RECIPROCITY

D.4.3

Catalogue of mobility best practices

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The RECIPROCITY project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

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Dissemination level (please select one)		
CO	Confidential, only for members of the consortium including the Commission Services	
PU	Public	x
PP	Restricted to other programme participants, including the Commission Services	
RE	Restricted to a group specified by the consortium including the Commission Services	

Nature of the deliverable (please select one)		
R	Report	x
D	Demonstrator	
W	Websites, patents filing, etc	
O[2]	Other	

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Publishable summary

RECIPROCITY aims to transform European cities into climate-resilient and connected, multimodal nodes for smart and clean mobility. The project's innovative four-stage replication approach is designed to showcase and disseminate best practices for sustainable urban development and mobility.

As part of this project, this catalogue of mobility provides guidance and direction for mobility services providers and cities looking to implement sustainable mobility solutions. It is based on interviews and results from RECIPROCITY workshops and webinars and is designed to help cities across Europe become more resilient, connected, and sustainable.

The catalogue of best practices is a critical component of the project's four-stage replication approach. It includes a range of strategies and tools for sustainable urban development and mobility, such as innovative transport modes, smart mobility solutions, and sustainable infrastructure. The catalogue also provides guidance on how to implement these best practices and adapt them to local contexts, ensuring they are feasible and cost-effective.

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List of abbreviations

BRT Bus Rapid Transit

BVLOS Beyond Visual Line Of Sight

CAA Civil Aviation Authorities

C-ITS Cooperative Intelligent Transport Systems

ERDF European Regional Development Fund

E-VTOL Electric Vertical Take-Off and Landing

H2020 Horizon 2020 Framework Programme for Research and Innovation of the European Union

ITS Intelligent Transport Systems

MaaS Mobility as a Service

MDMS Multimodal Digital Mobility Services

PT Public Transport

RCP Reciprocity

TRL Technology readiness level

UAM Urban Air Mobility

VLOS Visual Line Of Sight

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1. Introduction

RECIPROCITY has created a community of cities and municipalities that vary in size, requirements, and level of mobility advancement. These cities are engaging in support activities to accelerate the replication and scaling up of the outcomes of demonstration and pilot mobility projects. These activities include matchmaking, capacity-building, training, finance, and legal support, as well as knowledge sharing and exchange.

A continuous knowledge exchange and information flow between cities and municipalities is crucial to fast-track the process of replicating successful mobility innovations in the future. RECIPROCITY's WP4 Share, thus, is giving particular efforts towards knowledge capturing and sharing.

The mobility solutions described in this document have been selected among the ones listed during the stakeholder mapping activities carried out in WP1 Identify. It has been decided to collect both successful and less successful practices as well as past, ongoing and planned solutions.

Indeed, by examining best practices, it is possible to identify successful approaches and strategies that have been proven effective in achieving sustainable mobility solutions. These best practices can be used as models for replication, saving time and resources, and increasing the likelihood of success in new contexts.

Secondly, analysing unsuccessful practices can be equally valuable as it can highlight the common pitfalls and challenges that must be avoided when implementing sustainable mobility solutions. By learning from failures and mistakes, cities and municipalities can avoid repeating them in future implementations, leading to more efficient and effective use of resources and better outcomes.

Similarly, studying past mobility solutions allows us to identify successful approaches and strategies that have been implemented in the past, while examining ongoing solutions allows us to identify promising approaches that are currently being implemented and tested. Collecting information on planned solutions, on the other hand, provides an opportunity to learn about emerging trends and technologies in sustainable mobility, enabling us to anticipate and prepare for future challenges and opportunities.

Moreover, collecting both successful and unsuccessful practices, as well as information on past, ongoing, and planned mobility solutions, provides a comprehensive picture of what has worked and what has not, allowing the development of a more nuanced understanding of the factors that influence the success or failure of mobility solutions. This knowledge can be used to refine and improve existing solutions or develop new solutions that are better suited to specific contexts and needs.

In summary, this catalogue will support in the replication of innovative mobility solutions. By learning from both success and failure, we can develop more effective and efficient solutions that are tailored to specific contexts, and ultimately achieve our goal of sustainable and resilient mobility for all.

This document includes mobility solutions that emerged throughout the RECIPROCITY project. The collected mobility solutions have been clustered into six main thematic groups, some of them including sub-groups:

- *1st group – Autonomous vehicles*
- *2nd group – Multimodal Digital Mobility Services (MDMS)*
    - *Mobility as a Service (MaaS)*
    - *Multimodal Mobility and Shared Mobility*

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    - *On demand mobility*
- *3rd group - Electric and hydrogen vehicles*
- *4th group - Data collection and Traffic management systems*
    - *Parking management*
    - *Traffic calming*
    - *Data collection & usage*
- *5h group – Other*
    - *Air taxis and drones*
    - *Bikes*
    - *Tramway and light rail*
    - *Bus Rapid Transit (BRT)*

Moreover, some use cases have been assigned to several groups and may be repeated in different sections.

Only some use case owners have yet to confirm permission to publish the interview results. **Once the approvals are secured, the information will be published in the RECIPROCITY Knowledge Center and ARRIVAL platform.**

The collection of Mobility cases will continue until the end of the project. Therefore **the list of cases mentioned in this deliverable could be only partial.**

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2. Methodology: questionnaire on mobility use cases

A series of interviews have been conducted to collect information on the selected mobility solutions. These interviews provided us with valuable insights into the challenges and opportunities associated with implementing sustainable innovative mobility solutions, and allowed us to identify successful approaches and strategies that have been proven effective in different contexts. In this paragraph, the interviews carried out will be described.

The questionnaire has been thought to be flexible and adaptable to every different context and mobility case. Therefore, some questions were mandatory, while others could be answered when relevant, or reformulated. The interviewer was able to react flexible on the interviewee, the specific case and therefore also adapt the questions if needed.
The questionnaire has been developed to mirror the RECIPROCITY four-stage approach (see Figure 1) with sections dedicated to:

1. the **identification** of the solution,
2. a more specific description to facilitate the **learning**,
3. the information related to the **acceleration** of the implementation of the solutions (mainly dedicated to the already implemented innovations),
4. and finally a section related to the **share** of the solution, including its public acceptance and facts and figures.

By mirroring the four stages of replication, the interview results also feed into the other WPs in RECIPROCITY, e.g. Funding and Legal Helpdesk, Business Model Generation, and Policy recommendation. Through conducting interviews instead of only sending a survey to stakeholders, a much more extensive information base could be created, and stakeholder's connection to and involvement in RECIPROCITY could be expanded.

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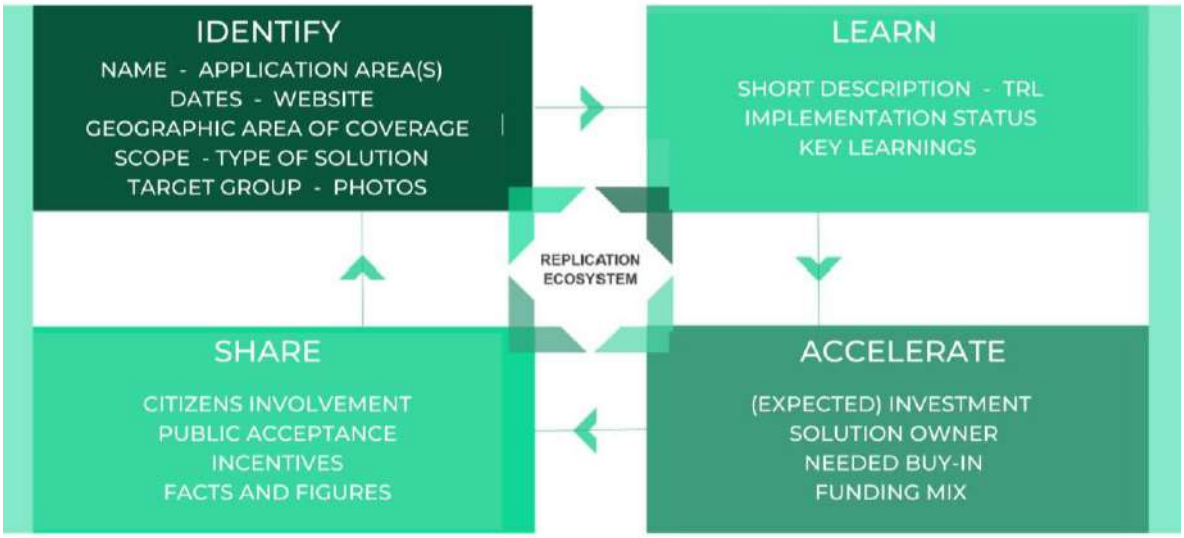

Figure 1 - interview structure

IDENTIFY[1]

1. Solution name*:
2. Application area(s):
    - City(s):
    - Region(s)*:
    - Country(s)*:
3. (Expected) starting implementation date*:
4. (Expected) completion date (since when application of the solution is ongoing)*:
5. Website:
6. Geographic area of coverage*:

    Please select one or more.

    ☐ Urban

    ☐ Periurban

    ☐ Rural
7. Scope*:

    Please select one or more.

    ☐ Tourism

    ☐ Commuter

    ☐ Everyday mobility

    ☐ Logistics

    ☐ Other

[1] *The questions marked with * are mandatory*

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8. If you selected other, please indicate what:
9. Type of solution*:

Please select one or more.

- ☐ Bus Rapid Transit (BRT)
- ☐ Electric or hydrogen vehicles
- ☐ Autonomous vehicle
- ☐ Data collection system
- ☐ Traffic management system
- ☐ Mobility as a service (MaaS)
- ☐ Multimodal Mobility
- ☐ Shared Mobility
- ☐ On-demand Mobility
- ☐ Other

10. If you selected other, please indicate what:
11. Target group:

Please indicate who your customers and who the users are.

12. You can also provide us other material (photos, graphics, text, videos) – please send it per mail.

Please use photos without copyright.

LEARN[2]

13. Short description of the solution*:

500 words max.

14. TRL[3]:

Please select one.

- ☐ TRL 1 – basic principles observed
- ☐ TRL 2 – technology concept formulated
- ☐ TRL 3 – experimental proof of concept
- ☐ TRL 4 – technology validated in lab
- ☐ TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)

[2] *The questions marked with * are mandatory*

[3] List is taken from https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf.

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- ☐ TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- ☐ TRL 7 – system prototype demonstration in operational environment
- ☐ TRL 8 – system complete and qualified
- ☐ TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

15. Implementation status and key learning*:

Please identify the main implementation barriers and drivers, the main actions carried out during the implementation and the key learnings. In case of aborted implementation, please indicate the reasons. 500 words max.

ACCELERATE[4]

16. What is the initial investment needed to implement the solutions, and which additional investment is needed to continue the deployment/scale-up of the implementation (e.g. including more roads, installing more charging stations, covering a larger area, etc.)?

If possible, please mention the budget breakdown for each phase of the replication (feasibility/implementation/operation)If possible, please precise the capital and operational costs (CAPEX/OPEX)?

350 words max.

17. Please indicate what the revenue/incomes are. *

350 words max.

18. Please share any key learnings to reduce the overall costs of the solution.

350 words max.

19. Who owns the solution? Who invests? Who operates and maintains it?*

200 words max.

20. Whose buy-in is needed to deploy the solution (legal, policy, procurement, etc.)? How did you succeed?

200 words max.

21. What funding mix is used to fund the project? *

- ☐ 100% of public funding? If yes, please indicate to which program you apply (will apply).
- ☐ 100% of private investments? If yes, please mention the Venture Capital, Business Angels or Foundations that invest in your project
- ☐ Other: Please indicate what is the funding mix (% and funding sources used, such as banks, crowdfunding, community fundraising, tax, etc.)

200 words max.

[4] *The questions marked with * are mandatory*

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SHARE[5]

22. How do you involve the citizens and users?: *

    Please indicate the stage of implementation. 300 words max.

23. What is the public acceptance of the solution? Do you implement any strategy to influence it?

    200 words max.

24. Which incentives are used to increase the uptake of the solution?

    200 words max.

25. How does policy and regulations affect the project implementation? What recommendations would you give to the national/EU policy makers to facilitate the replication of your solution?

    200 words max.

26. What would be your advice for others to replicate the solution?

    200 words max.

27. Facts and figures: is there anything else you would like to share?

    200 words max.

28. Please indicate the social media account (e.g. of the city where the solution is deployed, the companies involved) to tag for the dissemination of your mobility case."

In the following chapters, the different thematic groups will first be explained, in which mobility solutions have been clustered, and the solutions will be presented.

[5] *The questions marked with * are mandatory*

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3. Autonomous vehicles

Autonomous vehicles, also known as self-driving cars, are vehicles that use a combination of sensors, cameras, and advanced algorithms to navigate without human input. These vehicles have the potential to revolutionise the way we travel, as they have the potential to improve road safety, reduce traffic congestion, and increase access to transportation for people who are unable to drive themselves.

Autonomous vehicles operate using a combination of technologies, including lidar, radar, and computer vision. These sensors detect and interpret information about the surrounding environment, including other vehicles, pedestrians, and road conditions, and use this information to make decisions about how to navigate. Advanced algorithms then use this information to control the vehicle's steering, acceleration, and braking.

While the technology for autonomous vehicles is rapidly advancing, there are still many challenges that must be addressed before they become a common sight on our roads. These challenges include ensuring the safety of passengers and other road users, developing robust cybersecurity measures to prevent hacking, and addressing legal and regulatory issues around liability and insurance.

Despite these challenges, the potential benefits of autonomous vehicles are significant. With continued innovation and investment, autonomous vehicles have the potential to transform the way we move around our cities, making transportation safer, more efficient, and more accessible for all.

List of selected mobility cases on Autonomous Vehicles:

- AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)
- AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)
- AUTONOMOUS SHUTTLE FOR GOODS (GUNSKRICHEN, AT)
- AIRTAXI FOR PASSENGERS (LINZ, AT)
- EMILIA AUTONOMOUS PEOPLE MOVER – SHUTTLE (REGENSBURG, DE)
- AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)
- TWINSWHEEL (MONTPELLIER, FR)

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3.1.1. AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)

IDENTIFY

AUTONOMOUS SHUTTLE FOR PASSENGERS

Application area: Upper Austria (AT)
Implementation date: From 2023 to 2025
Geographic area of coverage: Periurban
Scope: Commuter and everyday mobility
Type of solution: Autonomous vehicle and on-demand Mobility
Target group: Companies, communters

LEARN

The project aims to develop a concept for an autonomous on-demand shuttle for regions. The shuttle will help to connect industry and municipalities with other means of public transportation to facilitate commuting and daily mobility.
The charging solution of the shuttle shall also work autonomously, and there will be a reservation system for the shuttle which shall include a real-time indication of when it will arrive.
Until the end of the project, we want to reach TRL 4.

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ACCELERATE

Implementation status and key learning

The project was granted by the Austrian funding agency FFG and will start in the summer of 2023.

TRL 2

Technology concept formulated

Investment needed

Acquiring the vehicle and the charging solutions, incl. road works. Further costs accrue through route planning, setting up the booking system, marketing, and potential infrastructure adjustments (stops,...).

Revenues/incomes

There will be indirect revenues/incomes, as the solution benefits employees and employers. Employee satisfaction might rise, as there will be better public transportation opportunities.

A possible revenue/income can be ticketing (this is not part of the project).

Solution owners

Project partners own, operate and maintain the solution.

Funding mix

Depending on the company type of project partner, the grant covers up to 85% of the expenses.

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SHARE

Citizen and user involvement

Citizens and users will be included throughout the project to ensure the shuttle will be used and accepted and that the on-demand service is working. The project team will stay in close contact with users, municipalities and companies.

Public acceptance

The autonomous e-shuttle shall serve as an efficient, transparent and dynamic public transportation for commuters. In the beginning, a safety driver will be on board to reassure passengers and answer their questions.

Incentives are used to increase the uptake of the solution

Further information is possible after the test operation.

Policy enablers for replication

Recommendations:

- Further development/standardisation of the approval processes for testing and operation of autonomous vehicles.
- Reduce bureaucracy
- Develop a well-founded set of rules/procedures for driverless operation (without safety driver)

Tips for replication

Urban air mobility projects with passengers are long-term projects - an implementation plan might take up to 15 years.

