services that meet the needs of users traveling to events such as music festivals and sports events located in city peripheries or neighbouring towns.

Deliverable 4.6 *Innovation Pilot Lab Barcelona - implementation and results - final version* describes in detail the measures to be demonstrated, their design and the implementation process of the measures. It also provides more detailed description of the characteristics of the Barcelona PL. The Barcelona PL introduced two INCLUSION measures, summarised in Table 7-1, to be demonstrated and included in the impact evaluation. The INCLUSION measures have been coordinated by the technology company Mosaic Factor and bus operator BusUp.

Overall, the Barcelona PL aims to: Enhance specific data analytics tools and apply these to social media data to identify unmet needs/demands for travel; and Propose and test smart mobility solutions (in the form of new collective bus services) to provide access to the CanetRock festival from the whole peri-urban region of the BMR, mainly for young persons. The PL will assess the level of acceptance of and satisfaction with the proposed smart mobility solution in peri-urban and rural areas of BMR by its targeted users, in terms of social inclusion, environmental sustainability and quality of life.

Table 7-1 Overview of INCLUSION measures being demonstrated in Barcelona PL

Measure name	Description
Using social media to identify unmet needs/demands for travel of people that want to attend Canet Rock 2019	<p>Two strands of Social Media analysis are applied to determine demand:</p> <ol style="list-style-type: none"> 1) Identifying the Twitter accounts which are the most relevant to the event. For this study, Mosaic developed and used their own algorithm. 2) Analysing the non-structured data aiming to detect Twitter activity related to the event in different geographic areas. For this, the data analytics tool Moriarty, developed by ITAInnova, is used. <p>These tools combined with other predictive algorithms (demographic distribution analysis, transport connectivity, historic attendee data, etc.) are used to detect locations where there is demand to attend the event that is currently not met by existing services. This allows the companies providing mobility services to offer tailored services to serve this demand and to advertise them through the social networks which they utilise.</p>
Introduce new collective bus services to meet identified mobility needs of people wishing to attend Canet Rock 2019	Based on the demand identified through social media data analytics, new on-demand bus stops and routes will be delivered providing new collective public transport services for those attending the Canet Rock festival.

7.1 Using social media to identify unmet needs/ demands

7.1.1 Overview of implementation

Both measures demonstrated in the Barcelona pilot lab are inextricably linked. The first measure analyses data from social media relating to the Canet Rock music festival in order to estimate demand for transport services to the festival from different locations across the Barcelona region. From this, the second measure establishes and delivers new collective bus services to serve the predicted demand. There were no significant issues in the planning and delivery of the demonstration measures for Canet Rock 2019.

Figure 7-3 illustrates the phases of the first measure to develop a model for estimating latent mobility demand for attending CanetRock from Social Media (Twitter) data analysis. This work was undertaken during 2018 by MOSAIC with the locations having potential highest demand determined by early 2019, and the published bus routes for the second measure provided by April 2019.

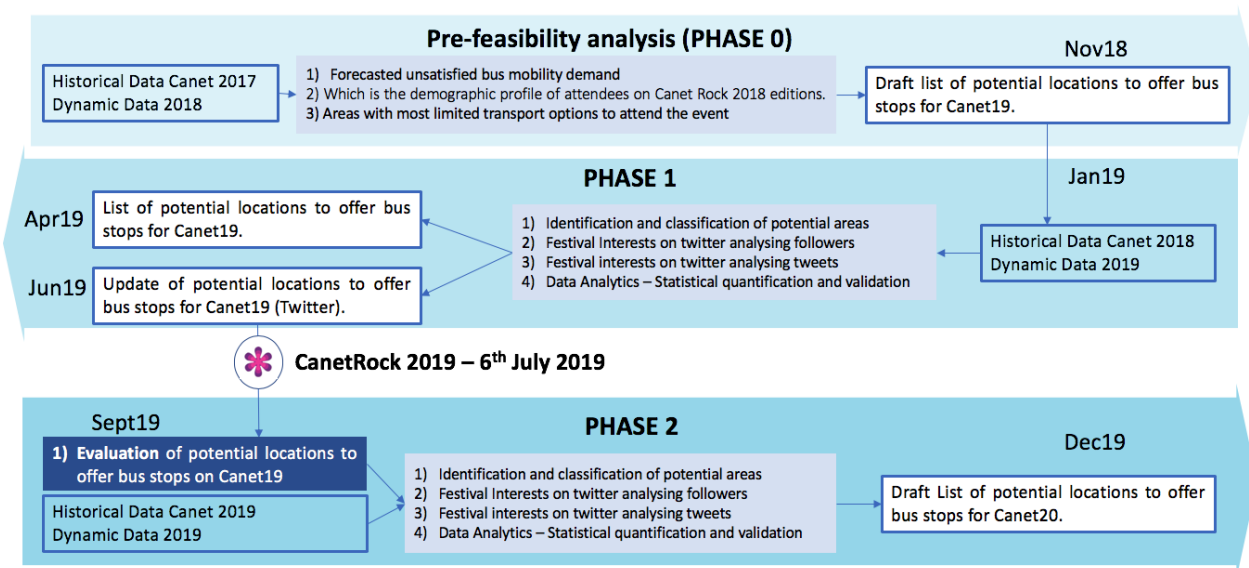


Figure 7-3 Three phases of analysis

Lessons learnt from the 2019 experience are being introduced to improve the demand estimation for the 2020 festival (Phase 2 in Figure 7-3). Unfortunately, due to the Covid-19 pandemic, CanetRock 2020 has had to be postponed from July 2020 until July 2021. As a result, the impact of the further enhancements made between 2019 and 2020 cannot be evaluated within the INCLUSION project. Therefore, the results and analysis presented in Section 7.1.2 below relate only to the 2019 event.

7.1.2 Impact evaluation

This section presents the main results from the evaluation work to validate the accuracy of the model comparing the model predicted demand with the actual demand for Canet Rock 2019. The predicted demand, according to location, was computed by analysing non-structured data of Tweets from accounts of users who connected with the festival core accounts to infer users who display an intention to attend the event. From this, a Twitter influence score was established for each of the 947 municipalities in the Region to get estimates of the spatially distributed demand to attend the event. This was then compared with the real demand, which was provided after the event, by the database of sold tickets for Canet Rock 2019.

The main objective was to quantify the accuracy of identifying spatial distribution of demand from social media data. Target users were attendees of the Canet Rock music festival, particularly young adults/teenagers and women from peri-urban and rural areas.

Table 7-2 presents the main impacts.

Table 7-2 Main impacts from using social media to identify unmet needs/ demands

Indicator	Target	Before	After	Impact
Comparison between estimated interest for CanetRock 2019 (Twitter data) vs actual attendance for CanetRock 2019	For the municipalities in peri-urban/rural areas of there is 80% correspondence between estimated and actual attendance	----	80% correspondence between the top 100 municipalities based on estimated demand from Twitter data and the top 100 municipalities based on actual attendance 90% correspondence between the top 50 municipalities based on estimated demand from Twitter data and the top 50 municipalities based on actual attendance	Target met
Accuracy of using Twitter score as an estimate of attendance	The log-log correlation between the attendees and Twitter score to be at least 0.7	Based on population data the correlation values are: 0.26 for 'low potential demand' stops 0.39 for 'medium potential demand' stops 0.75 for 'high potential demand' stops	Based on twitter data the correlation values are: 0.6 for 'low potential demand' stops 0.52 for 'medium potential demand' stops 0.8 for 'high potential demand' stops	Target met for 'high potential demand' stops
Accuracy of using attraction factor as an estimate of attendance	The log-log correlation between the attendees and 'attraction factor' score to be at least 0.8	Based on population data the correlation values are: 0.75 for 'high potential demand' stops	Based on attraction factor the correlation values are: 0.86 for 'high potential demand' stops	Target met for 'high potential demand' stops

Across all municipalities, a list of the top 100 municipalities with the most attendees of Canet Rock 2019 based on actual attendance was established. The model estimating demand to

attend the festival based on Twitter data identified 80% correspondence between the areas predicted by the model and the actual top 100 municipalities. This met the target set prior to analysis.