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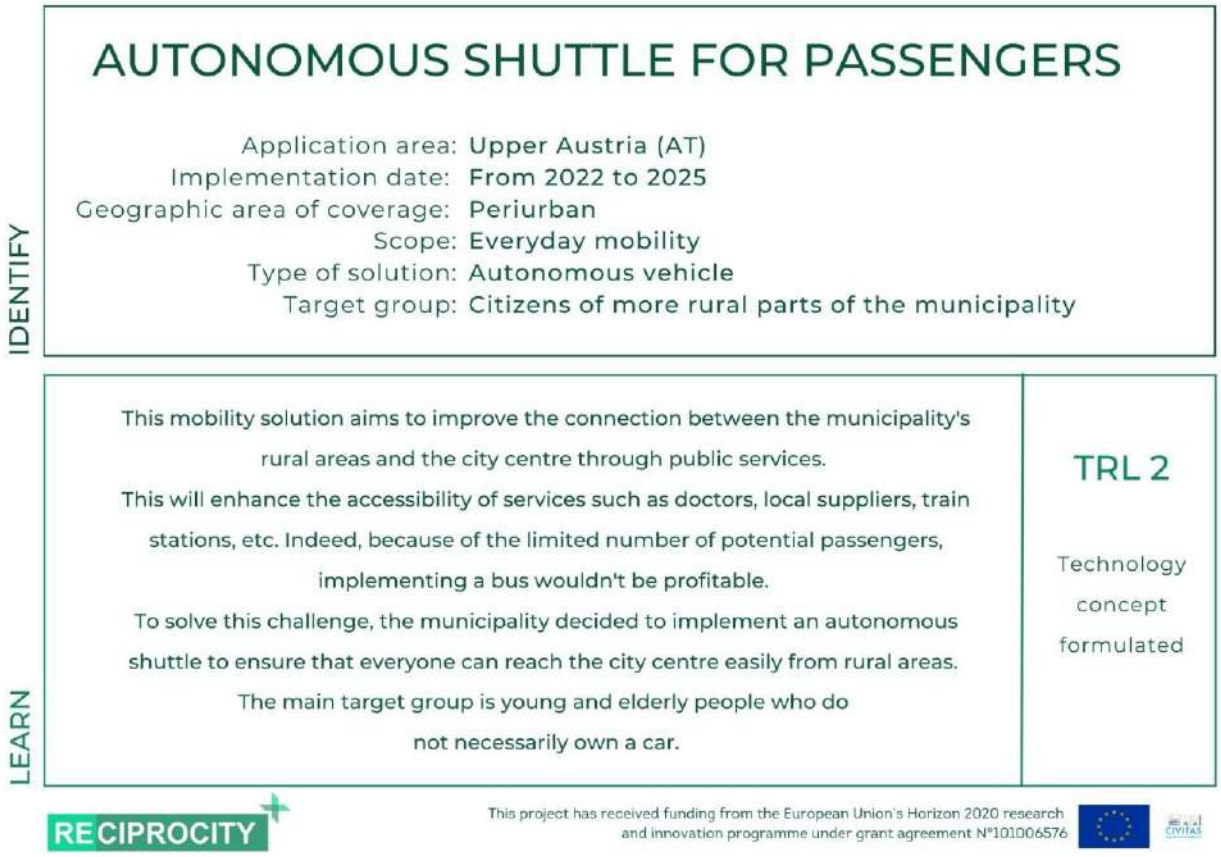
3.1.2. AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)



LEARN

Implementation status and key learning

Implementation cancelled.

Key learnings/reasons for the cancellation:

- The main focus was to connect the southern areas of the municipality with the city centre. The shuttle would have had to cross a busy road without stopping the traffic for too long. This is not possible at the moment.
- A shuttle service would primarily be needed during bad weather conditions (rain/snow). The current state of the technology does not allow this.
- Speed limitations for autonomous vehicles on public roads in Austria.

ACCELERATE

Revenues/incomes

Bus ticketing and public funding for the implementation and operation.

Solution owners

The municipality would have owned the solution.
Maintenance and operation would have been outsourced.

Funding mix

100% of public funding - From the State and the Municipality.

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SHARE

Citizen and user involvement

A survey showed that the citizens wanted public transportation to the centre, particularly the train station. As a result, the local government started looking for solutions to address this need.

Before the actual implementation, a second survey was planned to identify the real needs and wishes of the public regarding the shuttle, and more detailed information on the shuttle would have been given (e.g. ticketing).

Incentives are used to increase the uptake of the solution

A lottery for free shuttle usage for a year was planned.

Policy enablers for replication

- Cost reduction to support municipalities/cities with the implementation, such as funding for the implementation and operation.
- Regulations to prioritise public transportation.

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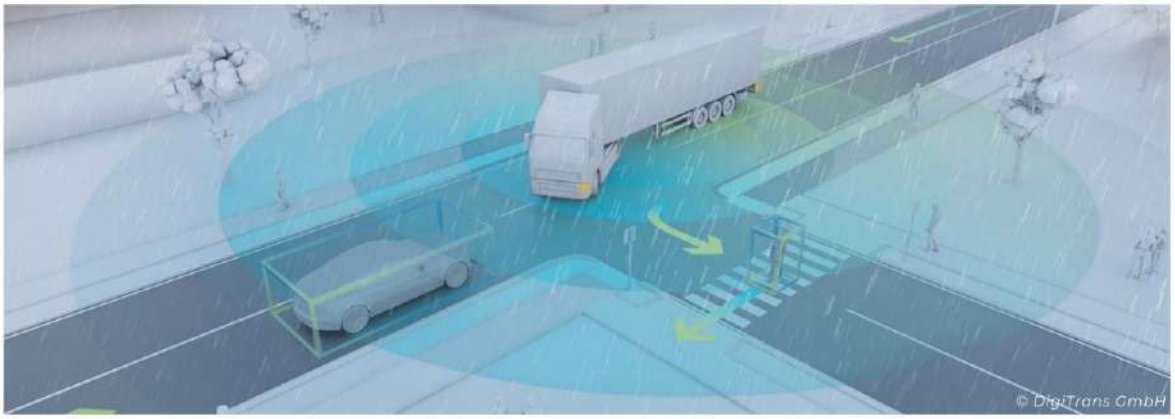
3.1.3. AUTONOMOUS SHUTTLE FOR GOODS (GUNSKRICHEN, AT)



IDENTIFY

AUTONOMOUS SHUTTLE FOR GOODS

Application area: **Gunskrichen, Upper Austria (AT)**
Implementation date: **From 2021 to 2023**
Geographic area of coverage: **Rural**
Scope: **Logistics**
Type of solution: **Autonomous vehicle**
Target group: **Companies**

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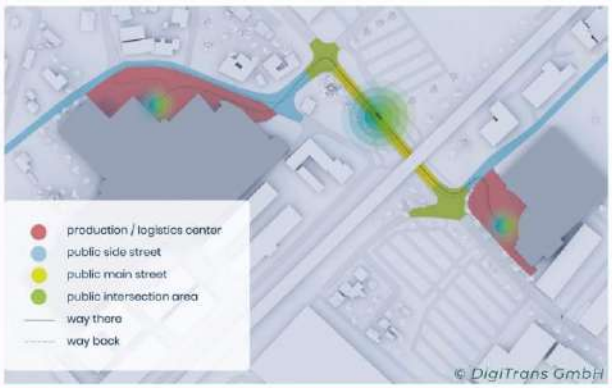
LEARN

AUTONOMOUS SHUTTLE FOR GOODS

Gunskirchen (AT) / Hub-to-hub is an autonomous logistics shuttle service that can work on public roads under harsh weather conditions (BRP Rotax, DB Schenker, Digitrans).

The project aims to **demonstrate the functionality of an autonomous exchangeable container truck between the Engine Factory of BRP-Rotax and the Logistics Hub of DB Schenker** (Gunskirchen, Austria), which are connected through factory areas, public roads and crossing areas.

The goal is to **replace the conventional truck with a driverless electric transporter** with test permission by 2023. The trucks will be able to work during all weather conditions.



For this purpose, new infrastructure is planned (5G network, C-ITS, etc.), and preliminary tests will be performed at the Digitrans test ground in St. Valentin with a unique outdoor rain plant.

TRL 6

System prototype demonstration in an operational environment.

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LEARN

Implementation status and key learning

Currently (April 2023), the project is in the final phase before the demo operation on public roads. The demonstration is planned for June 2023, followed by evaluation and proof of concept.

Key Learnings:

- Challenging legislation: risk assessments and vehicle safety demonstrations are required to enable safe test operations.
- The creation of roadside infrastructure as needed.
- Operation in bad weather conditions is of high importance (availability 24/7 is necessary)
- Early involvement of stakeholders is essential for familiarisation with the new technology. Early communication is important in supporting public acceptance.

ACCELERATE

Investment needed

Acquisition of the vehicles & technology: Currently (April 2023), these are in prototype status. Therefore, the costs are expected to drop sharply when serial production starts.
Preliminary work (test certificates, adjustments infrastructure, roads,...), operation, maintenance, personnel expenses, safety drivers and their training are costs that must also be considered.

Revenues/incomes

There will be indirect revenue as the autonomous shuttle does not need a driver and can operate 24/7.
Moreover, empty runs can be minimised.

Funding mix

H2020 project - depending on the company type, up to 100% funding.

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ACCELERATE

Key learnings to reduce the overall costs

A homogeneous concept will lead to better processes and therefore save costs.
Currently (April 2023), the technology is still a prototype. When it is in serial production, the price is expected to drop.

Solution owners

The solution is owned, operated and maintained by the project partners.
In the future autonomous shuttles could be owned and maintained by the company or the operator. The investment could be taken over by the operator.

Buy-in needed

The legal basis is the most critical factor.
To ensure social acceptance, the technology must be safe and mature.

SHARE

Policy enablers for replication

Recommendations:

- Further development/standardisation of the approval processes for testing and operation of autonomous vehicles.
- Minimise bureaucracy.
- Develop a well-founded set of rules/procedures for driverless operation (without safety driver)

Tips for replication

Assess the readiness level of the technology and evaluate the route.

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3.1.4. AIRTAXI FOR PASSENGERS (LINZ, AT)

IDENTIFY

AIRTAXI FOR PASSENGERS

Application area: Linz, Upper Austria (AT)
Implementation date: From 2019
Geographic area of coverage: Urban
Scope: Tourism and everyday mobility
Type of solution: Autonomous vehicle - Urban air mobility
Target group: Inhabitants of the city, tourists, workers and taxi users

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AIRTAXI FOR PASSENGERS

The project's goal involving EHang, FACC and LINZ AG is to implement passenger flights as autonomous air taxis in Linz.
The drones will fly on predefined routes to/from designated locations, and passengers can choose where to enter and which stop they want to fly to.
Each drone will have space for two passengers.

LEARN

Implementation status and key learning

Air taxis are ready for use and are already used in some countries. (e.g. in China).
The main barriers are the regulations and bureaucracy for testing the solution in Europe. Several workshops have been conducted to discuss, e.g. business models, public acceptance, ticketing, and safety regulations.
Linz AG and FACC are waiting for a permit to test the drones without passengers in a closed area.
After those tests, further planning and workshops can go on.

TRL 6

Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies).

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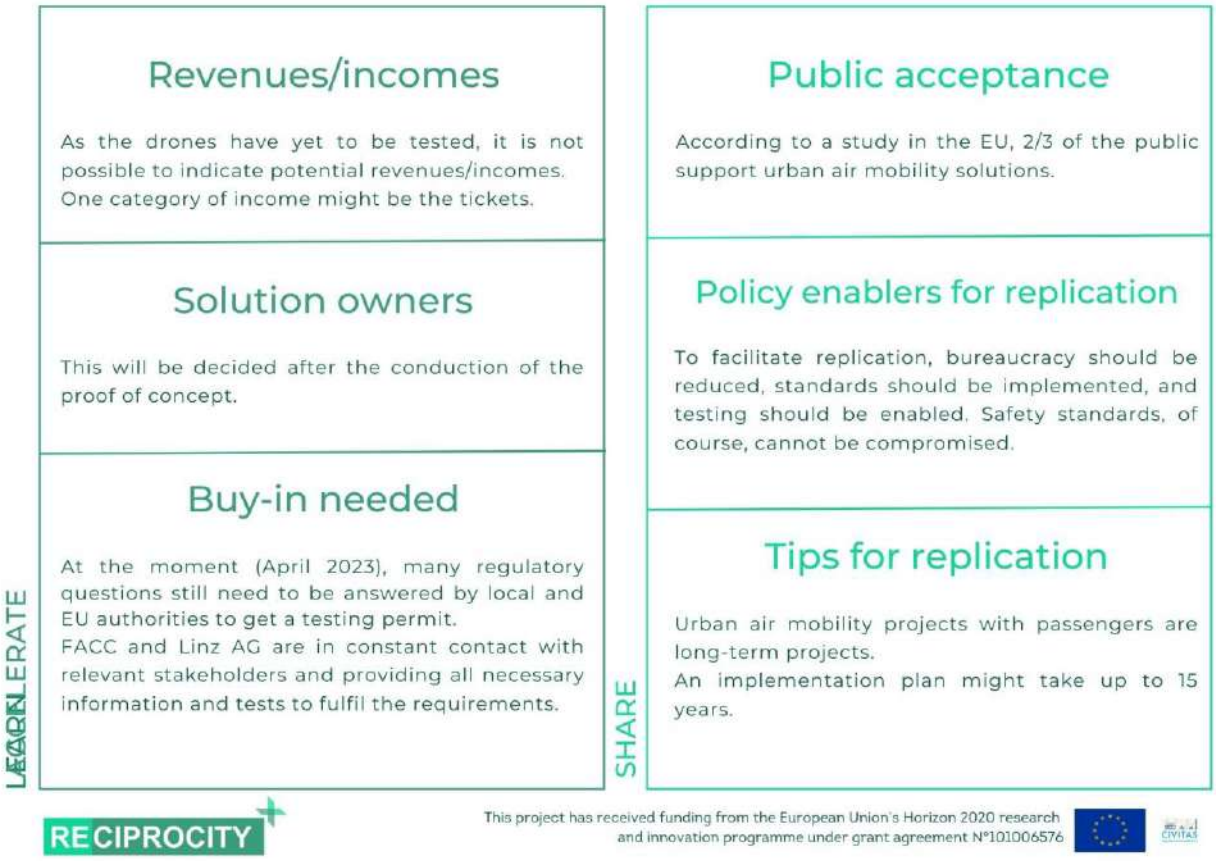
Revenues/incomes
As the drones have yet to be tested, it is not possible to indicate potential revenues/incomes. One category of income might be the tickets.
Solution owners
This will be decided after the conduction of the proof of concept.
Buy-in needed
At the moment (April 2023), many regulatory questions still need to be answered by local and EU authorities to get a testing permit.
FACC and Linz AG are in constant contact with relevant stakeholders and providing all necessary information and tests to fulfil the requirements.
LEARN
Public acceptance
According to a study in the EU, 2/3 of the public support urban air mobility solutions.
Policy enablers for replication
To facilitate replication, bureaucracy should be reduced, standards should be implemented, and testing should be enabled. Safety standards, of course, cannot be compromised.
Tips for replication
Urban air mobility projects with passengers are long-term projects.
An implementation plan might take up to 15 years.
SHARE
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3.1.5. EMILIA AUTONOMOUS PEOPLE MOVER – SHUTTLE (REGENSBURG, DE)

IDENTIFY

EMILIA
AUTONOMOUS PEOPLE MOVER (SHUTTLE)

Application area:	Regensburg, Bavaria(DE)
Implementation date:	From 2024 to 2025
Geographic area of coverage:	Urban
Scope:	Tourism, commuter and everyday mobility
Type of solution:	Electric vehicles, autonomous vehicles, data collection system
Target group:	E.g. citizens with routes within the commerce park of Regensburg

WEBSITE: WWW.DAS-STADTWERK-REGENSBURG.DE/MOBILITAET/AUTONOMER-SHUTTLE/

VIDEO: WWW.YOUTUBE.COM/WATCH?V=DQWJS4KUOAW

TRL 7 System prototype demonstration in operational environment

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EMILIA
AUTONOMOUS PEOPLE MOVER (SHUTTLE)

As part of a two-year pilot project, das Stadtwerk.Mobilität is sending two autonomous vehicles on a ring route with seven stops in the Regensburg industrial park.
On weekdays between 10:00 and 16:00, passengers can use the shuttle service there free of charge at 10-minute intervals.
At the beginning of 2021, the routes were measured with test drives in cooperation with the vehicle manufacturer Navya and TÜV Nord. On September 1st 2021, the autonomous shuttles started operating.
During the journey, a trained escort is on board who can intervene if necessary and control two otherwise driverless buses during this development phase.
In the pilot project, the das Stadtwerk.Mobilität is gathering a wealth of experience, knowledge and data and is in close contact with the French vehicle manufacturer Navya, supplying the actual vehicles and the necessary software and project support.
The project is also primarily concerned with identifying and addressing critical issues and problems relating to the operation of autonomous buses.
[simplicity to replicate (1=hard,... 5=easy): 1]

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Implementation status and key learning

Operation:
Key learnings from the process:

- Route extension: finding the right environment, considering obstacles in the existing network (e.g. traffic lights, road width, traffic flow, right of way rules, ...); most accessible: private area/enclosed area (without other road users).
- No route flexibility: construction sites and route changes require route adjustment (very high costs, approx. 80k€).
- Impact of weather conditions: Snowfall, heavy rain -> there are even driving bans from manufacturers under specific conditions.
- Extreme dependence on the manufacturer, e.g. no more support, software shutdown in case of insolvency.
- Under good conditions, the shuttle runs very well (lasts for weeks, with little driver intervention)
- Usage is strongly dependent on route and speed (18km/h too slow).

Main actions to implement:

- Obtain political (support) permission.
- Draw up specifications, incl. invitation to tender.
- Find funding, submit funding applications, and receive funding.
- Shuttle purchase.
- Permits: the City of Regensburg, the government of Upper Palatinate; TÜV expert opinion (test drives, accept software).
- Calibration of the route with the manufacturer.
- Training of employees: driver-operator license - manufacturer related; workshop employees for low-level support (less dependence on the manufacturer).
- Trial operation & fine-tuning through training (shuttle runs better after some testing and training).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

Initial:

- Shuttle: 600k€ for two shuttles (around 40% funding ~250k€).
- Training costs: operator (approx. 500€ per person), mechanics workshop.

Operation:

- Running costs to manufacturer: 4k€ per month per vehicle (depending on service package).
- Rent for heated hall & power supply.
- Operator personnel costs.
- Project coordinator personnel costs (interface with manufacturer, drivers...); 2-20 hours per week.

Revenues/incomes

Pilot action, no tickets needed.

Key learnings

Set up a maintenance contract instead of the entire service contract and buy spare parts in-house.

Solution owners

Das Stadtwerk Regensburg.Mobilität GmbH.

Buy-in needed

Manufacturer Navya

Funding mix

For the purchase of the shuttles, 40% funding (Federal Ministry for Digital and Transport)
For the operation, no funding applies.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Incentives to increase uptake

A higher accepted speed limit would increase the benefit of the solution, and therefore also, user acceptance would rise, and new use cases would appear.

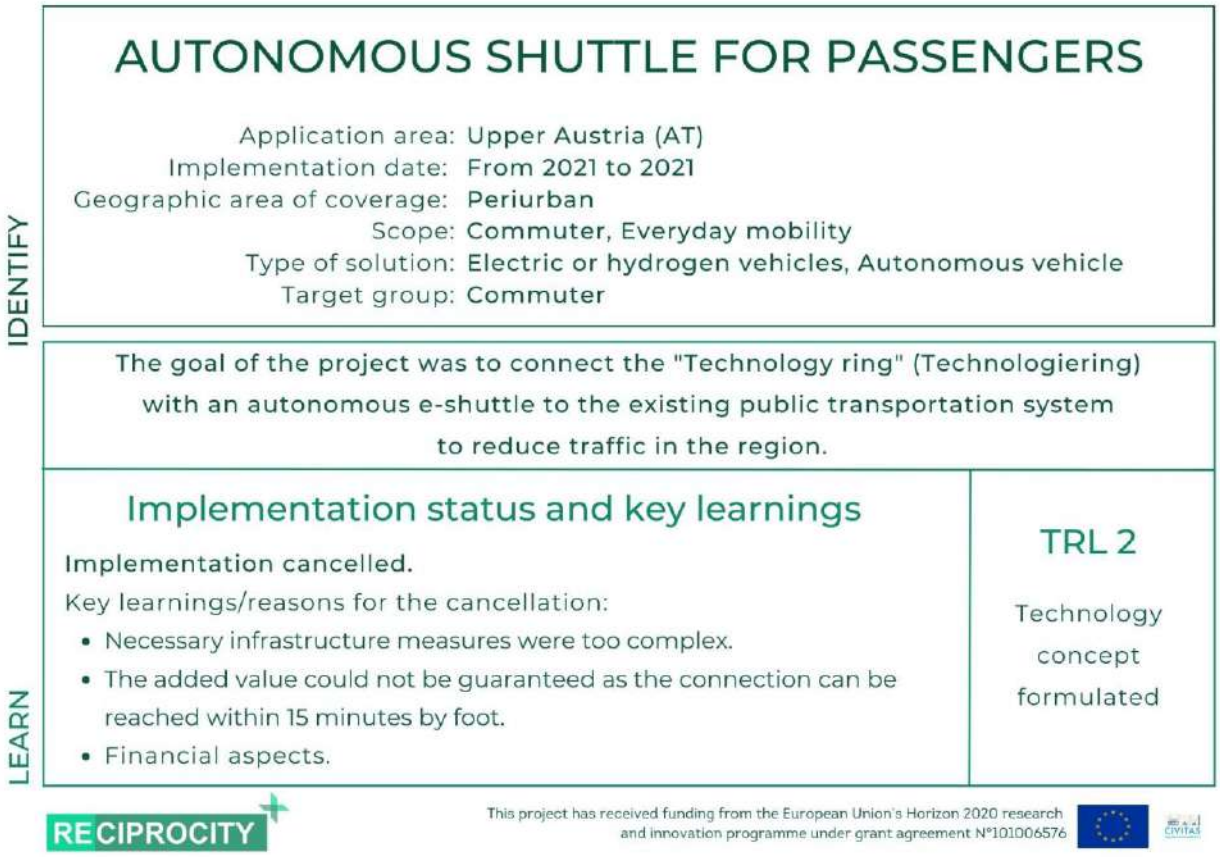
Facts and figures

External expertise from partners from industry and science is needed.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

3.1.6. AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)



ACCELERATE

Investment needed

- Upgrade of the road infrastructure
- Acquisition of the charging infrastructure
- Acquisition costs of the shuttle
- Safety drivers

Solution owners

The ownership and operating structure has not been discussed.

Funding mix

Public funding, municipality, transport providers.

Revenues/incomes

The aim was not to generate income.
In the long term, it should have become a "normal" means of public transport.

Buy-in needed

Municipality and transport providers.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizens and users involvment

Citizens/potential users would be informed through a PR campaign and presentations. An opening day event was planned. After that, the shuttle would have started operating.

Facts and figures

Autonomous shuttles are an opportunity to change mobility behaviour in a sustainable way, if, in the near future they are not so dependent on personnel (e.g. safety drivers).

Tips for replication

Bring different partners on board, also "small" partners and users. Use existing professional structures such as clusters.

Policy enablers for replication

- Clearer definition of the legal framework - there should be a clear set of rules, put on an equal footing with public transport.
- Reduce bureaucratic burden - also for funding.
- New idea for funding projects: at least one municipality/city should be a partner in the project.
- Smaller municipalities/cities should also get more opportunities/funding - include them in the funding measures.

Make autonomous shuttles accessible in a simplified way, especially for decentralised settlement structures.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

3.1.7. TWINSWHEEL (MONTPELLIER, FR)

IDENTIFY

TWINSWHEEL

Application area: Montpellier, Occitanie (FR)
Implementation date: From January 2020 to December 2024
Geographic area of coverage: Urban
Scope: Logistics
Type of solution: Autonomous vehicle
Target group: Logisticians, carrier, agglomeration, supermarket

LEARN

WWW.TWINSWHEEL.FR

TRL 7

System prototype demonstration in the operational environment.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Logisticians need to bring goods in and out of city centres.
With the establishment of a low-emissions zone, the solution ensures green and sustainable logistics.
Droids are small autonomous vehicles whose mission is to transport heavy loads in city centres to reduce the number of large cargo vehicles.
Experimentation includes parcels/mail delivery with La Poste, restocking stores with fresh products with STEF, and detecting potential gas leaks with GRDF.

LEARN

Implementation status and key learning

Two main barriers:

1. Economical
Finding the right business model and governance model to deploy logistics droids. Robots remain expensive due to technological bricks and safety.

2. Technical
To achieve the expected level of security, given that cities are a very complex environment, development is difficult. In addition, there is the question of public acceptance of the logistics droids.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

Deploying an autonomous delivery robot requires 100,000€ for hardware and installation (per robot). Investment is also needed for complex infrastructure points (e.g. connected traffic lights). In operation, regulations currently require one safety driver per robot.

Revenues/incomes

Revenues are based on the sale of droids and a subscription for maintenance and access to servers (fleet management app).

Key learnings

A Change to the regulations so that one safety driver can supervise ten robots at the same time would be beneficial.

Solution owners

- Incumbent carriers, such as postal services.
- The giants of e-commerce.
- Agglomerations as a shared vehicle.

Buy-in needed

ITS implementation requires the involvement and commitment of local authorities, as well as obtaining funding from external sources.

Funding mix

- 50 % public funding.
- 50 % private funding. The margins generated by the products when the robots are deployed on private sites.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

Involving other road users is very important for acceptance. This is why the products are specially designed and, above all, meet real existing needs.

For the users (carriers), the closure of city centres is forcing them to find alternatives to diesel vans.

Tips for replication

Build the right team and consult widely, because these are complex issues that affect the safety of road users and pedestrians.

© TwinswHeel

Public acceptance

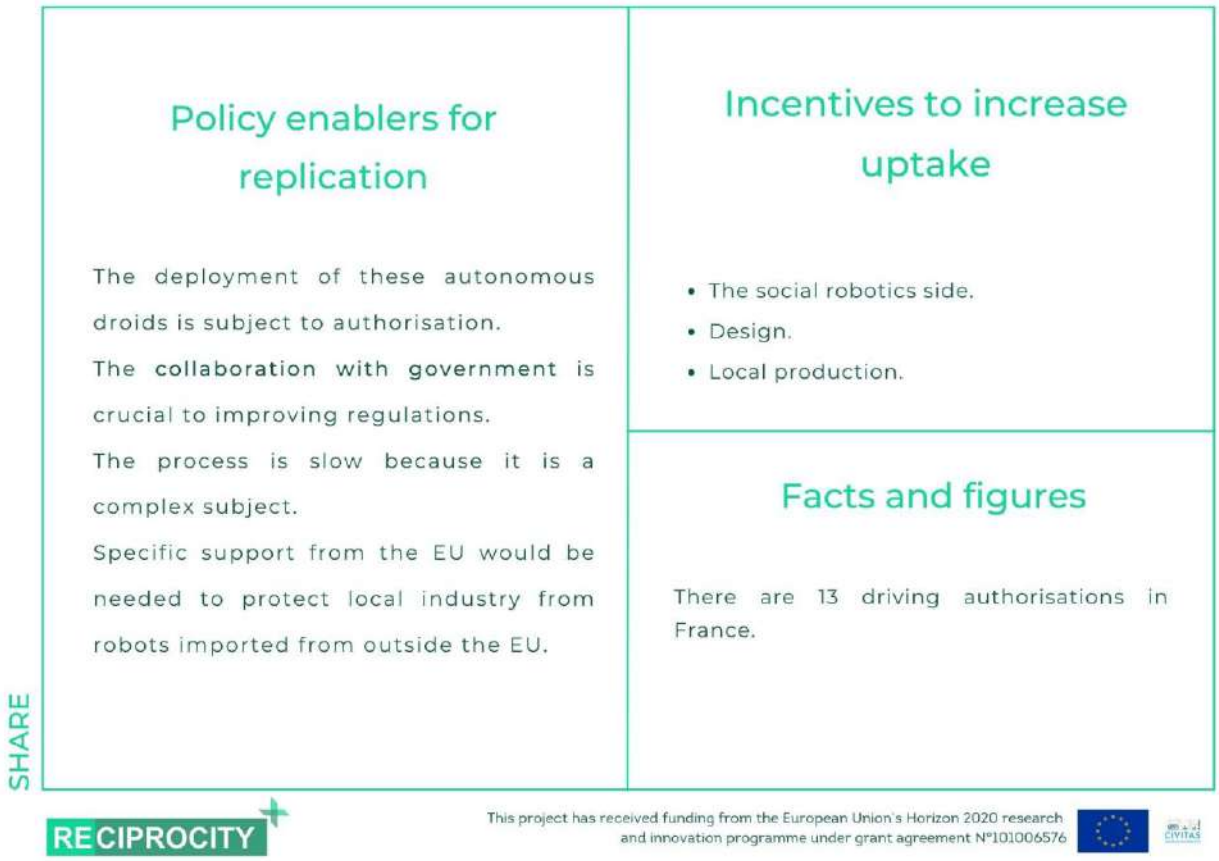
Some features help to build public acceptance:

- The old-school robot design recalls memories and facilitates public acceptance.
- Social robotics: animated eyes, speakers and micro-movements of robots.

The goal is to create a sensitive link with other road users.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576


Policy enablers for replication
The deployment of these autonomous droids is subject to authorisation.
The collaboration with government is crucial to improving regulations.
The process is slow because it is a complex subject.
Specific support from the EU would be needed to protect local industry from robots imported from outside the EU.
Incentives to increase uptake
• The social robotics side.
• Design.
• Local production.
Facts and figures
There are 13 driving authorisations in France.
SHARE
RECIPROCITY
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4. Multimodal Digital Mobility Services (MDMS)

Multimodal Digital Mobility Services (MDMS) refer to the integration of various modes of transportation through digital platforms and applications. These services offer users a seamless and efficient way to plan and access different modes of transportation, such as public transit, ride-sharing, bike-sharing, and walking.

Through these digital platforms, users can easily plan their journeys, select the most appropriate modes of transportation, and pay for their trips ideally using a single account or application. This not only simplifies the process of accessing transportation and makes the transfer from transport more convenient but also helps to reduce traffic congestion, improve air quality, and increase the use of sustainable modes of transportation.

MDMS are a key enabler of the shift towards more sustainable and connected cities, as they help to reduce reliance on private cars and promote the use of more sustainable modes of transportation.

Mobility as a service (MaaS)

Mobility as a Service (MaaS) is a concept that aims to provide users with a seamless and integrated approach to transportation. It involves combining different modes of transportation, such as public transit, ride-sharing, bike-sharing, and walking, into a single mobility service that users can access ideally through a single application or account.

MaaS has the potential to transform the way we think about transportation, shifting the focus from individual car ownership to more sustainable and connected modes of transportation. It offers a convenient and cost-effective alternative to traditional car ownership, making it easier for people to choose sustainable modes of transportation that best suit their needs. As such, MaaS is seen as a key enabler of the shift towards more sustainable and connected cities.

List of selected mobility cases on Mobility as a Service (MaaS):

- SEAMLESS MULTIMODAL MOBILITY – REGIOMOVE (KARLSRUHE, DE)
- DOMINO (LINZ, AT)
- SOFTLY MOBILE TOURISM MOBILITY (WERFENWENG, AT)
- URBAN-AIR PORT (COVENTRY, UK)
- MAAS IN THE CITY OF PILSEN AND PILSEN AGGLOMERATION (PILSEN, CZ)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.1. SEAMLESS MULTIMODAL MOBILITY – REGIOMOVE (KARLSRUHE, DE)

IDENTIFY

SEAMLESS MULTIMODAL MOBILITY - REGIOMOVE

Application area:	Karlsruhe, Baden-Württemberg (DE)
Implementation date:	From December 2017 to • App: Dec 2021, • incl. Ports: Aug 2022
Geographic area of coverage:	Urban and periurban
Scope:	Tourism, commuters, students and everyday mobility.
Type of solution:	Mobility as a service (MaaS), Multimodal Mobility, Shared Mobility and On-demand Mobility.
Target group:	Students, (young) families under 40-50 years, people living in residential neighborhoods), and urban focus.

VIDEO: : HTTPS://WWW.YOUTUBE.COM/WATCH?V=Y08JFO7BA4K

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

SEAMLESS MULTIMODAL MOBILITY REGIOMOVE

The regiomove app is not a classic local transport app but a mobility app. In addition to the classic means of transport such as buses, trams, regional and city trains, it is also possible to use car and bike sharing. Shuttles and e-scooters were also added. Because charging and parking facilities are also important for a sustainable transport mix, it is also possible to find these in the regiomove app. The customer can decide which means of transport wants to combine. Or can conveniently let the app decide. It couldn't be simpler. Not everyone can do without their car, especially outside the cities and the surrounding areas. With the Regiomove app, it is, therefore, possible to integrate your own car into the route, for example, to the next Regiomove port. It is possible to see which option is the most CO2-saving. The app is productive in the region of Karlsruhe, an area of approx. 1.300.000 inhabitants.

[Simplicity to replicate (1=hard,... 5=easy): 2-4, high staff power needed, individual solutions require extra effort]

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

Main actions:

- As many mobility service providers as possible from the start (Bike- & car sharing, PT)
- App processes, but also billing, define/work out together from the start; create an interface
- Clarify legal issues early, data protection (payment, fares, linking customer accounts, who gets data? cost sharing)
  - It is still a rather experimental business model
- Pricing (PT is often different from sharing service provider)
- Intermodal - decision if yes or no --> intermodality increases complexity, e.g. routing: open source solutions with billing, reservation services, ...
- Payment model: submitting requests to the payment provider (revenue risk for the provider) in return for a commission, all partners must be willing to pay the commission
- Limitation of partners in the mobility network due to increasing complexity, decreasing customer friendliness with a growing number of partners
- Ongoing adjustments are necessary, e.g. Deutschlandticket (a ticket that is valid throughout Germany and enables nationwide travel on public transport and SPNV)
- Ability to integrate cross-cutting/overlapping tickets
- Marketing
- Actively collecting App Store ratings -> rating systematics
- Look for cooperation partners/multipliers: e.g. Housing companies, universities, tourism ->Sales/Marketing

TRL 9

Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies or in space).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

Investment:

- Standard solutions 500k-1million€, individual solutions up to 2 million€ (subscriptions, tickets, intermodal, deep link or deep integration).
- Integrate new providers ca. 100k€ (car sharing is more complex than scooter/bike sharing).

Operation:

100k-200k€ (technical operation outsourced to system provider; as medium-sized network, in larger cities, e.g. Leipzig's own IT and technical solution).

Revenues/incomes

- user fee and participant fee don't cover costs
- changed from a revenue-based model to a fixed flat rate

Key learnings

- Use standard solutions.
- Compare system providers.
- Share costs through innovation partnerships with other regions with the same providers (dependent on system provider).

Solution owners

- KVV owns the app (incl. prohibition right) but corresponding costs; KVV owns rights to the app but not to the source code
- KVV invests
- always in cooperation with the system provider

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

2-stage communication:

1. Municipalities
2. Users.

Since the platform is a used product, it is disseminated by the operator's marketing department and related measures (campaigns, posters, videos, social media, ...). In the test phase of the app, a public call for becoming a test user was made. Public feedback forums during development were held, but led to discussions about the costs of PT and so this format was abandoned.

Public acceptance

The multimodal idea receives positive feedback. However, convincing citizens to use it requires a new lifestyle, which only a minority will do. Therefore, co-operations with local retail stores, cultural institutions, universities/schools, real estate companies, employers, tourism agencies etc., can support dissemination; hence, all partners can help spread the mobility services and implement it in the citizens' daily lives.