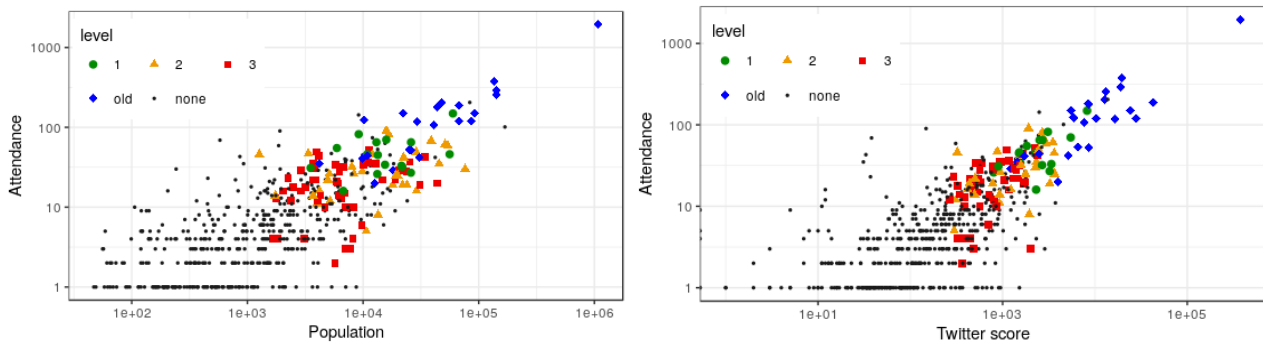
There was 90% correspondence between the top 50 municipalities based on estimated demand from Twitter data and the top 50 municipalities based on actual attendance to Canet Rock 2019. This exceeded the target set prior to analysis.

Focussing on peri-urban and more rural areas, i.e. prioritised areas in INCLUSION, the model has identified 119 municipalities within this category suitable for potential bus stops. These have been categorised by the model as having a high (32), mid (36) or low (51) level of potential demand. From those identified, 20 stops were already stops offering a BusUp service to Canet Rock in 2018, hence the model has identified 99 new municipalities in which to locate a bus stop. Of these, 16 are categorised as having high potential demand, 33 as having mid potential demand and 50 with low potential demand.

To assess the accuracy of the model for estimating the spatial distribution of demand, the predicted attendance from Twitter influence score for each municipality is measured against the actual attendees at Canet Rock 2019 from each municipality. These results are then compared with simply using population as the predictor for attendance. The plots in Figure 7-4 contain a single dot for each municipality: blue diamonds denote municipalities containing bus stops from last year; green circles denote municipalities with high modelled potential demand (1) for new bus stops; orange triangles denote municipalities with medium potential demand (2) for new bus stops; red squares denote municipalities with low potential demand (3) for new bus stops; and black dots represent municipalities not selected as a potential candidates for a bus stop.

Table 7-3 presents the log-log correlation, its coefficient of determination R^2 from the log-log fit $\log y = a + c \log x$, for the relation between attendance and population, and attendance and Twitter score respectively. The log-log correlation coefficient describes the strength of the relationship between the key parameter (i.e. Twitter score or population) and the actual attendees, with values closer to 1 reflecting a stronger (linear) relationship. The coefficient of determination (R^2) gives a measure of the 'goodness of fit' of the model and indicates the extent to which variation in demand to attend the festival can be explained by the key parameter (i.e. Twitter score or population). Again, the closer to 1, the better the key parameter at estimating demand to attend the festival. It can be seen from these results in Table 7-3 that Twitter score is superior to population variable when describing the attendance to Canet Rock 2019. This is observed for all categories of municipality for a candidate new bus stop (low, medium or high potential demand). What is most notable is that the Twitter score correlates much better with attendance than population does (R^2 as indicated in the last column of Table 7-3) for the municipalities categorised as having low and mid potential demand. This suggests that use of

Twitter data for estimating demand is especially useful in identifying areas with lower population but where there is relatively high demand to attend the event.



Colours denoted potential level, green (1), orange (2), red (3) stand for high, mid and low potential level. Blue diamond denotes stops from last year, and black dots represent municipalities not selected as a potential candidate for a bus stop.

Figure 7-4 Attendance in function of population, left, and Twitter score, right.

Table 7-3 Accuracy of using either municipality 'population' or municipality 'Twitter score' as basis for estimating demand from each municipality to attend the event

	population		Twitter score		
Level	Log-log correlation	R ²	Log-log correlation	R ²	R ² improvement
Low	0.256	0.045	0.594	0.339	653.3%
Mid	0.392	0.135	0.523	0.249	84.4%
High	0.752	0.554	0.805	0.636	14.8%

Note: Values of log-log correlation closer to 1 represent stronger linear relationship between population or Twitter score and attendance; value of R² closer to 1 reflects better 'goodness of fit' of population or

Although Twitter scores proved to be better than population at estimating attendance (R² values closer to 1 in Table 7-3), some municipalities with high Twitter scores showed low attendance and so would not be suitable bus stop candidates. This weakness is overcome by integrating demographic and historic demand data with the Twitter score. The function describing this fusion of demographic and historic demand data with future demand derived from Twitter data analysis results in a parameter termed the 'attraction factor' and further enhances the estimation of demand, providing a more consistent fit to attendance than using the Twitter score by itself. The correlation between the attendees' vs Twitter score is 0.8 for the high potential demand stops. The correlation between the attendees' vs attraction factor is 0.86 for the high potential demand stops.

7.1.3 Discussion of validity of the results

A general limitation of the approach to establish locations where demand for travel to the festival exists relates to the quantity and quality of the social media data sources. Twitter users often don't make their registered location publicly available for their accounts and seldom have geolocation access activated (in this case, only 15% of accounts). Other fields related to user location data can also be deprecated or fictional. Furthermore, it is not possible to scrape data from other social media (e.g. Facebook or Instagram) due to data privacy issues. Since the beginning of 2019, these platforms have blocked tools that automate user data collection. Hence, the demand location data which is derived only represents a fraction of the actual demand but should still provide a reasonable reflection of the locations with highest demand. Therefore, even when the target audience is likely to be active social media users, such as those attending music festivals, there may only be a relatively low percentage of their Twitter data that is useable and useful in estimating spatial distribution of demand. Hence, for best results, it becomes essential to complement the social media analysis with other data sources to increase robustness. This has been explored by combining demographic data, historic attendance data and Twitter influence score in the 'attraction factor' function.

7.1.4 Impact of Covid-19 and opportunities related to Covid-19

The outbreak of the Covid-19 pandemic had no effect on the implementation of the measures for Canet Rock 2019 (Phase 1 in Figure 7-3) as this was held in July 2019. The planned delivery of the measures for Canet Rock 2020 (Phase 2 in Figure 7-3) was severely affected by Covid-19. The 2020 festival was postponed from July 2020 until July 2021. Not only did this mean that no BusUp services could operate in 2020 during the INCLUSION project timeframes, it also had a major impact on the Twitter activity relating to the festival. As the Covid-19 pandemic took hold in Catalonia in March 2020, the nature and volume of Tweets related to the festival changed resulting in data that could not be relied on for estimating demand to attend the festival.

7.1.5 Financial sustainability assessment

Planning transport services for events with uncertain spatial demand is a difficult task. Data collection via traditional means such as surveys is very expensive. Using historic data is unreliable as attendees change year on year. This measure has shown that reliable demand data can be extracted from mining social network (Twitter) content with the aim of using the resulting information to inform the design of commercially viable bus routes. The data is free to access, and the cost of the technical analysis is modest.

7.1.6 Main findings

- The Twitter influence score is superior to population as a predictor of attendance, particularly in identifying peri-urban and more rural areas with lower population but where there is relatively high demand to attend the event. This is a notable finding for the Barcelona pilot lab where the objective is to improve access to the event for vulnerable users and from peri-urban and more rural areas.
- Fusing demographic, transport connectivity and historic demand data with future demand derived from Twitter data analysis results in a parameter termed the 'attraction factor' and further enhances the estimation of demand providing a more consistent fit to attendance than using the Twitter score by itself.
- The additional knowledge gained from Social Media (Twitter) data has led to the expansion of the BusUp service offering pre-bookable bus services, mainly from less densely populated areas, to the Canet Rock event.

Lessons learnt include:

The innovation of information mining from Social Networks can provide a better comprehension of the demand and can radically improve the capacity of bus ride-sharing services, such as BusUp, to offer more tailored services and to better aggregate and serve the demand to large events (>10.000 attendees).

A key factor in the suitability of this measure was that the attendees to the annual Canet Rock music festival were predominantly under 24 of age and the majority were social media active. Despite the fusion of other data sources with social media data increasing the robustness of the method and enabling its use where usable social media data may be limited, the approach is not suitable for use where levels of social media activity are very low. Nevertheless, in the future, increasing penetration of social media data, innovations in text mining and analysis methods, alongside more user centred transport solutions will continue to leverage social media as a supplemental transport planning data source.