Incentives to increase uptake

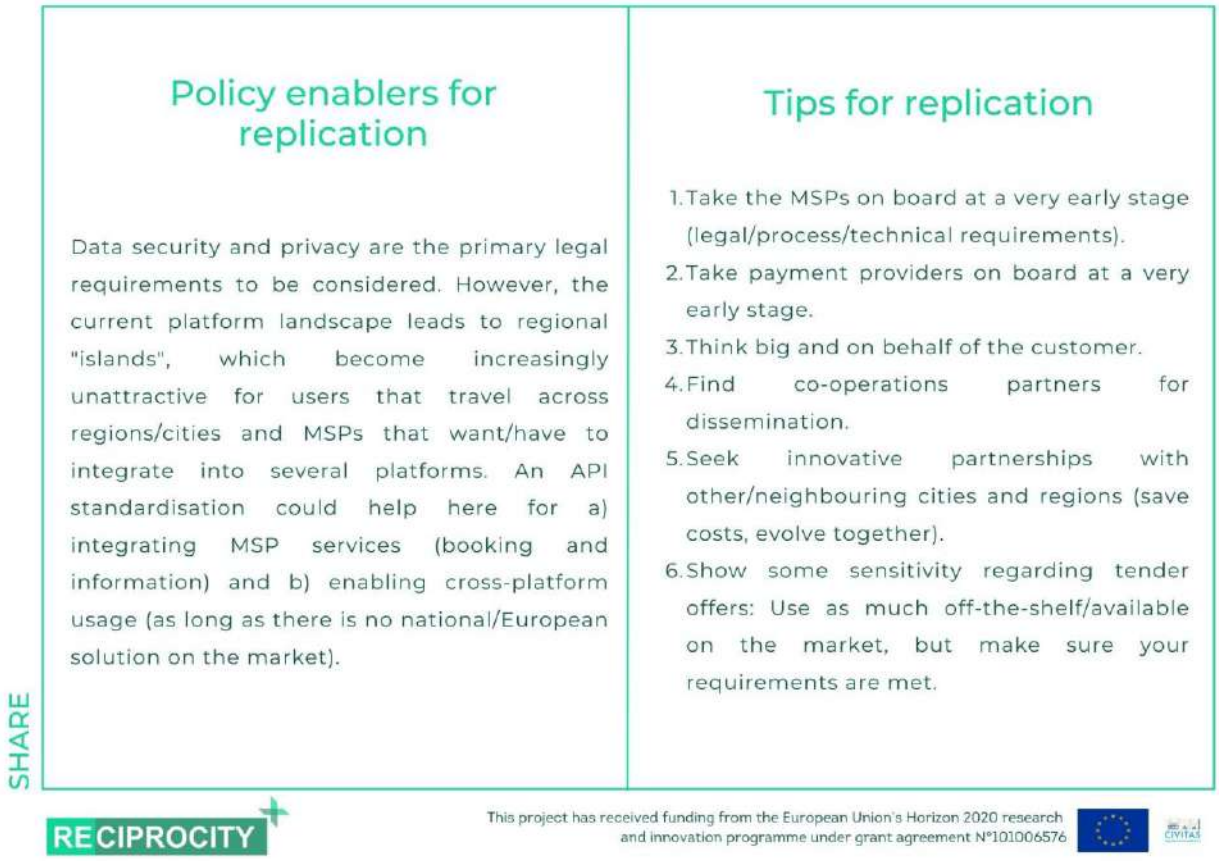
Currently none. A voucher system is being designed in order to bring citizens to make a "first step" and try the new services.

Facts and figures

- Started as a research project in Nov 2017 with 11 partners.
- Consortium lead was Karlsruher Verkehrsverbund (KVV).
- Live in the app stores since Nov 2020 for the area of Karlsruhe.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576


Policy enablers for replication
Data security and privacy are the primary legal requirements to be considered. However, the current platform landscape leads to regional "islands", which become increasingly unattractive for users that travel across regions/cities and MSPs that want/have to integrate into several platforms. An API standardisation could help here for a) integrating MSP services (booking and information) and b) enabling cross-platform usage (as long as there is no national/European solution on the market).
Tips for replication
1. Take the MSPs on board at a very early stage (legal/process/technical requirements).
2. Take payment providers on board at a very early stage.
3. Think big and on behalf of the customer.
4. Find co-operations partners for dissemination.
5. Seek innovative partnerships with other/neighbouring cities and regions (save costs, evolve together).
6. Show some sensitivity regarding tender offers: Use as much off-the-shelf/available on the market, but make sure your requirements are met.
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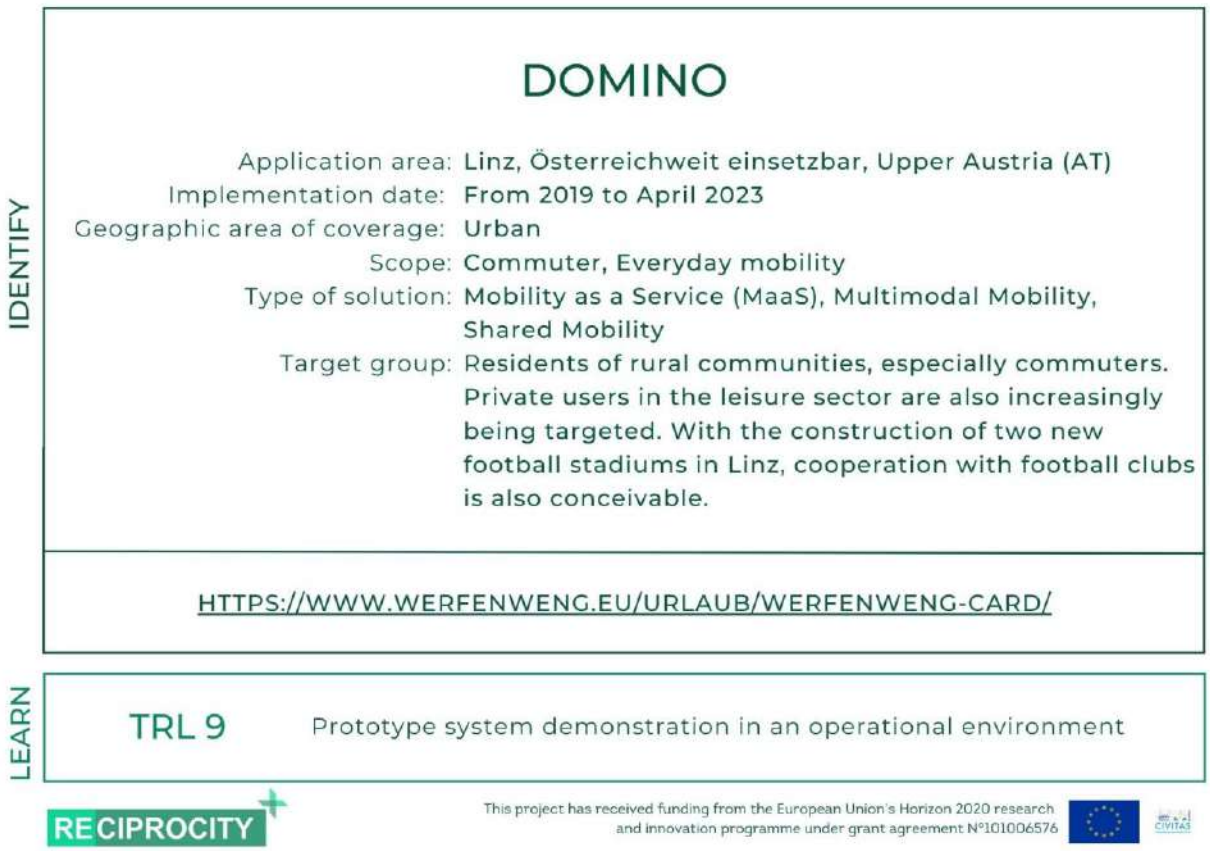
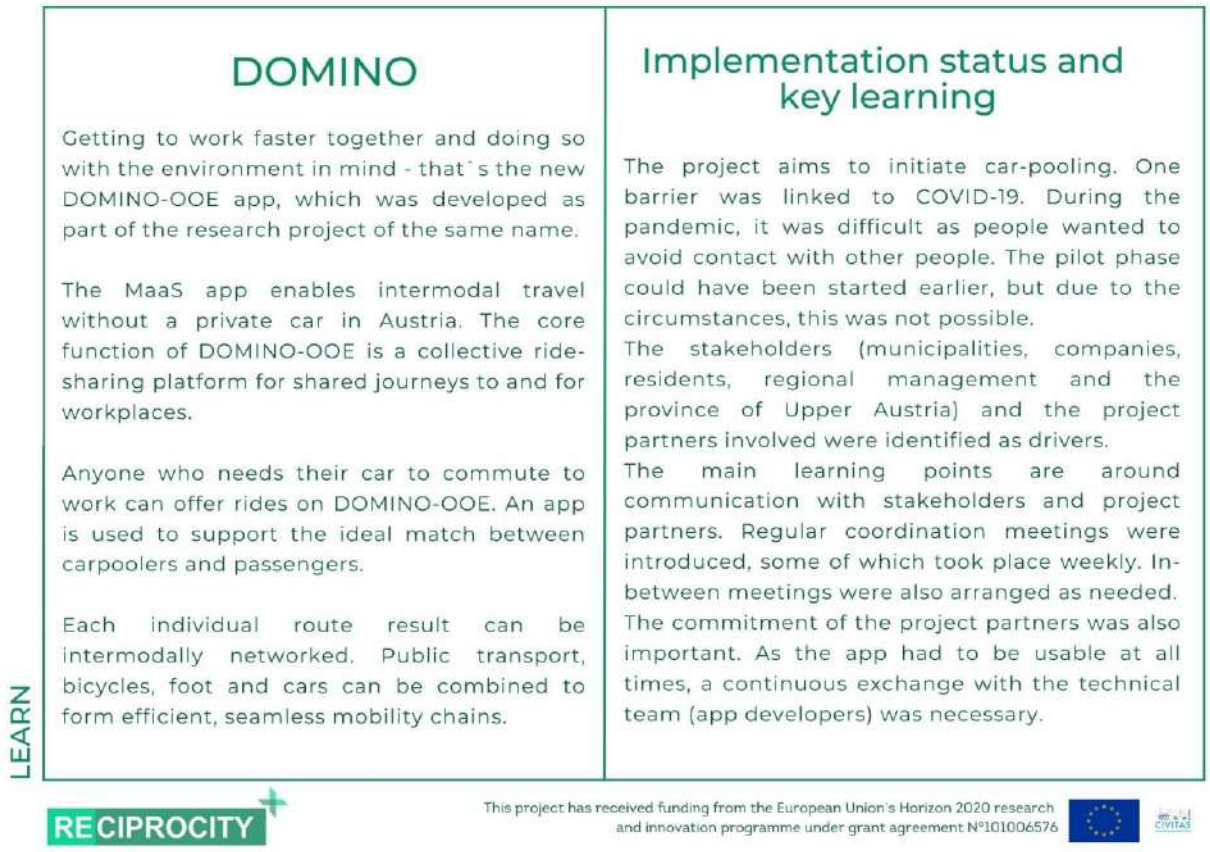
CIVITAS

4.1.2. DOMINO (LINZ, AT)





ACCELERATE

Investment needed

In order to scale up, the app needs to be continuously developed. New features would need to be added, especially in the area of leisure travel and closed communities (e.g. companies, clubs). Investment would also be needed in promotional material to increase awareness of the app.

Solution owners

The service will be continued after the end of the project (note: the cost absorption by the state or federal government has not yet been determined), and a follow-up project will continue to address the issue of carpooling.

Revenues/incomes

The app does not generate any revenue. It is a free service. This is made possible by funding from the project partners, the FFG and the Federal Ministry for Climate Protection.

Buy-in needed

We had the promise of support from the province of Upper Austria (e.g. PK with LR Mag. Steinkellner, who wants to reduce commuter traffic, relieve the road infrastructure and save CO^2 in the greater Linz area by using the DOMINO OÖ app) as well as funding from the BMK.

Key learnings

Communication with all parties is key!

Funding mix

- 50% funded by FFG.
- 50% by project partners.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

There was regular coordination between the municipalities. Communication documents about the project and the app were published for users.

During the pilot phase, a hotline was set up through ÖAMTC to receive feedback from users at any time. Problems and suggestions for improvement could also be sent by email.

This feedback method will be maintained in the follow-up project. The project team was able to send information and news to the users' e-mail addresses at any time to keep them informed about the latest developments. Recipients of these emails were also able to access the information directly.

Public acceptance

The public acceptance is very good.
Changes in mobility behaviour are always difficult to implement, so low-threshold offers are needed to engage users and encourage them to change their behaviour.
Incentives are also needed to encourage change. There has been a lot of positive feedback from users.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Policy enablers for replication

Legally, the implementation was relatively straightforward. One way to make it easier would be to pass a law banning single-occupancy cars from entering cities. This would encourage car-sharing.

Tips for replication

A good exchange of information about users' wishes and needs is important in advance. The needs of the companies and regions should also be known so that all needs can be addressed in a targeted manner. User needs should be taken seriously and addressed quickly.

Incentives are used to increase the uptake of the solution

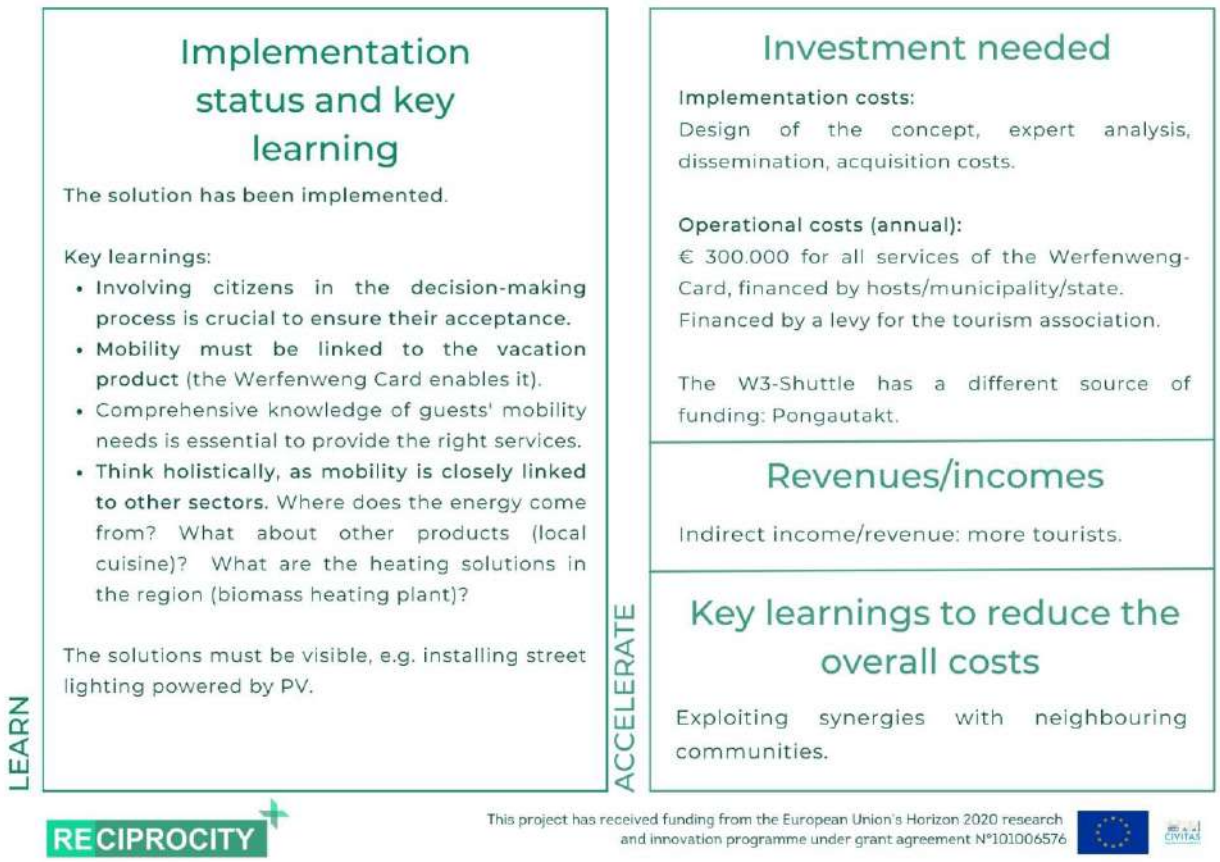
During the pilot phase, there was a monthly competition with prizes provided by the different project partners.
At the end of the pilot, the people who made the most journeys (both passengers and drivers) were awarded prizes such as an e-bike worth €4,000, an e-scooter, driving safety training, vouchers or small gifts.

SHARE

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.3. SOFTLY MOBILE TOURISM MOBILITY (WERFENWENG, AT)



ACCELERATE

Solution owners

The solution is owned by the tourism association.
The W3-Shuttle is owned by the municipalities

Buy-in is needed to deploy the solution

Stakeholder involvement:

- Customer side: guests and inhabitants
- Development side: tourism association residents, municipality
- External partners: mobility, regional association, state of Salzburg, Federal Ministries

Funding mix

40% public funding (LEADER, Interreg, national projects, Mobilito,...)
60% private investment from municipalities & tourism association.

SHARE

Citizens and users involvment

Stakeholder involvement activities:

- Inhabitants: Citizens' meetings, future workshops, field trips.
- Guests: surveys to identify needs and wishes.

Public acceptance

Most of the tourism in the areas came from Germany. These tourists were used to using their cars and were afraid of the limitations.
Their acceptance was a big challenge in the beginning. Tourist acceptance is growing, but there is still some resistance to the project.

Incentives are used to increase the uptake of the solution

Mobility needs are met without the need for a car.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Policy enablers for replication

The W3-shuttle is regulated by national law. It was necessary to take it to court in order to implement it.

In the past, the authorities had reservations. Now micro transport is accepted as public transport.

- Not everything is feasible, as not everything can be financed - More funding is needed for micro-mobility solutions.
- Building regulations that require a certain number of parking spaces per company are a challenge. There is a need to adapt regulations according to transport options. Greater flexibility would help implementation.

Tips for replication

Bring perseverance: do not give up immediately.
Thinking holistically: projects need to go in-depth, and a small investment for only a few e-cars is not enough.
Involve locals, day visitors, and local producers.

Facts and figures

W3-shuttle exceeded 50,000 passengers for the first time in 2022.
In the first three years after implementation, the number of guests increased from 162.000 to 212.000.
The number of overnight stays is now around 300.000.
Economic success is essential for acceptance.
It has to be a win-win situation for the environment and the local economy.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.4. URBAN-AIR PORT (COVENTRY, UK)

IDENTIFY

URBAN-AIR PORT

Application area:	Coventry, West Midlands (UK)
Start date:	25/04/2022
End date for demonstrations:	15/05/2022
Geographic area of coverage:	Urban
Scope:	Commuter, logistics.
Type of solution:	Drones and E-VTOL, Electric Vehicles, Autonomous Vehicles, Data collection and Traffic Management systems, MaaS.
Target group:	Potential customers and users include transportation and logistics operators, event organisers, emergency response teams, freight companies, and individuals in need of transportation services.

WEBSITE: WWW.URBANAIRPORT.COM

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

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URBAN-AIR PORT

Urban Air Port is designing and developing the world's smallest airport, a 'pop-up' airport that could be deployed in urban areas to support transport and logistics operations associated with major events, incident response, or as a freight hub using autonomous drones for the onward distribution of medical supplies or parcels.

The partnership behind the project is interested in using Coventry as a base for a pilot project that can be used to showcase the concept and the supporting technology. This innovative programme is called Air-One.

TRL 6

Technology demonstrated in relevant environment.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

Implementation status: In April 2022, Urban-Air Port successfully launched Air One, a groundbreaking demonstration of its vertiport technology (drones and eVTOL). Over the next five years, the company has ambitious plans to establish more than 200 vertiports worldwide. These ultra-compact and rapidly deployable operational hubs will facilitate the efficient operation of both manned and unmanned vehicles, offering essential services such as aircraft command and control, charging/refueling facilities, and cargo and passenger loading capabilities.

Key learnings: By hosting the facility, Coventry City Council will benefit through the ability to link the project to City of Culture 2021 and the Transport Innovation Showcase, the opportunity to showcase the city and its vibrant transport technology industrial base, to potential inward investors, and to market the city as a place to do business.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

The funding for the project comes from the UK government's Future Flight Challenge and totals £1.2 million (about $1.6 million).

Solution owners

The Urban Air Port Air-One has been launched in partnership with Hyundai Motor Group, Coventry City Council, the UK Government, and the startup Urban Air Port.

Revenues/incomes

This was a demonstration project and no revenue / income was generated.

Buy-in needed

- Local authorities, developers, emergency services, Legal, Civil Aviation Authorities (CAA), Airport operators.
- Engaging with all to understand what was required to operate legally in an urban environment.

Key learnings to reduce the overall costs

This could be a shared resource with various organisations such as, emergency services , medical organisations, logistic operators, local authorities and commercial land surveyors.

Funding mix

Local authorities were 100% funded and all other partners had to have match-funded.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Citizen and user involvment

Consortium partner Coventry University carried out a public engagement work package which gave the project a kick start. Once the structure was open to the public for three weeks, we had over 15 000 visitors who left a positive feedback.

Policy enablers for replication

Current regulation and policies did restrict the full demonstrations as a site. The partners will need to work with CAA and policy makers to adhere to a safe operating model for the new mode of transport operating in an urban environment.

Public acceptance

Feedback from the open days was positive and the proposal and development was widely accepted.

Tips for replication

Engage with local authorities and all interested operators to minimise the number of airspace users. Support the development with end users and urban planners to integrate this development.

Incentives to increase uptake

- Attract potential customers, boost aviation and manufacturing sectors, creative jobs, advance environmental goals.
- Potential to establish a UK UAM Centre of Excellence, driving innovation, improving connectivity, productivity, and transforming cities.

Facts and figures

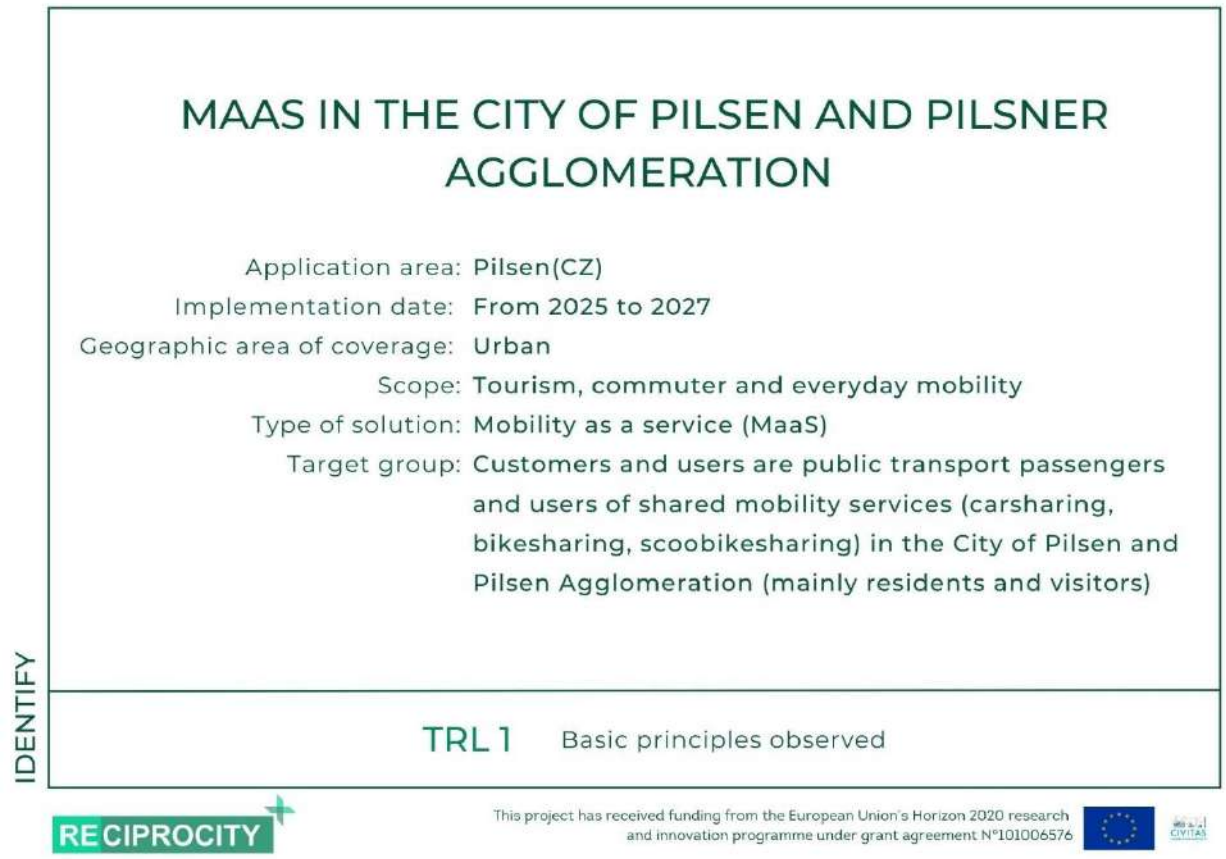
Current legislation in the UK states that the drones can only be flown whilst they are in Visual Line Of Sight (VLOS). We should work with all authorities like CAA and Airports to develop flights that can be developed for Beyond Visual Line Of Sight (BVLOS).

SHARE

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.5. MAAS IN THE CITY OF PILSEN AND PILSEN AGGLOMERATION (PILSEN, CZ)



LEARN

MAAS IN THE CITY OF PILSEN AND PILSNER AGGLOMERATION

The Mobility as a Service (MaaS) represents the next level of integration of public transport. This is not only a new ICT solution for finding the optimal route or buying a ticket, but also the integration of bikesharing or carsharing providers into the integrated public transport system into the user-unified system of integrated sustainable mobility.

The aim of the project is to combine the existing separate public transport, carsharing and bikesharing services into a single integrated service with the possibility of choosing the optimal route of the trip. The concept of development Mobility as a Service in Pilsen and the Pilsen Agglomeration is one of the proposed measures of the recently adopted Sustainable Mobility Strategy of the Pilsen Agglomeration. This concept is the first necessary step towards the systematic development of Mobility as a Service in the entire Pilsen agglomeration. The successful implementation of MaaS requires the implementation of related measures from the SUMP Pilsen Agglomeration - Data base of public transport and the Metropolitan Dispatch Center is necessary.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

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Implementation status and key learning

Mobility as a Service in the City of Pilsen and the Pilsen Agglomeration is currently in the form of a conceptual plan. The basic parameters of MaaS in the City of Pilsen and the Pilsen Agglomeration should be based on the example of good practice implemented within the integrated public transport system of Karlsruhe (KVV). One of the most important drivers is the inclusion of the plan in the Sustainable Mobility Strategy of the Pilsen Agglomeration and the efforts to further deepen the integration of public transport and its extension to other additional services. The main barrier to implementation is the fragmentation of existing shared mobility services and the lack of a database.

ACCELERATE

Investment needed

As this is only a conceptual plan, the investment and operating costs have not yet been accurately calculated.

Buy-in needed

The successful implementation of the project requires a resolution on the approval of the project by the Council or the Representation of the City of Pilsen and the Pilsen Region.

Key learnings to reduce the overall costs

Reducing the overall costs should be achieved by using and integrating existing shared mobility services into the public transport system of the City of Pilsen and the Pilsen Region in the Pilsen Agglomeration.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Revenues/incomes

One of the main benefits is the increased choice of means of transport for the last-mile when using public transport.

At the same time, the radius of action, as well as the temporal and spatial accessibility and availability of public transport, will be extended thanks to the wider application of last-mile services in areas where public transport is currently only available to a limited extent.

The proposed MaaS should also enable journeys to be made on the basis of a single application for all modes of transport used during the journey, with the possibility of choosing the optimal route according to pre-defined criteria.

Solution owners

The owner of the solution should be the City of Pilsen together with the coordinator of the regional public transport in the Pilsen Region POVED. The investor should be the City of Pilsen together with the Pilsen Region. The operation and maintenance could be provided by the Pilsen urban public transport company PmdP (an in-house company of the City of Pilsen) together with the coordinator of the regional public transport in the Pilsen Region POVED.

Funding mix

100% of public funding.

It is currently assumed that the project will be financed from public sources - own funds of the City of Pilsen and the Pilsen Region. The operational programme supporting activities in the field of shared mobility and mobility as a service is not yet known.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

The sustainable mobility strategy of the Pilsen agglomeration and the territorially appropriate concept of MaaS development were repeatedly presented and discussed with the professional and lay public.

Public acceptance

Given the stage of preparation of the project, the question of public acceptance is not relevant at the moment. In the case of public transport users, a rather positive reaction can be expected.

Incentives to increase uptake

Not relevant at this stage, given the state of technical preparation of the project at the project plan stage.

Policy enablers for replication

The lack of legislation in the area of regulation of shared mobility services has an impact on the implementation of the project.

Tips for replication

Using existing shared mobility concepts to minimise overall costs.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Multimodal Mobility and Shared Mobility

Multimodal mobility refers to the use of different modes of transportation for a single journey. This can include a combination of walking, cycling, public transit, ride-sharing, and other forms of transportation. The goal of multimodal mobility is to create a seamless and integrated transportation system that provides users with a range of options for getting from one place to another.

Shared mobility refers to the sharing of transportation resources, such as vehicles or bicycles, among multiple users. This can include services such as ride-sharing, car-sharing, and bike-sharing, where users can access shared vehicles for a short period of time, without the need for ownership.

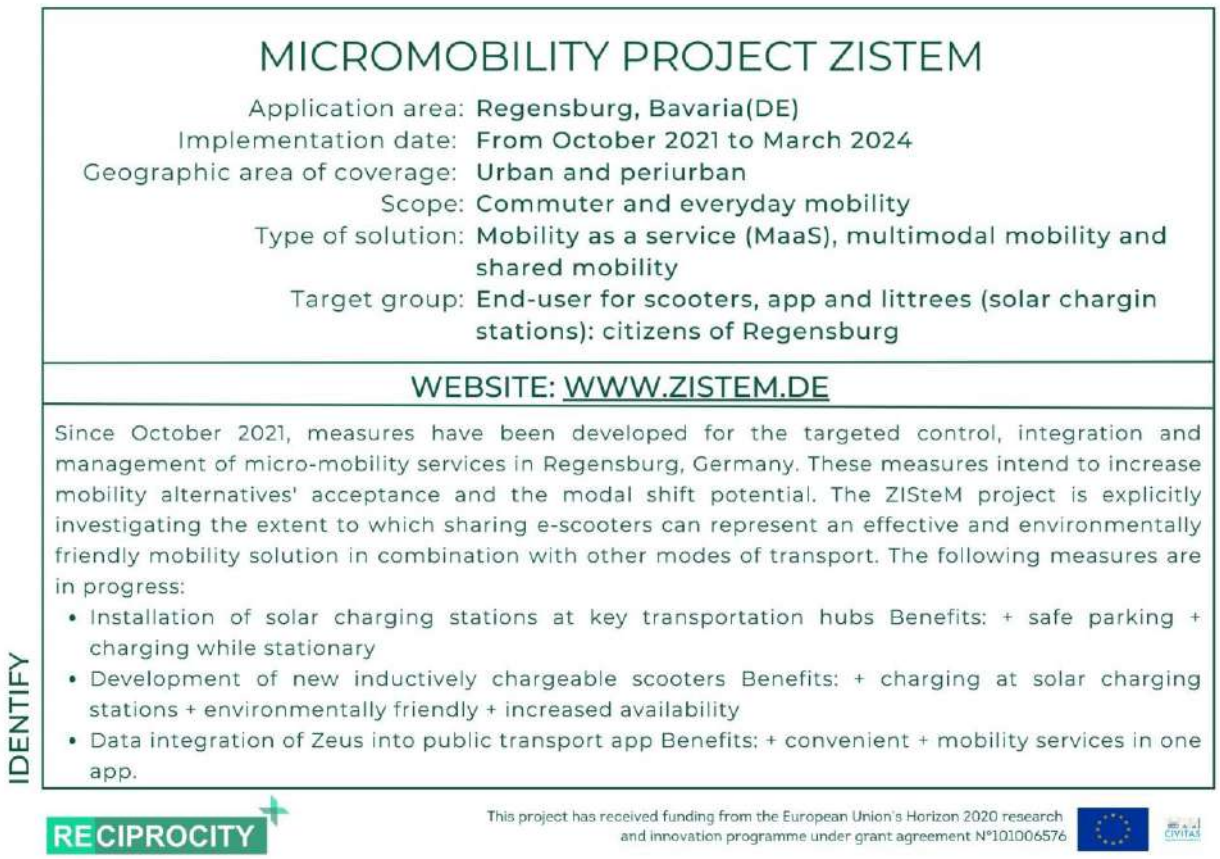
Together, multimodal and shared mobility create a more sustainable and connected transportation system that helps to reduce traffic congestion, improve air quality, and increase the use of sustainable modes of transportation. By providing users with a range of transportation options and encouraging the sharing of resources, these approaches can help to make transportation more accessible and affordable for everyone, while also promoting more environmentally friendly transportation options.