7.2 Introduce new collective bus services

7.2.1 Overview of implementation

BusUp has been operating existing collective transport bus services to the CanetRock festival for several years. The existing BusUp routes have been developed through traditional demand estimation based on population and previous attendance and are serving more densely populated urban areas or are intermediate stops on a route serving a densely populated urban area.

The outcomes from the first measure (using social media to identify unmet needs/ demands) feeds into the second measure of introducing new collective services. The identification of a number of bus stops and routes for new collective bus services were outputs from the first measure (Using social media to identify unmet needs/ demands) by mid-March 2019.

From April 2019, with the public transport company BusUp acting as a broker, local bus and coach operators were hired to operate the new routes. The new routes were then published and promoted to potential festival attendees via the festival website linked Twitter accounts. Those wishing to book travel were directed to the BusUp bus ride-sharing App/platform to complete the booking process. Booking went live from April 2019 until the cut-off for bookings 2 weeks prior to the CanetRock festival (i.e. 22nd June 2019). The new bus services were delivered to the festival on 6th July, returning the next day on 7th July 2019.

7.2.2 Impact evaluation

While outcome indicators relating to the level of service provided can be compared to services provided in previous years, establishing 'before' data from the target users for the new collective bus services measure is challenging because this is an annual event for which the audience changes each year and no survey data exists from those that attended the event in previous years.

The approach used is to compare the attitudes of those attending the event who did not use BusUp services (surveys conducted at entrance to the festival) with those who did use BusUp services (surveys conducted while travelling to the festival on the BusUp service). The surveys conducted on the BusUp services also asked if the passengers had attended the festival in previous years and retrospectively eliciting their 'before' attitudes and satisfaction etc.

The main objective was to improve access by public transport from peri-urban and rural areas to the Canet Rock festival. Target users were attendees of the Canet Rock music festival, particularly young adults/teenagers and women. Table 7-4 presents the main impacts.

Table 7-4 Main impacts from introducing new collective bus services to Canet Rock festival 2019, based on social media derived demand estimates

Indicator	Target	Before	After	Impact
Change in no of BUS SERVICES provided by BusUp, compared to previous editions	10% increase in BusUp SERVICES	24 Bus services to Canet Rock 2018	35 Bus services to Canet Rock 2019	46% increase in BusUp services
Change in no of DIRECT BUS SERVICES provided by BusUp, compared to previous editions	10% increase in BusUp DIRECT SERVICES	4 direct bus service routes to Canet Rock 2018	14 direct bus service routes to Canet Rock 2019	250% increase in BusUp direct routes
Change in no of STOPS covered by BusUp, compared to previous editions	10% increase in BusUp STOPS	19 BusUp stops for Canet Rock 2018	27 BusUp stops for Canet Rock 2019	42% increase in BusUp stops
Change in no. of BUS TICKETS SOLD to attend the festival, compared to previous editions	10% increase in BusUp TICKETS	1217 tickets sold for Canet Rock 2018	1666 tickets sold for Canet Rock 2019	37% increase in BusUp ticket sales
Target users using BusUp services	Increased % of Women accessing festival	49% of attendees who were non BusUp users	84% of BusUp users	BusUp users were 70% more likely to be female than average festival attendees
	Increased % of Under 24's accessing festival	67% of attendees who were non BusUp users	78% of BusUp users	BusUp users were 16% more likely to be aged under 24 than average festival attendees
	Increased % of Under 18's accessing festival	10% of attendees who were non BusUp users	42% of BusUp users	BusUp users were 4 times more likely to be aged under 18 than average festival attendees
Access to festival without BusUp service	Increase access for those with no alternative	----	13.9% of BusUp users couldn't have attended without BusUp	
	Reduce number of car trips	-----	30% of first-time attendees would have come by car without BusUp	
		----	60% of BusUp users attending for the second time came by car in 2018	
Satisfaction compared to other non-car modes	Increase satisfaction for women	60% of female train users claimed to be satisfied	98.3% of female BusUp users claimed to be satisfied	
	Increase satisfaction for under 24's	75% of train users under 24 claimed to be satisfied	98.1% of BusUp users under 24 claimed to be satisfied	

The process to establish the bus routes to adequately match the offer of bus services to the predicted festival attendance demand (based on attraction factor selection) needs to take account of several factors. These include the location of stops, the driving time distances between them, and the expected demand from each stop, as well as logistics and business

considerations. For instance, knowledge of the budget available and cost of hiring different sized buses is required along with the number and availability of buses of differing size. This design work was undertaken by BusUp, who acts as a broker to hire bus service provision for the event from local bus and coach operators. A set of core routes were identified by BusUp, each of which have a minimum predicted demand of 50 passengers. Having established the core routes, these are then publicised to potential festival attendees via the festival website and Twitter account. Those wishing to book travel are then directed to the BusUp bus ride-sharing App/platform to complete the booking process.

Ultimately 25 new stops were published to receive bookings from the public. In addition to this, there were a total of 20 'old' stops (i.e. those established in previous years) which were published and made available to receive bookings. The reduction in new stops between those output from the model (see Table 7-5) and those chosen to be published for booking is the result of filtering out stop locations where there is already some form of reasonable public transport access to the event location. Most of these fell in the more urban areas of Barcelona and large towns such as Girona (see Figure 7-2 for maps of existing PT network).

The majority of hired buses allocated to the core routes contain 52 seats. A route is deemed to be economically viable once a minimum vehicle occupancy of 70% is achieved. If all 52 seats become booked and expected demand can justify a second bus for the route, then this is hired. If the 70% occupancy is not achieved 2 weeks prior to the event (2-week cut-off) then the route is cancelled; however, it will be checked if a smaller vehicle can be hired which is economically viable with lower numbers of passengers.

Overall, there was 42% increase from 2018 to 2019 in the number of bus stops served (see Table 7-5), with the majority of these operating as direct routes between the new stop and the event. This suggests the model successfully identified, from the outset, stop locations with sufficient demand to fill buses without the need to divert or stop en-route. The number of tickets sold increased by 37%.

The majority of the existing BusUp routes (developed through traditional demand estimation based on population and previous attendance) are serving more densely populated urban areas or are intermediate stops on a route serving a densely populated urban area. It is notable that the majority of new stops (illustrated by the green and yellow circles in Figure 7-5), suggested by incorporating the Twitter influence score into the stop selection, resulted in commercially viable direct routes from less densely populated areas. This confirms that deriving estimated demand from social media data can form the basis to establish commercially viable bus routes to large scale events from peri-urban and more rural areas.

Table 7-5 provides an overview of the high, medium and low potential stops which were a) 'proposed' by the model; b) 'published' to receive bookings; and c) ultimately 'operated' within commercially viable routes. It can be seen that of the new stops which were published, 5 out of 10 high potential stops had received sufficient bookings 2 weeks prior to the event to be

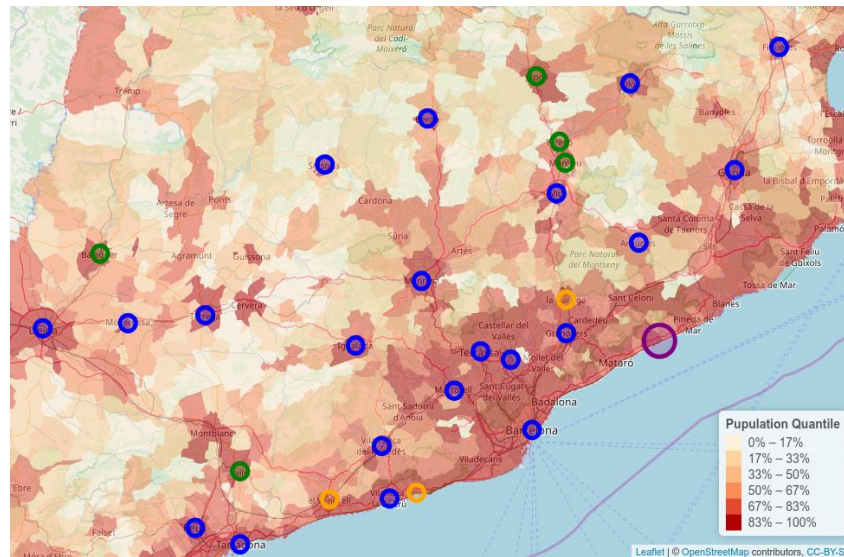
commercially viable (i.e. tickets sold > 70% of bus capacity), only 3 out of 11 medium potential stops and none of the 4 low potential stops received sufficient bookings to be economically viable. Meanwhile, 19 of the 20 old stops which were published received sufficient bookings to be viable. The location of the 'operated' bus stops served by BusUp services to Canet Rock 2019 are shown in Figure 7-5.