List of selected mobility cases on Multimodal Mobility and Shared Mobility:

- MICROMOBILITY PROJECT ZISTEM (REGENSBURG, DE)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.6. MICROMOBILITY PROJECT ZISTEM (REGENSBURG, DE)



MICROMOBILITY PROJECT ZISTEM

Application area: Regensburg, Bavaria(DE)
Implementation date: From October 2021 to March 2024
Geographic area of coverage: Urban and periurban
Scope: Commuter and everyday mobility
Type of solution: Mobility as a service (MaaS), multimodal mobility and shared mobility
Target group: End-user for scooters, app and littrees (solar chargin stations): citizens of Regensburg

WEBSITE: WWW.ZISTEM.DE

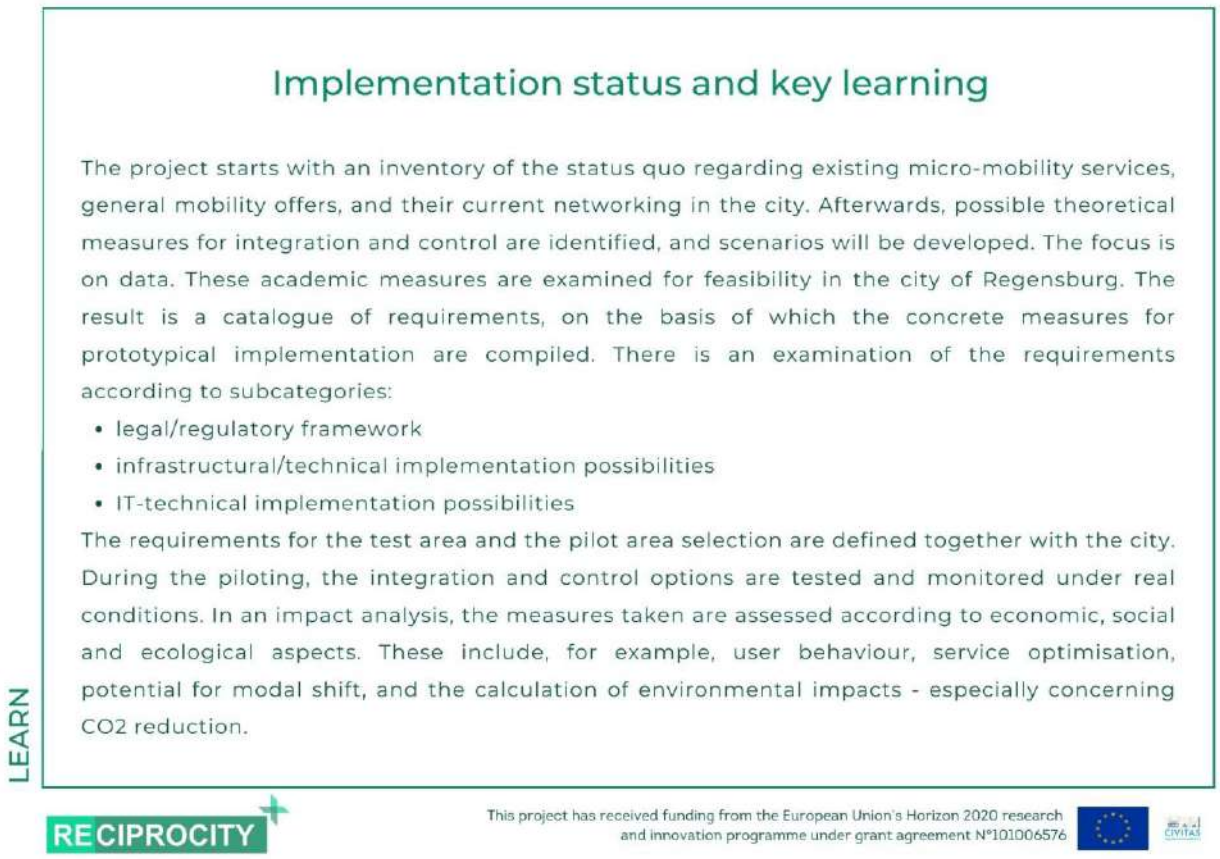
Since October 2021, measures have been developed for the targeted control, integration and management of micro-mobility services in Regensburg, Germany. These measures intend to increase mobility alternatives' acceptance and the modal shift potential. The ZISteM project is explicitly investigating the extent to which sharing e-scooters can represent an effective and environmentally friendly mobility solution in combination with other modes of transport. The following measures are in progress:

- Installation of solar charging stations at key transportation hubs Benefits: + safe parking + charging while stationary
- Development of new inductively chargeable scooters Benefits: + charging at solar charging stations + environmentally friendly + increased availability
- Data integration of Zeus into public transport app Benefits: + convenient + mobility services in one app.

IDENTIFY

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576



Implementation status and key learning

The project starts with an inventory of the status quo regarding existing micro-mobility services, general mobility offers, and their current networking in the city. Afterwards, possible theoretical measures for integration and control are identified, and scenarios will be developed. The focus is on data. These academic measures are examined for feasibility in the city of Regensburg. The result is a catalogue of requirements, on the basis of which the concrete measures for prototypical implementation are compiled. There is an examination of the requirements according to subcategories:

- legal/regulatory framework
- infrastructural/technical implementation possibilities
- IT-technical implementation possibilities

The requirements for the test area and the pilot area selection are defined together with the city. During the piloting, the integration and control options are tested and monitored under real conditions. In an impact analysis, the measures taken are assessed according to economic, social and ecological aspects. These include, for example, user behaviour, service optimisation, potential for modal shift, and the calculation of environmental impacts - especially concerning CO2 reduction.

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RECIPROCITY

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Implementation status and key learning

The following measures are currently in progress:

- Installation of solar charging stations at key transportation hubs (planned in 2023)
- Development of new inductively chargeable scooters (scooters are developed, and rollout in Regensburg is 2023/24)
- Data integration of Zeus into a test version of a public transport app (planned in March 2023) for the pilot phase. During this time, selected test users can use the e-scooters free of charge. The aim is to specifically test whether e-scooters represent a sustainable mobility alternative to cars by coupling them with public transport. The first results will be published after the pilot phase in 2023.

Finally, the transfer and derivation of recommendations for action for comparable cities and further innovative mobility offers are planned.

Key learnings:

- As solar charging stations are not regionally produced, but in China, there will be a delay in delivery.
- City must be open to cooperating with the scooter providers – cities have a significant role in such projects.
- Benefit of multimodal mobility must be very clear. Otherwise, acceptance problems will appear.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

The project volume is 1.137.428 €, of which 56 % is funded by BMDV.

Further investment might be needed for a city-wide application of solar charging and parking solutions (upscaling). Eventually, new scooter functionalities come with additional costs for the MaaS Provider.

Revenues/incomes

There is no direct revenue. Nevertheless, higher acceptance of new mobility solutions might result in higher revenues.

Buy-in needed

The city's approval is needed.

Solution owners

Project partners:

- Siemens Technology: coordination of the various actions
- City of Regensburg
- Zeus Scooters GmbH: scooters & solar charging stations (operation and maintenance)
- Hacon Ingenieurgesellschaft mbH: App development
- RVV – public transportation provider
- R-Tech GmbH: Communication Partner

Funding mix

For purchas1.137.428€ with a funding share of 56% by the German Federal Ministry of Digital Affairs and Transport and 44% out of project partners' own resources.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576


SHARE
Citizen and user involvement
• Pilot phase with test users
• Surveys
• Interviews
Incentives to increase uptake
We respond to the wishes of the citizens and users. We are looking for solutions to complaints.
Facilitation of communication.
RECIPROCITY
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

On-demand mobility solutions

On-demand mobility solutions refer to transportation services that are available to users on an as-needed basis, rather than following fixed schedules or routes. These solutions are often facilitated by technology platforms, such as mobile apps or web portals, that allow users to book and pay for transportation services in real-time.

Examples of on-demand mobility solutions are bike-sharing systems, which allow users to rent bicycles for short-term use and return them to a designated location when finished. Other on-demand mobility solutions include car-sharing services, which allow users to rent vehicles on an hourly or daily basis, and peer-to-peer car-sharing services, which allow individuals to rent out their personal vehicles to others. Also on-demand busses and shuttles, such as the ones that stop only at prebooked stops, are useful tools to reduce the traffic in the cities.

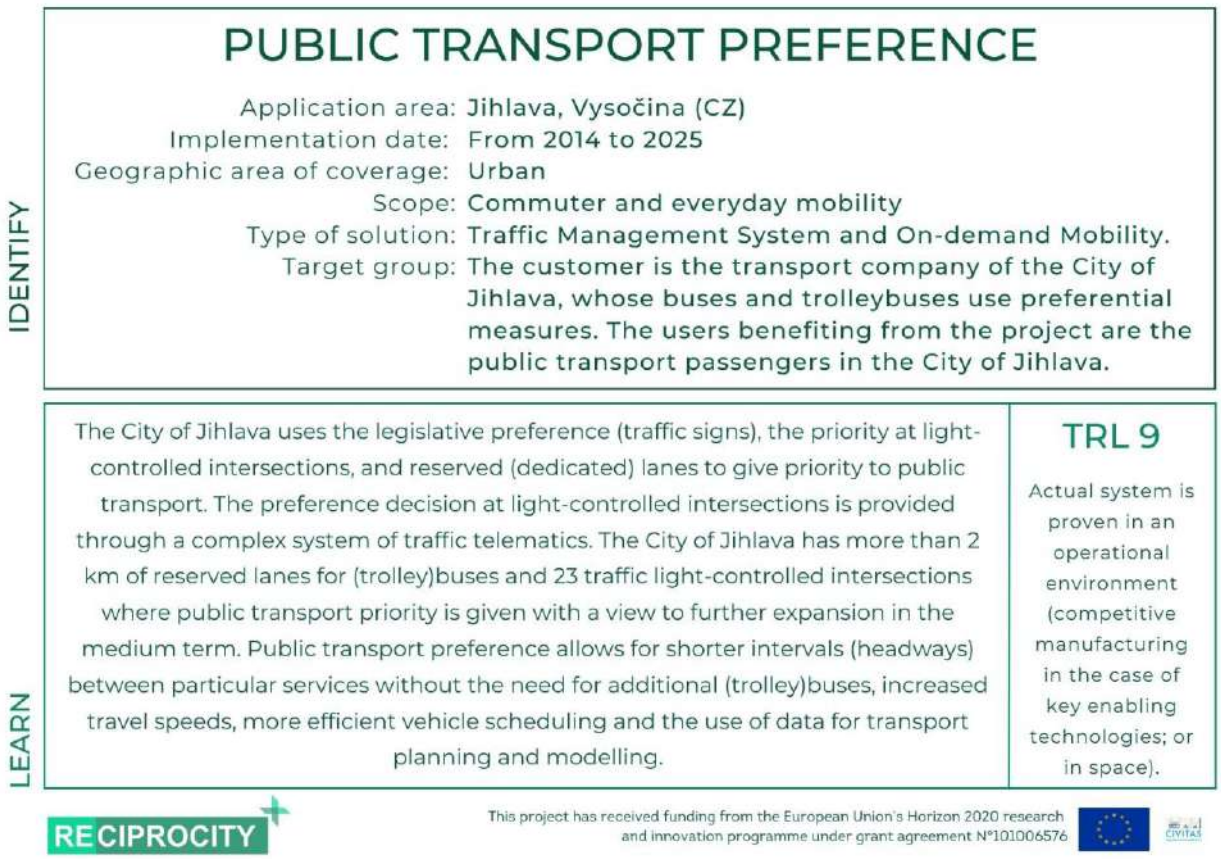
Overall, on-demand mobility solutions are an important component of mobility solutions for cities, providing users with greater flexibility and convenience while also offering opportunities for reducing the number of vehicles on the road.

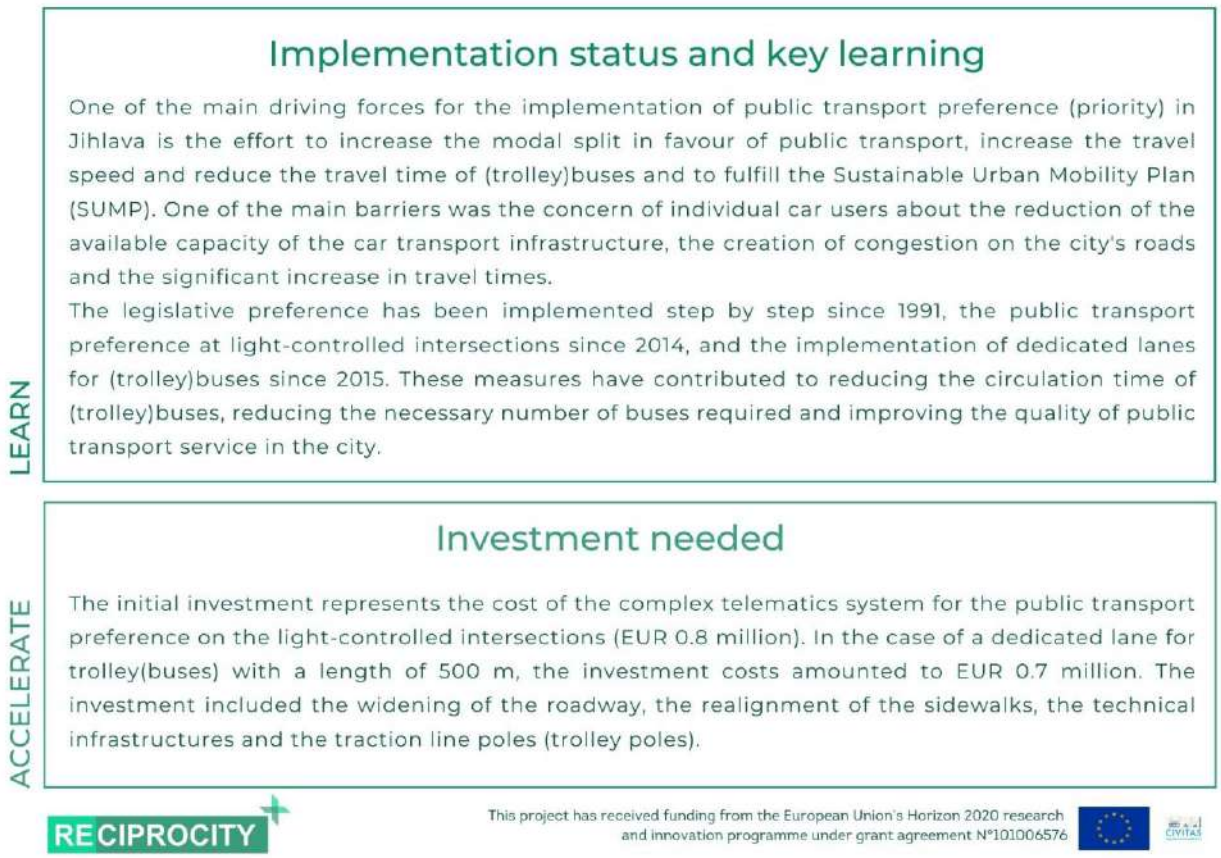
List of selected mobility cases on On-demand mobility:

- PUBLIC TRANSPORT PREFERENCE (JIHLAVA, CZ)
- ON-DEMAND PUBLIC TRANSPORT (PILSEN, CZ)
- AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)
- PUBLIC TRANSPORT PREFERENCE (PILSEN, CZ)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.7. PUBLIC TRANSPORT PREFERENCE (JIHLAVA, CZ)





ACCELERATE

Revenues/incomes

The main benefits include an increase in travel speed by 14%, reducing of the interval between services (headway) without the need to operate additional trolley(buses), an increase in the number of transported passengers by 12%, an increase of journeys realised with public transport per inhabitant by 14%, more efficient planning of (trolley)bus circulation, driver rostering and effective elimination of delay on preferred lines.

Solution owners

The owner of the solution is the City of Jihlava. The City of Jihlava is also an investor. The telematic system of traffic signalling operates and maintains the Management and Services of the City of Jihlava (organisational unit of the city) and the Urban Public Transport Company of the City of Jihlava.

Key learnings to reduce the overall costs

One of the key learnings is the effort to maximise the use of the existing infrastructure without the need for the implementation of fundamental new roads and large investments. As part of the project, the strategy of less investment-intensive measures on the road network and the massive involvement of transport telematics ("more technology instead of concrete") was implemented.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Buy-in needed

The support and encouragement of the city's political representatives was an essential prerequisite for the successful implementation of the intention to give priority to public transport on parts of the bus and trolleybus routes.

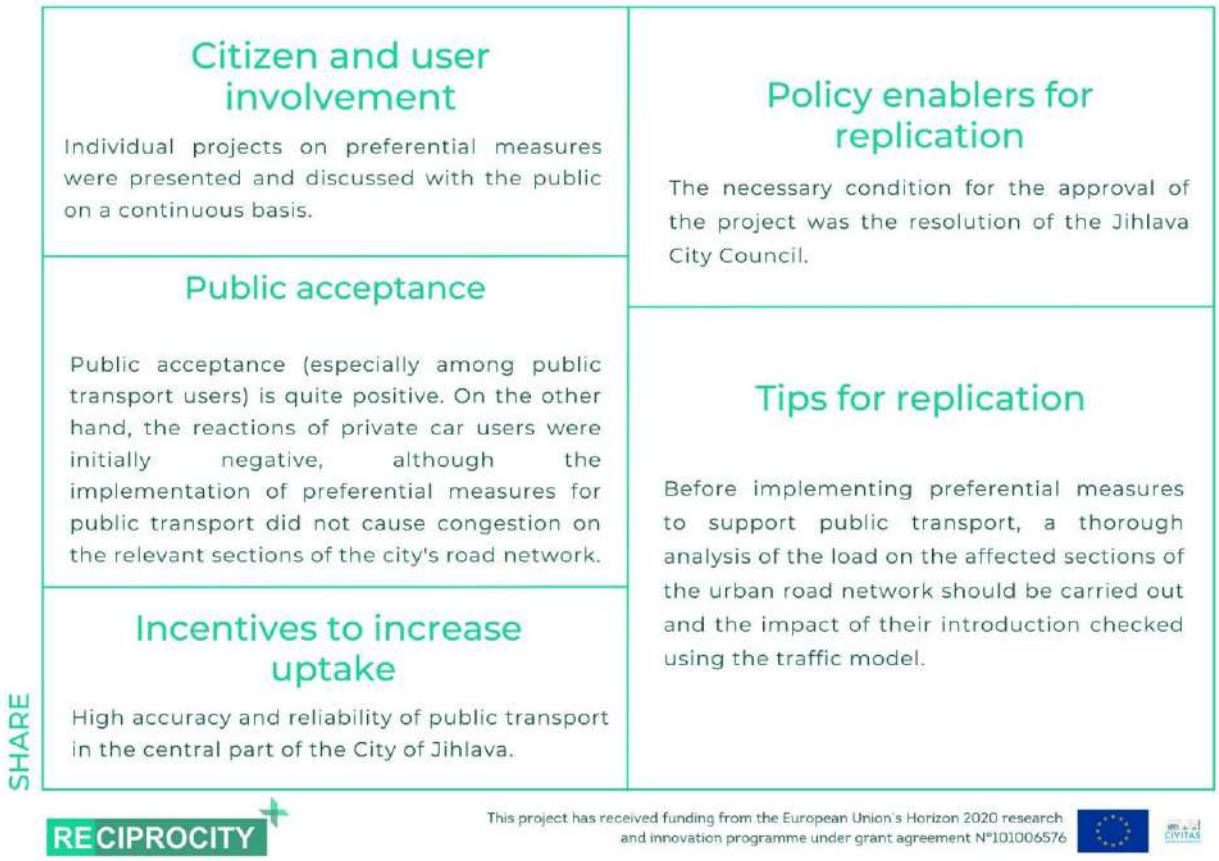
Prior to the implementation of a number of public transport priority measures, there were obvious concerns from private cars users about the deterioration of the city's accessibility by private car. However, after the implementation of the preferential measures, there was no significant deterioration in the city's accessibility for car users.

Funding mix

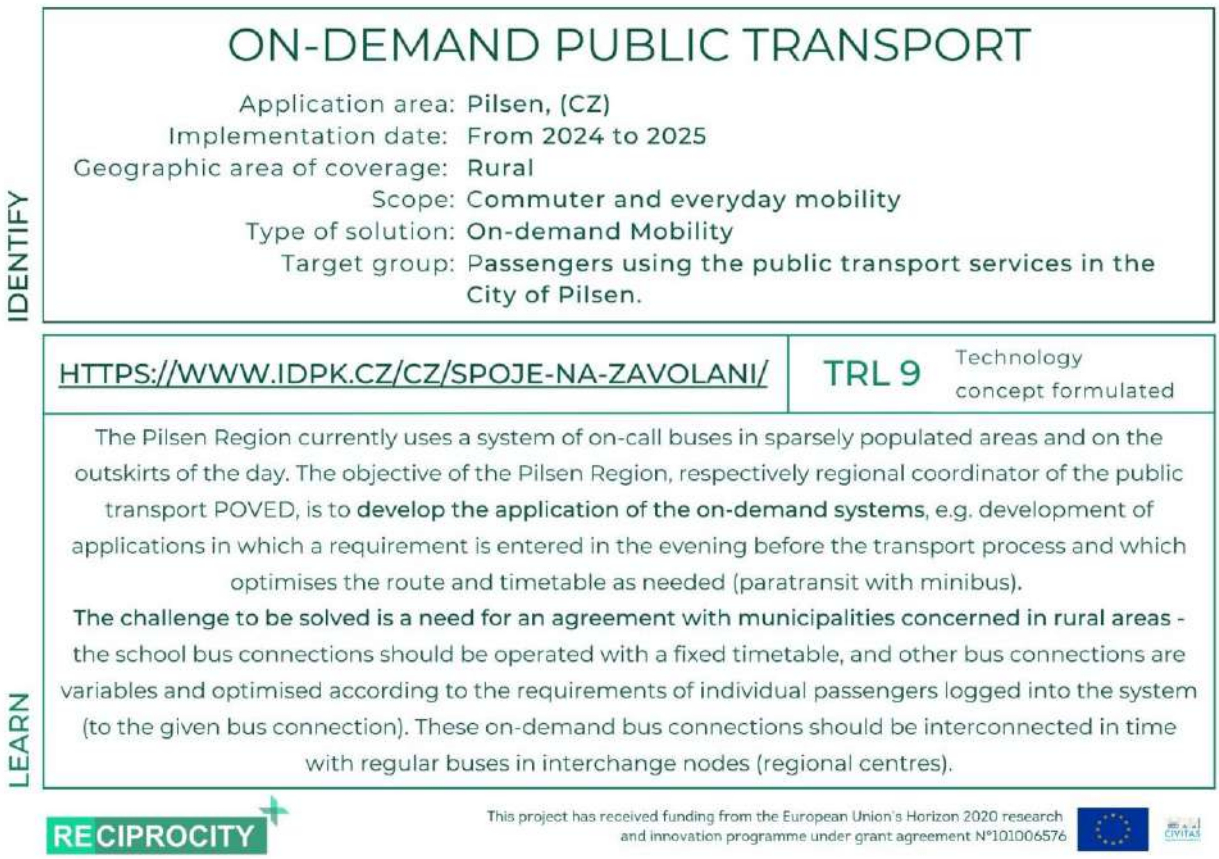
100% of public funding.
The sub-project "Comprehensive transport telematics system for ensuring public transport preference on all traffic signaling lights in the city" was financed from the city's own financial resources (20%) and from the Integrated Regional Operational Programme (ERDF - 80%).
The other related projects were financed from the city's own resources.

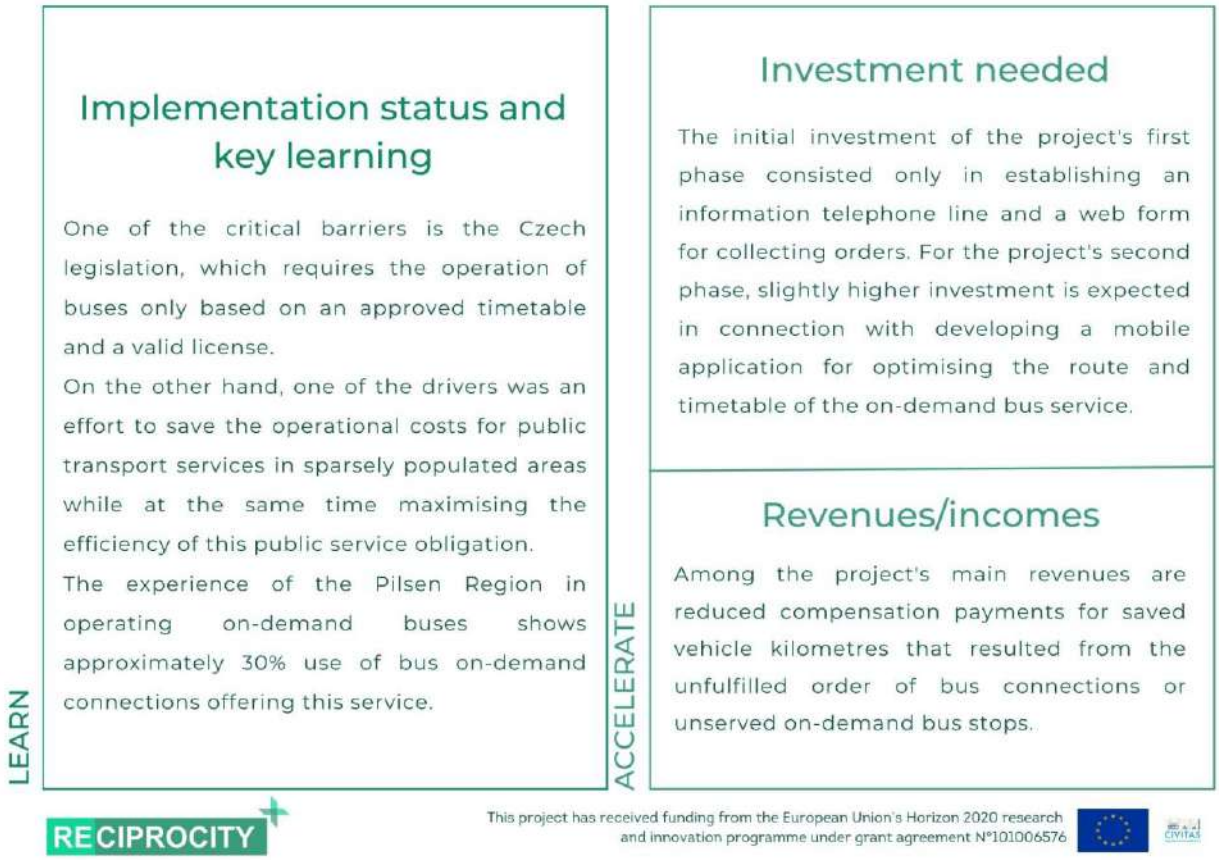
RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576


Citizen and user involvement
Individual projects on preferential measures were presented and discussed with the public on a continuous basis.
Public acceptance
Public acceptance (especially among public transport users) is quite positive. On the other hand, the reactions of private car users were initially negative, although the implementation of preferential measures for public transport did not cause congestion on the relevant sections of the city's road network.
Incentives to increase uptake
High accuracy and reliability of public transport in the central part of the City of Jihlava.
Policy enablers for replication
The necessary condition for the approval of the project was the resolution of the Jihlava City Council.
Tips for replication
Before implementing preferential measures to support public transport, a thorough analysis of the load on the affected sections of the urban road network should be carried out and the impact of their introduction checked using the traffic model.
SHARE
RECIPROCITY
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.8. ON-DEMAND PUBLIC TRANSPORT (PILSEN, CZ)





ACCELERATE

Key learnings

The savings resulting from implementing the first phase of this solution in the Pilsen region amounts to up to 70% on compensation payments on on-demand bus lines compared to the same case with a fixed timetable.

Buy-in needed

In the case of on-demand buses, legal support in license allocation and timetable approval is critical, especially for the second phase of the project using alternative routes of individual bus connections without a fixed timetable.

Funding mix

100% of public funding.
The operation of on-demand public transport is financed from the budget of the Pilsen region with a contribution from the municipalities concerned.

Solution owners

The owner of the solution is the regional coordinator of public transport in the Pilsen region (POVED). The investor is the Pilsen region. The bus operator Arriva Střední Čechy is involved in operation and maintenance.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

Before the start of the project, negotiations took place with the affected municipalities and their citizens about the intended implementation of on-demand buses.

Public acceptance

Public acceptance is primarily favourable since there was a reasonably intensive information campaign before the on-demand bus system was launched. The only barrier for passengers presented in the public space is the need to order a bus service by 6 p.m. the day before.

Incentives are used to increase the uptake of the solution

One of the incentives is the reduction of travel time for certain groups of passengers compared to bus services with a fixed timetable. Specifically, these users travel to the bus's final stop, provided that the benefit of some intermediate stops is omitted, where the passengers have yet to make an actual request to stop, thanks to a buffer in the running time.

RECIPROCITY

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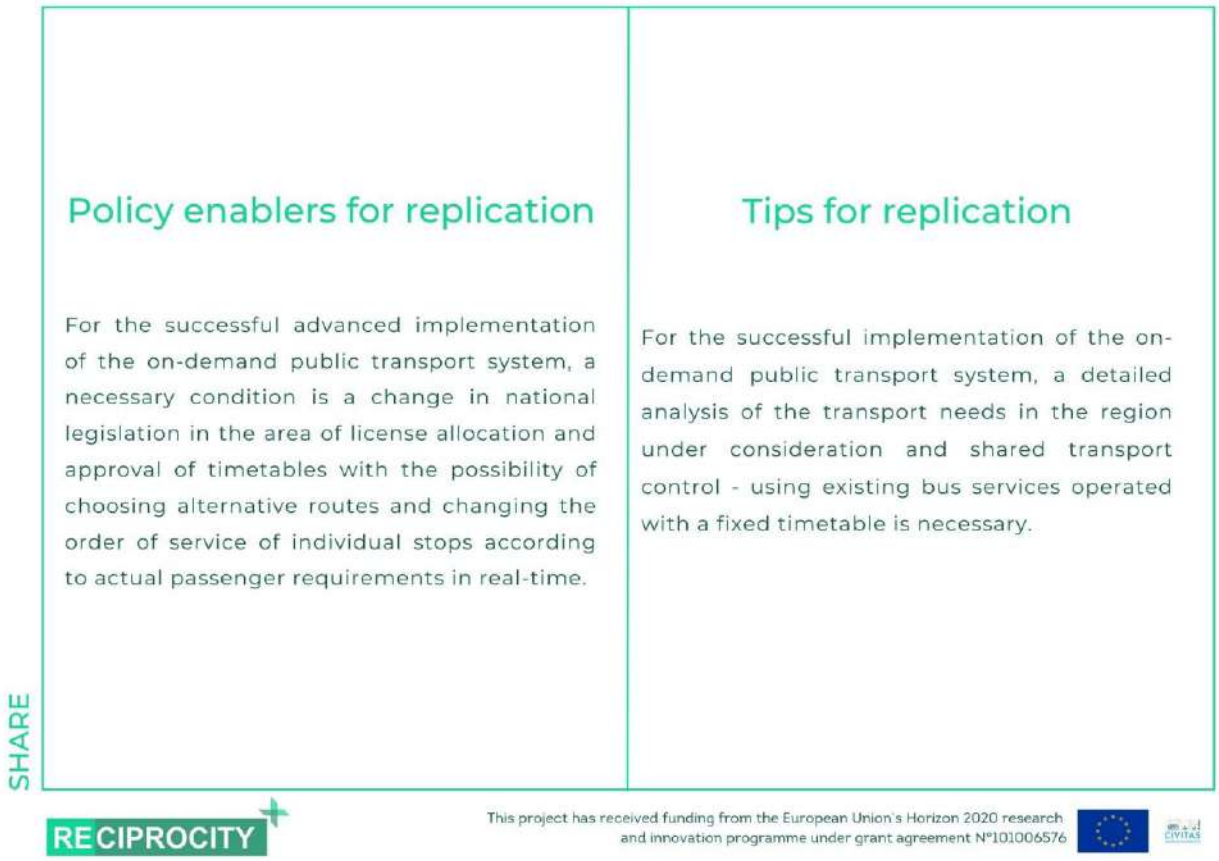
Policy enablers for replication
For the successful advanced implementation of the on-demand public transport system, a necessary condition is a change in national legislation in the area of license allocation and approval of timetables with the possibility of choosing alternative routes and changing the order of service of individual stops according to actual passenger requirements in real-time.
Tips for replication
For the successful implementation of the on-demand public transport system, a detailed analysis of the transport needs in the region under consideration and shared transport control - using existing bus services operated with a fixed timetable is necessary.
SHARE
RECIPROCITY
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.9. AUTONOMOUS SHUTTLE FOR_PASSENGERS (UPPER AUSTRIA, AT)

IDENTIFY

AUTONOMOUS SHUTTLE FOR PASSENGERS

Application area: Upper Austria (AT)
Implementation date: From 2023 to 2025
Geographic area of coverage: Periurban
Scope: Commuter and everyday mobility
Type of solution: Autonomous vehicle and on-demand Mobility
Target group: Companies, communters

LEARN

The project aims to develop a concept for an autonomous on-demand shuttle for regions. The shuttle will help to connect industry and municipalities with other means of public transportation to facilitate commuting and daily mobility.
The charging solution of the shuttle shall also work autonomously, and there will be a reservation system for the shuttle which shall include a real-time indication of when it will arrive.
Until the end of the project, we want to reach TRL 4.

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RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Implementation status and key learning

The project was granted by the Austrian funding agency FFG and will start in the summer of 2023.

TRL 2

Technology concept formulated

Investment needed

Acquiring the vehicle and the charging solutions, incl. road works. Further costs accrue through route planning, setting up the booking system, marketing, and potential infrastructure adjustments (stops,...).

Revenues/incomes

There will be indirect revenues/incomes, as the solution benefits employees and employers. Employee satisfaction might rise, as there will be better public transportation opportunities.

A possible revenue/income can be ticketing (this is not part of the project).

Solution owners

Project partners own, operate and maintain the solution.

Funding mix

Depending on the company type of project partner, the grant covers up to 85% of the expenses.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

Citizens and users will be included throughout the project to ensure the shuttle will be used and accepted and that the on-demand service is working. The project team will stay in close contact with users, municipalities and companies.

Public acceptance

The autonomous e-shuttle shall serve as an efficient, transparent and dynamic public transportation for commuters. In the beginning, a safety driver will be on board to reassure passengers and answer their questions.

Incentives are used to increase the uptake of the solution

Further information is possible after the test operation.

Policy enablers for replication

Recommendations:

- Further development/standardisation of the approval processes for testing and operation of autonomous vehicles.
- Reduce bureaucracy
- Develop a well-founded set of rules/procedures for driverless operation (without safety driver)

Tips for replication

Urban air mobility projects with passengers are long-term projects - an implementation plan might take up to 15 years.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

4.1.10. PUBLIC TRANSPORT PREFERENCE (PILSEN, CZ)

IDENTIFY

PUBLIC TRANSPORT PREFERENCE

Application area:	Pilsen (CZ)
Implementation date:	From 2024 to 2027
Geographic area of coverage:	Urban
Scope:	Commuter and everyday mobility
Type of solution:	Traffic Management System and On-demand Mobility.
Target group:	The customer is the Pilsen Urban Transport Company (PmdP), whose buses and trolleybuses use preferential measures. The end users are the passengers of public transport in the city of Pilsen.

WWW.KORIDOR16.CZ/CZ/OPATRENI/

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

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PUBLIC TRANSPORT PREFERENCE IN THE CITY OF PILSEN

Public Transport Preference in the City of Pilsen is represented by a set of organisational and constructional preferential measures on the backbone trolleybus line No. 16 in the City of Pilsen, which carries 25 000 passengers daily and is currently characterised by a high tendency to delays. This public transport preference project is part of the Sustainable Mobility Plan of the City of Pilsen and at the same time it is inspired by the approach to the public transport preference in the City of Jihlava. The aim of the project is to:

- Eliminate the impact of the surrounding traffic on the operation of the line.
- Reduce the travelling time.
- Increase the reliability and robustness of the line timetable.
- Optimise the location of stops.
- Improve the quality of the interchanges on the line.