Overall, there was 42% increase from 2018 to 2019 in the number of bus stops served (see Table 7-5), with the majority of these operating as direct routes between the new stop and the event. This suggests the model successfully identified, from the outset, stop locations with sufficient demand to fill buses without the need to divert or stop en-route. The number of tickets sold increased by 37%.

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Table 7-5 Proposed, published and confirmed/operated stops for services to Canet Rock 2019

Demand levels stops	Proposed	Published	Published/ proposed %	Operated	Operated/ proposed %	Operated/ published %
New stops (added for 2019)	99	25	26.00%	8	8.08%	32.00%
High – new	16	10	62.50%	5	35.29%	50.00%
Mid – new	33	11	33.33%	3	9.09%	27.27%
Low – new	50	4	8.00%	0	0.00%	0.00%
Existing stops (repeated from 2018)	20	20	100.00%	19	95.0%	95.00%
High – old	16	16	100.00%	16	100.00%	100.00%
Mid – old	3	3	100.00%	2	66.67%	66.67%
Low – old	1	1	100.00%	1	100.00%	100.00%
Total	119	45	37.82%	27	22.69%	60.00%
High	32	26	81.25%	21	65.63%	80.77%
Mid	36	14	38.89%	5	13.89%	35.71%
Low	51	5	9.80%	1	1.96%	20.00%



Note: Blue circles denote old stops, green and orange denote high and medium demand for new stops. Purple circle marks the location of the Canet Rock festival.

Figure 7-5 Confirmed bus stop locations where BusUp services operated overlaid on population density

In terms of the users of the BusUp services operated, the feedback was extremely positive. 209 BusUp users (12.5% of all BusUp passengers) were surveyed about their circumstances and attitudes regarding travel to the event. This was complemented by a smaller sample (60) of non BusUp users attending the event at the entrance to the festival. This revealed that the BusUp service was very popular with female festival goers - in total, 84% of BusUp users were female (sample 209) compared to 49% of non BusUp users (sample 60) and younger festival goers (78% of BusUp users were under 24 compared to 67% of non BusUp users). Interestingly while 42% of BusUp users were under 18, only 10% of non BusUp users were under 18, suggesting that the BusUp service is enhancing opportunities and empowering young people and women to attend the event.

Of the 13.9% of BusUp users stating they couldn't have attended without BusUp, 58% of these were under 18 again illustrating the heightened benefits for this group.

60% of those using BusUp who had attended previous Canet Rock festivals had previously travelled by car and changed to BusUp. A further 37% previously used train. However, satisfaction with train use is much worse than for BusUp, especially amongst female and younger travellers. Where 98.3% of female and 98.1% of those under 24 were satisfied or very satisfied with the BusUp service, only 60% and 75% respectively in these groups were satisfied with the train service.

7.2.3 Discussion on validity of the results

The uptake of BusUp services, of course, is affected by other factors such as availability of lifts from friends/family and the success or otherwise of the marketing and promotion of the BusUp routes. It is also the case that some BusUp routes suggested by the demand analysis, and

published by BusUp for receiving bookings, were withdrawn by the bus operator prior to the festival due to insufficient bookings and/or insufficient declarations of interest. Phase 2 of the work (see Figure 7-3) looked to address these identified shortcomings through increased marketing of the published routes across a wider range of media and developing stronger partnership with festival organisers to tie in festival ticket sales with bus bookings. BusUp reached agreement with the event organizer to enhance communication on routes available for CanetRock 2020. Unfortunately, the planned work for Canet Rock 2020 had to be put on hold as the festival was postponed until July 2021 as a result of the Covid-19 pandemic.

7.2.4 Impact of Covid-19 and opportunities related to Covid-19

The outbreak of the Covid-19 pandemic had no effect on the implementation of the measures for Canet Rock 2019 (Phase 1 in Figure 7-3) as this was held in July 2019. The planned delivery of the measures for Canet Rock 2020 (Phase 2 in Figure 7-3) was severely affected by Covid-19. The 2020 festival was postponed from July 2020 until July 2021. This has meant that no BusUp services could operate in 2020 during the INCLUSION project timeframes. It is unclear at this stage how overall festival attendance and uptake of BusUp services to travel to the festival will be affected come July 2021.

7.2.5 Financial sustainability assessment

The BusUp service delivery model is built on commercial viability. The Twitter data analysis estimates the distribution of demand across the region and then bus stop locations and routes are established that are most likely to attract enough BusUp users for a commercially profitable service. All revenues are generated from passenger fares. The ticket prices for passengers vary depending on the driving time and distance with the BusUp services on average costing passengers 0.17€/km, compared to an average cost by car of 0.35 €/km. So, unless sharing lifts, the cost of travelling by car is around double that of using the BusUp bus service (excluding any parking charges).

A BusUp route is deemed to be economically viable once a minimum vehicle occupancy of 70% is achieved. If the 70% occupancy is not achieved 2 weeks prior to the event (2-week cut-off) then the route is cancelled; however, it will be checked if a smaller vehicle can be hired which is economically viable with lower numbers of passengers. This guarantees that only profitable routes are delivered. No funding or subsidy is required from the public sector. It is worth reiterating that profitable routes don't mean exclusion of small municipalities with medium to low demand. These kinds of municipalities can be included within a profitable route where the social media data analysis identified sufficient demand.

However, as has been demonstrated there is a significant rate of cancellation at the two-week cut off point. Out of 25 new routes published to receive bookings from the public only 8 were

eventually operated as commercially viable. Two main reasons were identified for this low conversion rate. Firstly, awareness of the BusUp service by festival attendees could be improved. Almost 25% of non-BusUp users who attended did not know about the BusUp service. As discussed above, improved marketing of the BusUp routes through the event organiser has been introduced for future years.

The second and more significant reason for the low conversion rate was the lack of attendees booking the BusUp service well in advance of the festival. Booking of BusUp transport to the event was very often left until very close to the time of the festival, despite event tickets being purchased months in advance. A late surge in bookings was experienced 3 weeks prior to the festival which coincided with the end of School and College exams. It is very likely the case that many more young people would have booked the BusUp service in the 2 weeks prior to the festival had this still been an option. To reduce the risk of this scenario in future years, BusUp have reached an agreement with the event organizer to enhance communication to event ticket purchasers on routes available for CanetRock 20. In addition, reduced BusUp ticket prices are being considered for advance purchase in order to encourage as many attendees to book their travel early to maximise the chance to confirm the BusUp routes well in advance for the festival. When asked if they would have bought their ticket earlier if they had been offered a discount, 95% of BusUp users answering the question stated they would.

7.2.6 Main findings

- The attendees to the annual Canet Rock music festival were predominantly under 24 of age, female, and the majority were social media active. In addition, there was a reliance on lifts from parents due to a lack of public transport options from peri-urban and more rural areas. These characteristics were important factors in the appropriateness and success of the approach described.
- Compared to other transport options, the BusUp services were rated as safer, more convenient and empowering for young people and women to attend the Canet Rock music festival.
- The innovation of information mining from Social Networks can provide a better comprehension of the demand and can radically improve the capacity of bus ride-sharing services, such as BusUp, to offer more tailored services, increasing accessibility to cultural and social events by otherwise excluded users.
- The demand estimation from Twitter data resulted in publication of 25 potential new stops for 2019 which the demand analysis suggested could be viable, mainly from less densely populated areas. Ultimately 8 of the stops modelled from Twitter data analysis attracted enough bookings to make the services commercially viable, providing improved access to around 450 new users (a 37% increase on the previous year).

While this confirms that deriving estimated demand from social media data can form the basis to establish commercially viable bus routes to large scale events from peri-urban and more rural areas, it also highlights that there is scope to further improve the number of bookings from the stops on routes which were ultimately cancelled.

Practitioners should be aware that the transferability of this approach to other scenarios needs to be considered carefully. Three characteristics of this example were important factors in contributing to its successful application:

1. Gaps in knowledge of demand: one-off or irregular large-scale travel demand generators such as events where attendees are changing/not known in advance
2. Social Media active target groups
3. Shortage of suitable existing transport options for the target groups

Lessons learnt include:

- Several aspects of the model used to mine Twitter data could be further developed in future replications to improve the quality of data that is mined, as well as to increase the quantity and variability of the different datasets regarding tickets, demographic data, transport connectivity, etc. The dictionaries that were used for data scraping would greatly benefit from A.I. assistance.
- There is a variable amount of uncertainty regarding the transparency, accessibility, and availability of personal data from social media platforms. In general, more localised festivals and events generate less activity online than international ones. This is a risk that not enough data can be mined from too few Tweets. Additionally, the topic of data privacy continues to be explored and debated. Already there is a slowly growing trend to deny social media apps geolocation trackability.
- In events which sell out early, such as Canet Rock, it is essential to channel market communications through the event organiser. For next editions of the event this aspect will continue to be key.

8 Budapest pilot lab (Hungary)

Budapest has a population of 1.75 million inhabitants and an extensive public transport system which includes a 39 km long metro network on four lines and one of the greatest tram networks in Europe. Tram 6 is the busiest tram line in the world, with more than 400,000 passengers daily. The tram network was extended in 2016 and comprises 36 lines. Providing equality of access for transport services is a key priority; however, the metro and tram network in Budapest is currently not accessible for everyone.

Despite the recent improvements in the infrastructure in terms of accessibility, the environment is still not inclusive. There are four metro lines in Budapest. While the vehicle fleet is accessible, not all of the stations provide step free access. Line 4 is fully accessible; line 2 is partly accessible with some stations having step free access; while stations on lines 1 and 3 do not have step-free access. Tram service is partly accessible. All stations on lines 4-6 are step-free and a reconstruction programme in 2016 provided several additional fully accessible stations on the tram network.

The main gaps and need for improvements focus around the needs of the approximately 10-15% of all public transport users who are somehow reduced in their mobility (disabled, visually impaired, passengers with luggage, temporarily disabled people, or even people who do not speak the country's language). The general comprehension about accessibility is that it is an additional expenditure that is solely for disabled people. It is vital to re-educate the wider public with campaigns and retrain staff to change attitudes, from believing a passenger with a disability is a problem, to creating an inclusive, equitable environment which stimulates everyone to help passengers with reduced mobility and reduced ability to use the PT system. The main objective of the Budapest PL was to improve accessibility of public transport for people with reduced mobility.

The INCLUSION PL in Budapest focussed on launching campaigns to better understand the needs of people with reduced mobility and on training the public transport staff to stimulate an environment for social inclusion by providing appropriate assistance at stops and stations. Furthermore, encouraging understanding and co-operation among all stakeholders of persons needing assistance is also an important aim.

Deliverable 4.7 *Innovation Pilot Lab Budapest - implementation and results – final version* describes in detail the measures to be demonstrated, their design and the implementation process of the measures. It also provides more detailed description of the characteristics of the Budapest PL.

The Budapest PL introduced two INCLUSION measures, summarised in Table 8-1, to be demonstrated and included in the impact evaluation. The INCLUSION measures were coordinated by the public transport authority of Budapest (BKK).

Table 8-1 Overview of INCLUSION measures demonstrated in Budapest PL

Measure name	Description
Staff training	A new training programme for metro, tram and bus staff, ticket inspectors, and customer service employees has been developed and piloted in order to contribute to more competent staff behaviour and therefore a more inclusive environment. This training considered the specific needs of persons with the following vulnerabilities: blind and visually impaired, disabled, travellers with luggage or baby buggy, tourists, and foreigners staying in Budapest long-term.
Crowdsourced user needs platform	An online, public platform has been created to allow travellers to share their travel experiences and highlight specific issues/problems they face on the PT system. This helped BKK to understand the needs, barriers and problems of the target group of travellers with reduced mobility and reduced ability to use or understand the PT system.

8.1 Staff Training

8.1.1 Overview of implementation

The staff awareness training measure involved four phases: 1) a workshop held with representatives and associations of the target groups to better understand their respective and varied mobility needs, 2) a reflection process and needs assessment that led to the production of a training guide, 3) conducting the training with staff in participation with volunteers (i.e. people with reduced mobility from disability associations that assisted to demonstrate their needs and teach the staff how to enable them), 4) evaluation of the impacts on the staff and volunteers.

The staff training was delivered between 28th May and 25th June 2019. The training materials were designed for the different needs of vulnerable passengers with the support of identified representatives of the vulnerable user groups, e.g. National Institute for Blind and Visually Impaired People (Government institute); ETIKK (Universal Design Information and Research Centre of Hungary); FESZT (Council of Handicapped People); The National Association of Large Families; Budapest Airport; and Tempus Public Foundation. It was intended that the training would be held on an annual basis, with improvements made to the training materials following feedback received from staff and vulnerable users and their representatives. Inputs received through the second measure to be demonstrated (crowdsourced user needs platform, see Section 9.2) would also help inform the content of the training in subsequent years.

8.1.2 Impact evaluation

This section presents the impact evaluation for the staff training measure to make staff aware of the needs and capabilities of vulnerable users and to educate them on how best to support these users.

The data related to the 'staff training' measure has been collected using the following methodologies:

- 'Before' and 'after' surveys with staff undertaking the training course on competency level of staff and on usefulness of the training.
- Mystery shopping and test trips with small sample of selected users from target groups with 'before' and 'after' surveys on the change in level of satisfaction of staff competence and ease of use of public transport.
- 'Before' and 'after' surveys of members of the public from the target groups. In total, 265 before surveys and 225 after surveys were completed. These were distributed through identified representatives of the vulnerable user groups to ensure responses were received from the target users.

The main objective was to contribute to more competent behaviour from public transport staff towards people with reduced mobility. Target users included blind and visually impaired, disabled, travellers with luggage or baby buggies, tourists, and foreigners staying in Budapest long-term. Table 8-2 presents the main impacts.

Table 8-2 Main impacts from staff training measure

Indicator	Target	Before	After	Impact
Number of trained staff	Approximately 16% (50 employees) of BKK staff will be trained	----	27% of staff trained (85 employees)	Target exceeded
Number of training hours	4 training events of 8 hours each will be held		4 x 8 hour training events held totalling 680 staff hours of training	Target met
More competent employees	20% increase in competency level of employees with regard to the target groups	Level of competency increased from 64%	83%	19% increase in level of competency
Change in level of satisfaction with PT services by blind and visually impaired persons, disabled persons and persons with baby buggies.	10% increase in vulnerable users 'satisfied' or 'very satisfied' with public transport services	50% very satisfied (mystery shopper test trips)	66% very satisfied (mystery shopper test trips)	+16% change in % very satisfied
		22.2% satisfied or very satisfied (Wider target group survey – sample 198)	27.6% satisfied or very satisfied (Wider target group survey – sample 163)	+5.4% change in % satisfied or very satisfied <ul style="list-style-type: none"> • 24% increase in target group users who are satisfied or very satisfied
Change in number of trips on public transport by vulnerable groups	10% increase in vulnerable users using PT at least once a week	72.2% use PT at least 1 to 2 times per week (Wider target group survey – sample 198)	74.6% use PT at least 1 to 2 times per week (Wider target group survey – sample 163)	+2.4% change in vulnerable users using PT at least once a week <ul style="list-style-type: none"> • 3.8% increase in users

In total, the number of staff trained was 85 which exceeded the target of 50. These staff included customer centre staff/ticket sales staff, ticket inspectors, bus drivers and trolley bus drivers, and onsite traffic operator.

Competency level was measured through surveys conducted with members of staff prior to and after receiving training. The surveys asked a range of questions relating to understanding of vulnerable user's conditions and capabilities, how to provide support to different types of vulnerable users in certain scenarios, and rules/guidance related to accessing vehicles and moving around stations with buggies and wheelchairs. All questions were multiple choice and the competency level relates to the percentage of correct answers averaged across all questions.

While the competency level surveys with staff are based on self-assessment, the mystery shopper test trips performed by target users before staff received the training and after the training provides an independent view on the changes directly experienced/noticed by the target users. These test trips involved all aspects of the journey including engagement with customer services, ticket purchase, and making the trip and so the vulnerable users encountered different staff who had been exposed to the training during all stages of the journey. Despite the relatively small number of mystery shopper test trips, this form of assessment is particularly important to give an indication of the effectiveness of the staff training programme directly experienced by the target users. The 'after' test trips were undertaken shortly after the staff training was completed when the training was fresh in the minds of the staff.

The mystery shopper testing involved 12 test users comprising 4 blind persons, 4 wheelchair users, 2 users with movement impairments, a person with a baby buggy and a tourist. They reported on their experiences interacting with a range of staff types including Customer centre staff, Ticket inspectors, bus drivers and trolley bus drivers, and an onsite traffic operator. In summary, 7 out of 12 reported improved satisfaction with ease of use of PT services and 3 out of 12 test users reported improved satisfaction with competence of employees. The most frequent improvements in satisfaction related to the ease of use of PT resulting from changes in behaviour of driving staff.

Supporting the mystery shopper test trips, a before and after survey with a wider group of target users was conducted. This provided an indication of the extent to which the staff training measure had impacted on the target group more generally. Those surveyed may not have used public transport or may not have come into direct contact with the staff who received training (which made up 27% of BKK staff and did not include staff of other PT companies operating services or involved in serving passengers on the PT network). The impacts reported from these surveys need to be interpreted in this context.

Other useful findings from these surveys showed that 56% of those with non-visual disabilities would use PT more often if PT employees could help them more and a further 36% felt this would partly help them use PT more often. This is much higher than the other groups of target users and is reflected in their use of public transport with significantly smaller proportions using PT on a regular basis and over 7% of disabled respondents stating they would like to use public transport but are unable to use it.

8.1.3 Discussion on validity of the results

It was initially intended that a number of vulnerable users would undertake some further mystery shopper test trips during Jan/Feb 2020 to assess if the training education has been retained by the staff and adopted in their regular working practice. However, this proved to be difficult as the working patterns of the trained staff meant they were dispersed across the Budapest network and so it was not feasible to establish whether a test trip had encountered trained or non-trained staff. Over time, as more and more staff receive the training a more consistent level of staff service should be encountered anywhere on the public transport network.

The 'before' surveys with the wider target groups did not distinguish the responses between three sub-groups of vulnerable users: blind and visually impaired persons, disabled persons and persons with a baby buggy. This is unfortunate as there is likely to be variation in effectiveness of the staff training for these different target groups which could not be captured. The after survey, which did distinguish between these groups, was able to highlight which groups are likely to benefit most from improved staff understanding and assistance. This knowledge can be used to inform and tailor the future staff training content.

8.1.4 Impact of Covid-19 and opportunities related to Covid-19

The 'after' survey with the wider target groups were undertaken in March and April 2020. This coincided with the Covid-19 restrictions on travel. This resulted in a smaller number of completed surveys due to the increased difficulties in engaging with the vulnerable users. Furthermore, some of the questions relating to daily travel habits, completed during the lockdown, may have provided unreliable data as respondents may have reported on their habits at the time the survey was filled out. This, of course, is not comparable to the 'before' situation. However, the majority of survey questions related to more general views on attitudes, satisfaction and needs and so remain valid.

The Covid-19 restrictions has meant that planned staff training for 2020 has been put on hold. The intention had been to not only train more BKK staff, but also to roll out the training to other PT operators in the city in order to increase the coverage to more of the PT staff in the city.

In the recovery from Covid-19 there are many new rules and regulations around safe use of public transport which passengers are expected to follow, and staff are expected to communicate and enforce. The need for staff training has never been more important to ensure that all PT users can travel safely, but due to the heightened needs of vulnerable users, communicating the new rules in an empathetic manner is essential. Future staff training for vulnerable users provides the opportunity to incorporate Covid-19 related guidance and responses suitable for different vulnerable user groups.

8.1.5 Financial sustainability assessment

In general, the cost of staff awareness training needs to be borne by provider of the transport service. Often this is the public sector directly, or where private sector transport providers operate under contract, then staff awareness training can be included as a requirement in service contracts, in which case the training is provided by the PT provider within the contract costs for the service provision.

Better staff awareness and improved attitudes towards vulnerable users helps remove confidence barriers that prevent vulnerable users from utilising conventional Public Transport services. Better trained staff can also lead to improved safety and feelings of security while travelling, which is of particular relevance to women and elderly passengers. This can result in more patronage and hence more fare revenues.

However, the main driver for the staff awareness training is improved social inclusion. This can lead to savings in other areas of public sector expenditure by maintaining independence for the more vulnerable in society and reducing demands on social care services. One example of this being that the improved level of service resulting from the staff training may reduce the need for certain specialist vulnerable user transport services (e.g. for health or social services clients) that operate in parallel and at extra public-sector cost to the conventional PT network.

8.1.6 Main findings

The staff training campaign in Budapest is viewed as a success for BKK. In particular:

- BKK strengthened its relationships with stakeholders and its customer relations with passengers
- BKK employees better understand the habits and needs of the passengers and feel more confident in recognising and supporting those vulnerable users who may benefit from extra assistance. Staff competency in recognising and assisting vulnerable users increased by just under 20%.
- More of the vulnerable target users feel confident to use public transport and there have been around 20% more vulnerable users in the target groups satisfied or very satisfied with public transport services.

- In the future, the training is to be rolled out to employees from other PT service providers (operating the bus services) working across the city.

Lessons learnt include:

- The effect of the staff awareness training on vulnerable users is that it is empowering, empathetic, gender equitable, and safe.
- Staff who are in contact with vulnerable users have better ability to recognise them, have a good understanding of their additional needs, and have knowledge of how to best deliver service to them. This includes greater recognition that less visible disabilities such as autism, dementia or anxiety can be just as much of a barrier to travel as a visible disability.
- Staff awareness training further helps ensure staff know the appropriate actions to take when serving a vulnerable user, such as drivers giving extra time for boarding, including securing wheelchairs/sitting and alighting for vulnerable passengers in wheelchairs or with mobility difficulties.

8.2 Crowdsourced user needs platform

8.2.1 Overview of implementation

The existing Járókelő online crowdsourcing platform, allowing the public to feedback on public services in the city, was enhanced to offer a public transport specific sub-page. This was accompanied by a marketing and promotion campaign to inform the public and encourage them to submit feedback or 'announcements' about issues encountered or improvements needed regarding use of public transport.

The launch of the crowdsourced user needs platform was planned for July 2019 but was delayed until November 2019 due to political disruption. The crowdsourced user needs platform by its nature highlights problems and issues related to the public transport network. This was deemed to be politically sensitive in the run up to municipal elections in mid Oct 2019. As a result, approval to launch this measure was delayed until after the elections had been held. The platform was launched in November 2019 and has been 'live' since then. Although not critical, this delay has resulted in a reduced number of users of the platform, compounded by Covid-19 lockdowns restricting all travel on public transport and effectively ending the demonstration period for this measure in March 2020.

8.2.2 Impact evaluation

This section presents the impact evaluation for the crowdsourced user needs platform (the Járókelő online public crowdsourcing platform) that allows users of public transport services to share their travel experiences and highlight specific issues/problems they face on the PT

system. The Járókelő platform, which existed to receive crowdsourced data complaints and feedback on general public services, has been enhanced with a dedicated public transport page. This will help BKK understand the needs, barriers and problems of the target group of travellers with reduced mobility and reduced ability to use or understand the PT system.

The data related to the 'crowdsourced user needs platform' measure has been collected using the following methodologies:

- Data records submitted by users of the Járókelő platform.
- 'Before' and 'after' surveys of members of the public from the target groups. In total, 265 before surveys and 225 after surveys were completed. These were distributed through identified representatives of the vulnerable user groups to ensure responses were received from the target users.

The main objective was to contribute to improvements in public transport usability for people with reduced mobility. Target users included blind and visually impaired, disabled, travellers with luggage or baby buggies, tourists, and foreigners staying in Budapest long-term. Table 8-3 presents the main impacts.

Table 8-3 Main impacts from crowdsourced user needs platform

Indicator	Target	Before	After	Impact
Number of announcements through jarokelo.hu webpage from PT users	5% increase the number of mobility announcements from target groups.	5 per month 52 announcements (for the 10 month period 1 Jan 2019 – 29 Oct 2019)	14 per month 82 announcements (for the 6 month period 30 Oct 2019 – 29 April 2020)	180% increase
Number of solved announcements			36 solved	44% solved
Number of trips by blind and visually impaired, disabled and those with buggies or luggage	5% increase	72.2% use PT at least 1 to 2 times per week (Wider target group survey – sample 198)	74.6% use PT at least 1 to 2 times per week (Wider target group survey – sample 163)	+2.4% change in vulnerable users using PT at least once a week • 3.8% increase in users
<i>Blind + visually impaired</i>		-----	84.00% (sample 49)	
<i>Disabled</i>		-----	71.4% (sample 56)	
<i>Buggies or luggage</i>		-----	87.5% (sample 40)	
Change in level of satisfaction of blind and visually impaired, disabled and those with buggies or luggage	5% increase	22.2% satisfied or very satisfied (Wider target group survey – sample 198)	27.6% satisfied or very satisfied (Wider target group survey – sample 163)	+5.4% change in % satisfied or very satisfied • 24% increase in target group users who are satisfied or very satisfied
<i>Blind + visually impaired</i>			34% (sample 49)	
<i>Disabled</i>			16.1% (sample 56)	
<i>Buggies or luggage</i>			30% (sample 40)	

Change in level of satisfaction of tourists + foreigners who live in Budapest on long term	5% increase	56% satisfied or very satisfied (Wider target group survey – sample 66)	59.7% satisfied or very satisfied (Wider target group survey – sample 62)	+3.7% change in % satisfied or very satisfied • 6.6% increase in target group users who are satisfied or very satisfied
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82 passenger-provided 'announcements' (crowdsourced data submissions) were received through the dedicated public transport Járókelő online platform during the measure demonstration period, i.e. from November 2019 to March 2020. This equated to 14 per month. The type of announcement varied significantly, with many relating to lack of physical access to stops, platforms and stations. The most common complaint submitted related to a lack of low kerbs for wheelchairs and buggies (29 instances of this were submitted). These low kerbs (drop kerbs) are required on pavements surrounding PT stops. However, this could not be solved by BKK as it is the responsibility of Budapest Public Roads department (Budapest Közút). Nevertheless, the information was shared with these organisations for future work. Some other announcements would require major infrastructure investment and cannot be solved in a short space of time. However, the information is included to be considered in the long-term planning of infrastructure and fleet upgrades (BKK oversee an annual reconstruction program where future renovations are planned).

In total, 36 announcements were acted on and solved, or official responses were provided on actions that will be taken. The types of problems that could be solved included improvements to information at stops, introduction of tactile paving on platforms and in stations, fixing lighting issues highlighted by visually impaired users, plans to introduce braille signs at PT stops, adjusting handrails on a staircase, improving audio information at stations, professional responses to requests to provide barrier free access to PT stops and to the street from stations, and improved descriptions of how to use discount cards / student IDs.

Where appropriate, announcements relating to feedback about staff behaviour can feed into the future staff awareness training programs (see Section 8.1).

The 'before' and 'after' surveys conducted with the target groups show improvements in satisfaction levels and small increase in levels of PT use. The extent to which these positive improvements are a result of the crowdsourced data platform measure is not clear. Awareness of online announcement websites where users can report their transport-oriented problems was 38% (up from 28% in the before survey), although only 10% of the target users in the after survey had used the Járókelő online platform (significantly up from 2.5% in the 'before' survey).

Having good support from organisations that represent the target groups is crucial in marketing and making the users they represent aware of, and able to understand how to use, the Járókelő online platform for submitting/sharing feedback on their public transport trip experience.

8.2.3 Discussion on validity of the results

The main difficulty in the 'before' data collection related to obtaining data specific to the target user groups. Data on announcements/complaints from passengers received does not identify if the user belongs to a vulnerable target group. This was deemed to be sensitive information relating to the individual and as the 'announcements' were submitted to a public platform the information provided is retrievable. In many cases, target group can be inferred from the nature of the announcement/complaint received, but not always. This needs to be borne in mind when interpreting the results from this measure.

The 'before' surveys with the target user groups also suffered difficulties differentiating between some of the target groups. Again, the sensitivity of this information was the barrier to including this. For the 'after' surveys the distribution was more closely controlled to enable isolation of responses from different target groups. Nevertheless, the results presented show positive results for both of the combined target groups in terms of satisfaction and level of use (blind and visually impaired, disabled and those with buggies formed the first group; non-native Hungarian speakers, tourists and foreigners who live in Budapest on long term, formed the second group).

8.2.4 Impact of Covid-19 and opportunities related to Covid-19

Covid-19 resulted in an emergency situation being declared in Hungary on 11 March 2020. Only Hungarian citizens could enter the country from 17 March 2020 (this has since been relaxed for business travel from certain countries). No personal meetings or events were allowed to be organized.

Covid-19 resulted in the curtailment of most public transport services in mid-March 2020. Citizens were avoiding travel, especially more vulnerable persons, and no tourists were arriving to Budapest. Refreshed communication campaigns and planned marketing / targeted promotion of the Járókelő online platform also had to be stopped due to Covid-19.

As a result, the announcements to the Járókelő online platform, although still possible until 29th April 2020, had declined from mid-March 2020. This provided a relatively short demonstration period of 4 ½ months for the measure. Nonetheless, a reasonable number of announcements were received from the public in this time.

The 'after' survey with the wider target groups were undertaken in March and April 2020. This coincided with the Covid-19 restrictions on travel. It is likely that this resulted in a smaller number of completed surveys due to the increased difficulties in engaging with the vulnerable users.

In the recovery from Covid-19 there are many opportunities that a crowdsourced information platform can offer. Passengers can report on instances where safety and hygiene protocols are

not being adhered to. Passengers can share information on crowding levels on PT services and platforms to inform other passengers, but also to notify BKK where more capacity is required, or where gating is necessary to restrict numbers on platforms.

8.2.5 Financial sustainability assessment

Significant costs are incurred by transport authorities or providers to improve infrastructure or adjust service provision in response to user feedback. Traditional mechanisms for collecting user feedback are costly and often infrequent (e.g. through surveys every few years). This is a very slow process and also not very effective at capturing user concerns, which are often forgotten shortly after they are experienced. Capturing user feedback through a crowdsourcing online platform provides a low-cost, instant and continuous source of feedback from which more informed and timely interventions can be introduced.

The information captured can also inform more effective planning decisions in other sectors such as roads and infrastructure and so interdisciplinary cross-sector funding could be attracted for the commissioning of such services. As these infrastructure and fleet renewal upgrades can cost into the millions of Euros, supporting a low-cost crowdsourced data collection platform that identifies user's needs can avoid costly design errors or omissions.

8.2.6 Main findings

- The demonstration showed that almost half (44%) of the reported issues can be quick and relatively cheap to solve or respond to. BKK's previous protocol for dealing with accessibility issues was outdated and slow.
- People with reduced mobility were *empowered* by this measure in the sense that they were given a legitimate and public space to express unmet needs and their voices were heard and quickly responded to.
- Not all reported issues can be solved, especially physical barriers. However, the information should be included to be considered in the long-term planning of infrastructure and fleet upgrades and also shared with other city organisations and stakeholders responsible for road maintenance, street access and signage around stops and stations.
- The contract between BKK and Jarokelo NGO will be extended and the crowdsourced public transport data platform will continue after the end of the INCLUSION demonstration campaign.

Lessons learnt include:

- Providing responses to all 'announcements' is important to build trust between the target users and BKK (the transport provider) and create a feeling that the provider is empathetic to the user's needs.
- Promotion and marketing are essential to raise awareness of the crowdsourced platform.
- Having good support from organisations that represent the target groups is crucial in marketing and making the users they represent aware of, and able to understand how to use the platform. Communicating the benefits of the platform to them, sharing success stories of issues that have been solved, and showing the platform works is crucial to engage these users.

9 Conclusions

Work Package 5 has undertaken a quantitative assessment of the impacts and a qualitative process evaluation of the innovative transport solutions implemented in the INCLUSION pilot sites.

This Deliverable, D5.5, presents a description of the “during INCLUSION” phase for each of the measures that are being demonstrated in the Pilot Labs and provides results of the assessment comparing the “before INCLUSION” data with the “during/after INCLUSION” data collected by June 2020 for a set of identified key performance indicators. The impacts of the INCLUSION measures are evaluated from changes in directly observed data relating to the KPIs and supplemented by additional feedback provided by key stakeholders in the measure delivery. At each PL site, the results are interpreted in the context of external factors, including the Covid-19 pandemic, and data validity considerations are highlighted for each measure.

While the preceding Sections have presented the impact of each measure evaluated individually, against the measure specific objective and associated key performance indicators for the measure, there are a number of key indicators which broadly apply across measures and which address the common INCLUSION project objective to: *“Ensure accessible, inclusive and equitable conditions for all and especially vulnerable user categories”*.

Table 9-1 to Table 9-4 present the common indicators and quantitative targets relating to the impact evaluation at the project level, as defined in Section 2 of the Description of Action. These tables then highlight the impact achieved for the different measures introduced in WP4 relating to the project level KPIs.

In addition, an initial cross-site assessment has been undertaken to elicit some key common findings from the impact evaluation. These are summarised below:

The most successful measures were those where extensive demand analysis or user requirements work was undertaken and where co-design formed a key element of the process.

- It is essential to provide platforms or settings where vulnerable users’ voices can be heard and quickly responded to.
- Properly catering for the needs of vulnerable users, captured in co-design sessions, takes time and adds cost to the development, but it is necessary.
- Co-design needs to include all stakeholders involved in the solution and not just the end users. E.g. Flanders LMS and volunteer drivers more important in the co-design than the elderly users.
- Properly understanding the needs, wishes and capabilities of the target users avoids developing / delivering solutions that are not compatible with users’ way of life.

Building partnerships and providing one-to-one support are essential for increasing user awareness, confidence and capability, leading to greater uptake.

- Certain vulnerable user groups encounter social-demographic barriers to use of new solutions; e.g. elderly persons using technology solutions, migrants understanding information solutions, older persons lacking confidence to cycle. One-to-one support is essential to help vulnerable users overcome such barriers.
- To maximise uptake and use by target vulnerable users, partnerships are necessary with local businesses and organisations who work with vulnerable users and can direct or refer suitable vulnerable users to the new mobility service.
- Local champions are essential, especially for solutions where extra support and building partnerships in the community are required (Bike shop owners, Migrant support workers)

The public sector has a role to play through financing, monitoring, assuring quality and safety.

- Public-Private Partnerships (or Public-Community Partnerships) often provide the best means of delivering solutions, where public sector funding initiates new services which can then be operated at a lower cost by private or not for profit organisations. The private sector or community organisation also increases promotion and engagement within the local community.
- The public sector funding provides the leverage to ensure vulnerable user needs are catered for and can benefit from the schemes and that safety and security of users (and their data) is enforced.

A more comprehensive cross-site assessment synthesising the results of the impact evaluation in combination with the process evaluation will allow for important factors of success/failure to be identified within the context of the conditions in which the measures have been implemented. This cross-case analysis will also be conducted to find similarities and differences among the PL measures taking account of the widely differing implementation environments and target user groups. This is crucial for identifying transferability recommendations which will be reported on in D5.6 '*Evaluation of findings and transferability potential at European level*'. This final deliverable in work package 5 will also present a set of lessons learnt and key recommendations for policy and practice.

Table 9-1 Project KPI: Change in no. of uses / trips by target groups

Indicator	Target	Site/measure	Target Users	Impact
Change in no. of uses / trips by target groups	25% increase in number of trips made using PT (conventional or alternative PT) services by vulnerable users	RHEIN SIEG: More frequent bus service	Families with young children	400% increase in number of trips using bus to primary school by children accompanied by parents
		BARCELONA: Demand responsive collective bus service	Young adults, teenagers, women	37% increase in BusUp ticket sales
		FLORENCE: Campi Bisenzio	Migrants	84% increase in bus trips by migrants on line 30
		FLORENCE: San Piero	People living in rural areas	7.7% increase in bus trips
	25% increase in number of trips involving transport connections to the PT network by target users at pilot lab sites (for measures where connected journeys are a desired outcome by users)	FLORENCE: Campi Bisenzio	Migrants	35% of migrant bus trips involved connection from bus to tram during morning peak. A further 18% made bus to bus connections
		FLORENCE: San Piero	People living in rural areas	82% increase in passengers who make a connection to other PT services
		CAIRNGORM NATIONAL PARK: e-bike share scheme	Tourists	27% of tourist users of e-bike scheme accessed CNP by train. This compares to the average of only 3% of tourists using PT to access CNP

Table 9-2 Project KPI: Change in no. of users from target groups

Indicator	Target	Site/measure	Target Users	Impact
Change in no. of users from target groups	-----	BUDAPEST Staff training + crowdsourced data platform	Physically disabled; Sensory disabled; Those with buggies	3.8% increase in vulnerable users using PT at least once per week
		RHEIN SIEG: More frequent bus service	Families with young children	16% increase in children accompanied by parents using bus at least once a week for regular trips. 40% increase in proportion of unaccompanied children using bus at least once a week 80% (net) of rare PT users increasing their bus use.
		RHEIN SIEG: Promoting cycle use	Families with young children	increase in children accompanied by parents cycling to activities: +57% to primary school +0% to secondary school +21% to sports activities +33% to social activities
		BARCELONA: Demand responsive collective bus service	Young adults, teenagers, women	BusUp users 70% more likely to be female than average festival attendees BusUp users 16% more likely to be aged under 24 than average festival attendees BusUp users 4 times more likely to be aged under 18 than average festival attendees
		CAIRNGORM NATIONAL PARK: e-bike share scheme	People living in rural areas; Elderly	65% of rural residents using e-bike had never used e-bike before. 15% of resident users were over 65 and 20% were 56-65 years old

Table 9-3 Project KPI: Increase in access to services and activities

Indicator	Target	Site/measure	Target Users	Impact
Increase in access to services and activities (e.g. PT network / Social and Leisure activities / Work locations)	Increase type of transport services available to the public at pilot site	RHEIN SIEG: More frequent bus service	Families with young children	More frequent (+lower fare) bus service accessing school, kindergarten
		RHEIN SIEG: Promoting cycle use	Families with young children	58% of trips by hired e-bike replace car trips 41% of e-bike trips were to access work 33% to access leisure 20% to access shopping 6% of hired e-bike trips involved parents accompanying children – all of these trips were previously undertaken by car
		BARCELONA: Demand responsive collective bus service	Young adults, teenagers, women	46% increase in number of BusUp services accessing Canet Rock festival 13.9% of BusUp users couldn't have attended without BusUp 60% of BusUp users attending for the second time came by car in 2018
		CAIRNGORM NATIONAL PARK: e-bike share scheme	People living in rural areas; Elderly; Young persons without access to car	Shared e-bike service provided at 3 locations. For residents, leisure and health were the most commonly stated reason for use, with 17% using e-bike to access work.
		FLORENCE: Campi Bisenzio	Migrants	Improved bus to tram intermodal connections – approx. 500m reduction in walking interchange for trips accessing city centre employment and services

Table 9-4 Project KPI: Change in satisfaction

Indicator	Target	Site/measure	Target Users	Impact
Change in satisfaction with general mobility provision and access to services and activities (e.g. PT network / Social and Leisure activities / Work locations)	40% increase in satisfaction with access to key services / opportunities for vulnerable users (at pilot site)	RHEIN SIEG: More frequent bus service	Families with young children	7.8% increase of people who are very satisfied or satisfied by mobility offers in Hennef Im Siegbogen
		BARCELONA: Demand responsive collective bus service	Young adults, teenagers, women	64% more women satisfied with BusUp compared to using train to access the event 31% more under 24’s satisfied with BusUp compared to using train to access the event
		FLORENCE: Campi Bisenzio	Migrants	78% increase in passengers satisfied or very satisfied with PT offer.
		FLORENCE: San Piero	People living in rural areas	15.7% increase in passengers satisfied or very satisfied with PT offer
		BUDAPEST	Physically disabled; Sensory disabled; Those with buggies	24% increase in target group users who are satisfied or very satisfied
			Non-native language speakers	6.6% increase in tourists + foreigners who live in Budapest long term who are satisfied or very satisfied
Change in satisfaction with services and/or information on services (amongst those who used or experienced the new solutions)		RHEIN SIEG: More frequent bus service	Families with young children (survey with wider population)	38.5% increase of people who are very satisfied or satisfied with the general mobility offer amongst those who used the increased bus frequency measure
		RHEIN SIEG: Reduced bus fare		35.4% increase of people who are very satisfied or satisfied with the general mobility offer amongst those who used the lower bus fare
		RHEIN SIEG: Promoting cycle use		20% increase of people who are very satisfied or satisfied with the general mobility offer amongst those who used the Mobility map measure
		FLORENCE: San Piero	People living in rural areas	75% increase in passengers satisfied or very satisfied with quality of information provision
		FLORENCE: San Piero	People living in rural areas	111% increase in passengers making a connection who are ‘very satisfied’ with ease of making connection



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