The planned project includes 8 light-controlled intersections with a priority for the trolleybus line No. 16, 3 sections with a separate lane for trolley buses, the implemented synergy good practice "Traffic calming in the city centre" at the Americká street, construction of a new trolleybus stop with an attractive connection to long-distance and regional railway lines, and system priority for public transport at two intersections.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

A part of the public transport preference measures is already being implemented - 'Traffic Calming in the Center of the City of Pilsen 2021'. Other measures included in the project are at the stage of technical studies. The main driver for the implementation is the effort of the political representation, the public transport company and the technical departments of the city to increase the efficiency of the operation of the backbone trolleybus line with the highest number of passengers transported in the city, compared to the backbone tram lines.

One of the barriers to the implementation is the fear of individual transport users of increased traffic congestion caused by a greater preference for public transport.

TRL 2 Technology concept formulated

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

The investment costs have not yet been calculated and will be revealed in the next stages of the project documentation.

Revenues/incomes

The main benefits for users are increased travel speed, reduced travel time, increased reliability and economic efficiency of line operation, increased attractiveness of urban public transport, improved the quality of stops and the surrounding public space.

Buy-in needed

The support and encouragement of the city's political representatives would be an essential prerequisite for the successful implementation of the intention to prioritise transport preference on the backbone trolleybus line No. 16.

Solution owners

The owner of the good practice is the City of Pilsen. The investor is the City of Pilsen - Department of Investments and Administration of the Public Estate of the City of Pilsen. In the case of two partial projects, the investor is the Road and Motorway Directorate of the Czech Republic. The operation should be ensured by the Administration of the Public Estate of the City of Pilsen, the public transport provider of Pilsen Urban.

Funding mix

100% of public funding.
All sub-projects should be financed from public sources. Selected partial projects could be financed from the Integrated Regional Operational Programme.

Key learnings

A mix of construction and organisational preferential measures is important to minimise overall costs, while organisational measures (less costly) should prevail.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

The project is part of the Pilsen Sustainable Mobility Plan, which was discussed with experts and the wider public during its preparation.

Public acceptance

At the current stage of project preparation, public acceptance is neither positive nor negative.

Tips for replication

Developing a detailed traffic model to determine the likely delays for car transport users in case of implementation of public transport preference on relevant sections of the city's road network.

Incentives to increase uptake

High accuracy and reliability of public transport in the central part of the City of Pilsen as a result of the implementation of the sub-project and good practice of "Traffic calming in city centres".

Policy enablers for replication

The necessary condition for the approval and implementation of the project will be the resolution of the Pilsen City Council and Representation.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

5. Electric and hydrogen vehicles

Electric vehicles (EVs) are vehicles that are powered by an electric motor and battery pack, rather than a traditional gasoline or diesel engine. EVs can be charged by plugging them into an electric charging station or a standard electrical outlet. They emit zero tailpipe emissions, making them a more environmentally friendly transportation option also with less noise pollution. A common problem concerning EVs is the battery life cycle, as there are no solutions yet to enable the reuse of batteries causing a relevant production of waste.

Hydrogen vehicles, also known as fuel cell vehicles (FCVs), are vehicles that are powered by a fuel cell that converts hydrogen into electricity to power the vehicle. Like EVs, FCVs emit zero tailpipe emissions, making them a more sustainable and environmentally friendly transportation option. However, the infrastructure to support hydrogen vehicles, such as hydrogen fuelling stations, is still limited compared to electric charging stations.

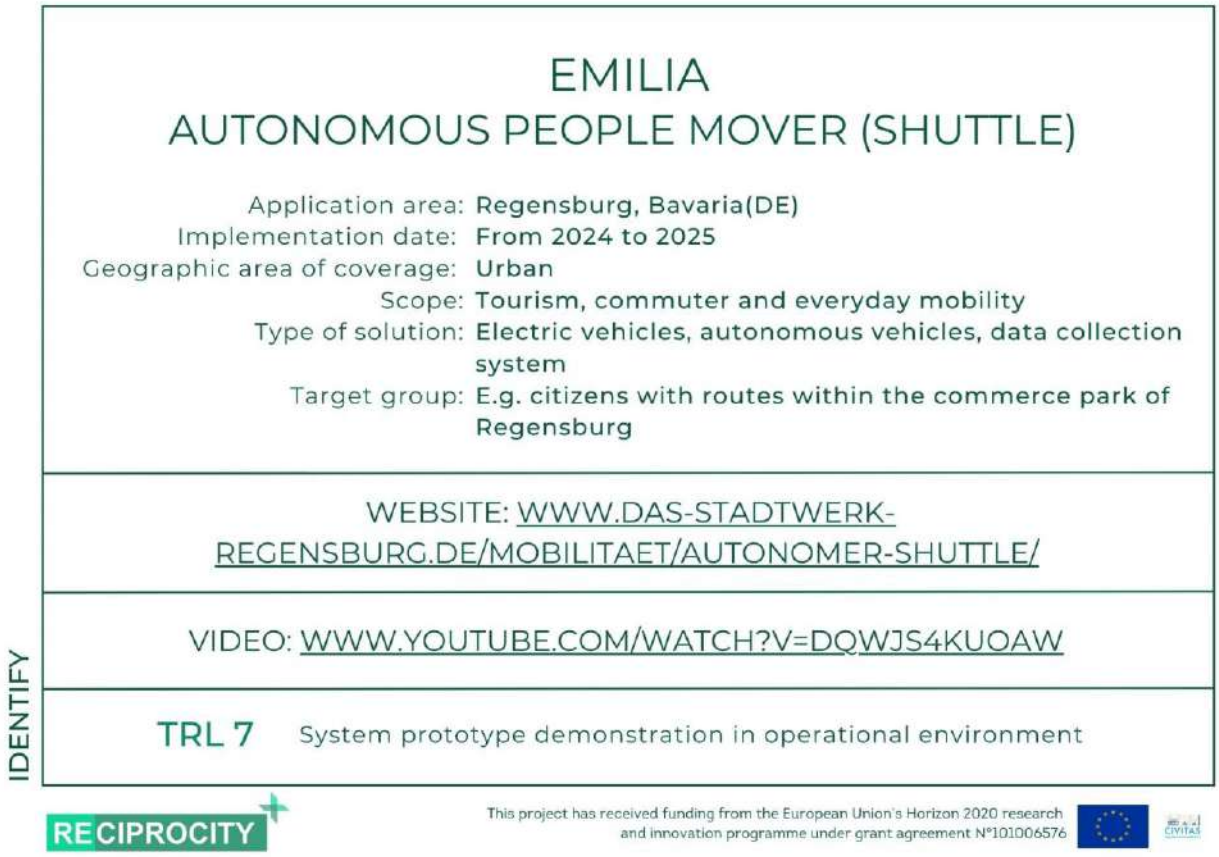
Both electric and hydrogen vehicles are seen as key components of a more sustainable and connected transportation system. As the technology for these vehicles continues to improve and become more widely available, they have the potential to revolutionize the transportation industry and help reduce our dependence on fossil fuels.

List of selected mobility cases on Electric and Hydrogen vehicles:

- EMILIA AUTONOMOUS PEOPLE MOVER – SHUTTLE (REGENSBURG, DE)
- ELECTROMOBILITY - BATTERY TROLLEYBUSES (PILSEN, CZ)
- AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

5.1.1. EMILIA AUTONOMOUS PEOPLE MOVER – SHUTTLE (REGENSBURG, DE)



LEARN

EMILIA
AUTONOMOUS PEOPLE MOVER (SHUTTLE)

As part of a two-year pilot project, das Stadtwerk.Mobilität is sending two autonomous vehicles on a ring route with seven stops in the Regensburg industrial park.
On weekdays between 10:00 and 16:00, passengers can use the shuttle service there free of charge at 10-minute intervals.
At the beginning of 2021, the routes were measured with test drives in cooperation with the vehicle manufacturer Navya and TÜV Nord. On September 1st 2021, the autonomous shuttles started operating.
During the journey, a trained escort is on board who can intervene if necessary and control two otherwise driverless buses during this development phase.
In the pilot project, the das Stadtwerk.Mobilität is gathering a wealth of experience, knowledge and data and is in close contact with the French vehicle manufacturer Navya, supplying the actual vehicles and the necessary software and project support.
The project is also primarily concerned with identifying and addressing critical issues and problems relating to the operation of autonomous buses.
[simplicity to replicate (1=hard,... 5=easy): 1]

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

Operation:
Key learnings from the process:

- Route extension: finding the right environment, considering obstacles in the existing network (e.g. traffic lights, road width, traffic flow, right of way rules, ...); most accessible: private area/enclosed area (without other road users).
- No route flexibility: construction sites and route changes require route adjustment (very high costs, approx. 80k€).
- Impact of weather conditions: Snowfall, heavy rain -> there are even driving bans from manufacturers under specific conditions.
- Extreme dependence on the manufacturer, e.g. no more support, software shutdown in case of insolvency.
- Under good conditions, the shuttle runs very well (lasts for weeks, with little driver intervention)
- Usage is strongly dependent on route and speed (18km/h too slow).

Main actions to implement:

- Obtain political (support) permission.
- Draw up specifications, incl. invitation to tender.
- Find funding, submit funding applications, and receive funding.
- Shuttle purchase.
- Permits: the City of Regensburg, the government of Upper Palatinate; TÜV expert opinion (test drives, accept software).
- Calibration of the route with the manufacturer.
- Training of employees: driver-operator license - manufacturer related; workshop employees for low-level support (less dependence on the manufacturer).
- Trial operation & fine-tuning through training (shuttle runs better after some testing and training).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

Initial:

- Shuttle: 600k€ for two shuttles (around 40% funding ~250k€).
- Training costs: operator (approx. 500€ per person), mechanics workshop.

Operation:

- Running costs to manufacturer: 4k€ per month per vehicle (depending on service package).
- Rent for heated hall & power supply.
- Operator personnel costs.
- Project coordinator personnel costs (interface with manufacturer, drivers...); 2-20 hours per week.

Revenues/incomes

Pilot action, no tickets needed.

Key learnings

Set up a maintenance contract instead of the entire service contract and buy spare parts in-house.

Solution owners

Das Stadtwerk Regensburg.Mobilität GmbH.

Buy-in needed

Manufacturer Navya

Funding mix

For the purchase of the shuttles, 40% funding (Federal Ministry for Digital and Transport)
For the operation, no funding applies.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Incentives to increase uptake

A higher accepted speed limit would increase the benefit of the solution, and therefore also, user acceptance would rise, and new use cases would appear.

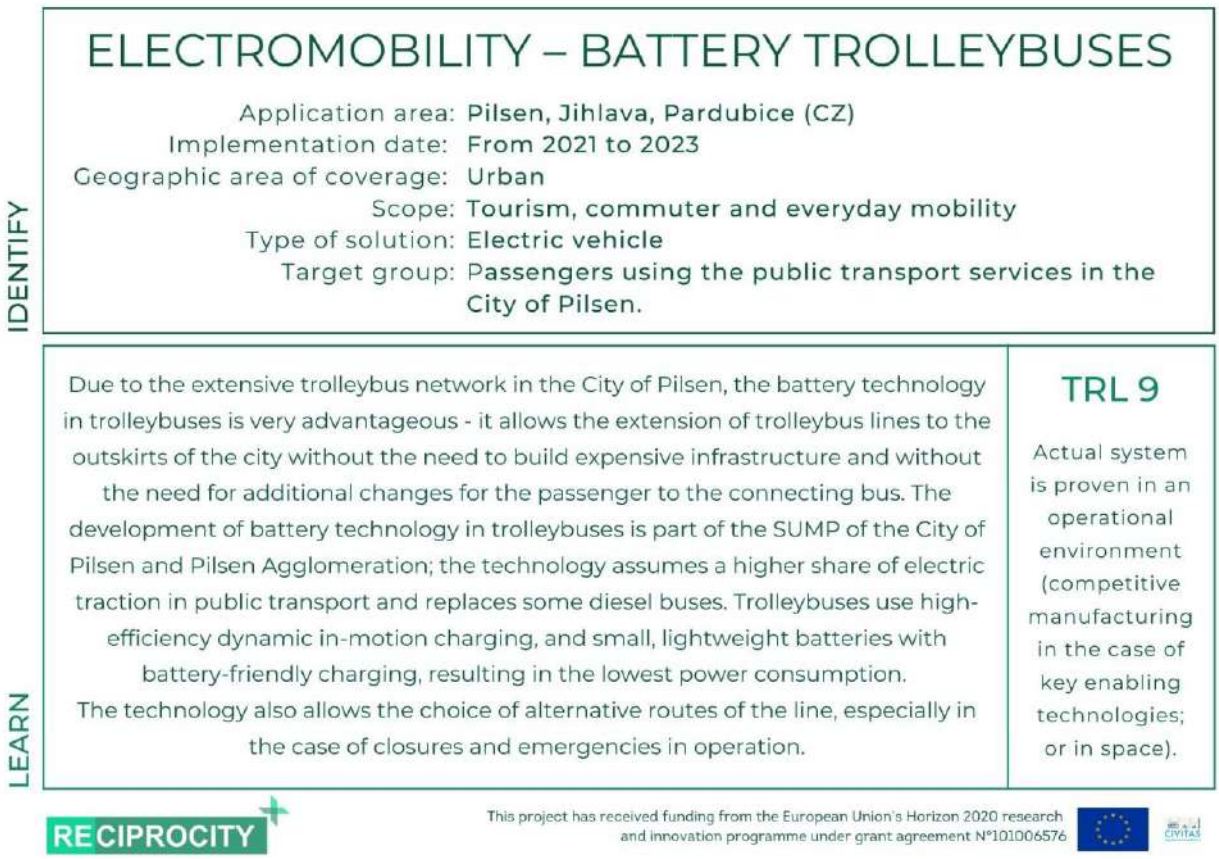
Facts and figures

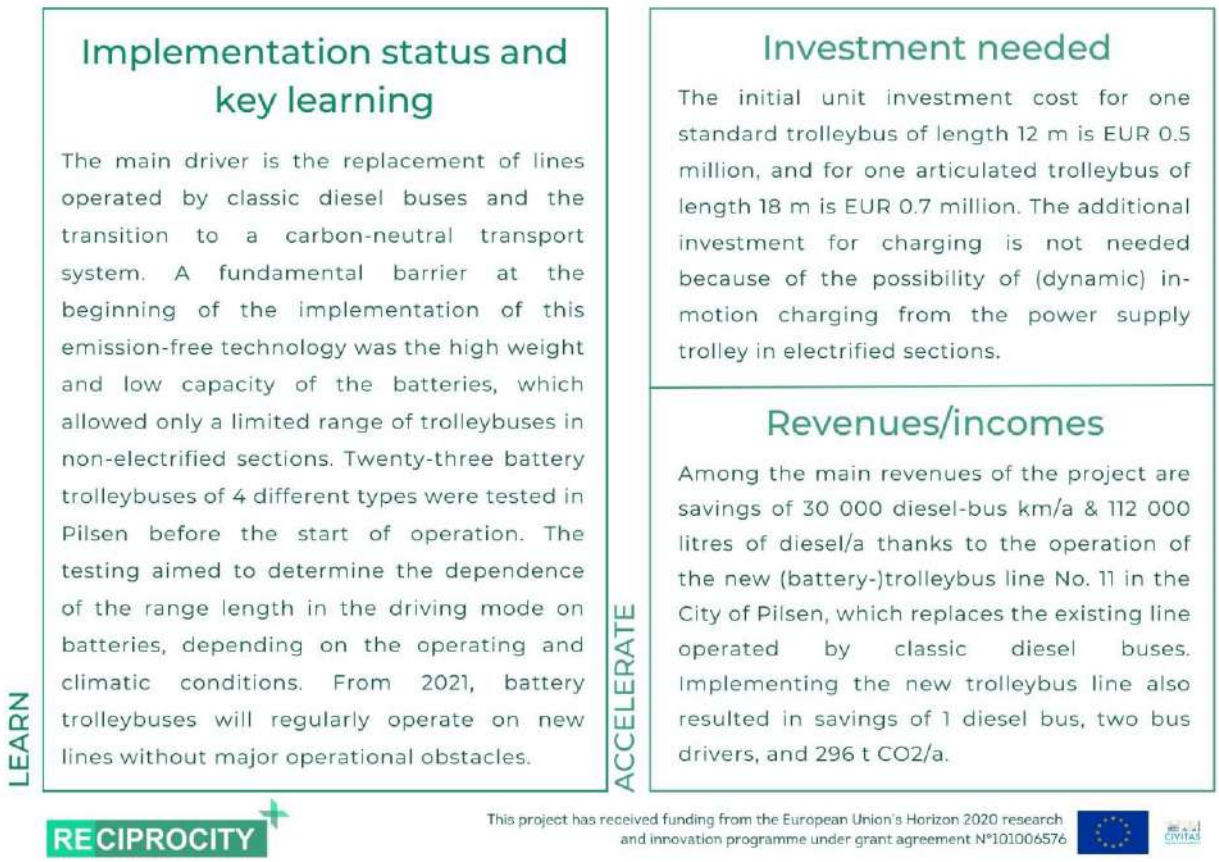
External expertise from partners from industry and science is needed.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

5.1.2. ELECTROMOBILITY - BATTERY TROLLEYBUSES (PILSEN, CZ)





ACCELERATE

Key learnings

An essential aspect is the unification of the fleet of battery trolleybuses due to more accessible and cheaper maintenance using economies of scale when a more significant number of trolleybuses of the same type are purchased from one trolleybus producer.

Buy-in is needed

A fundamental prerequisite was political support during the development of the Sustainable Mobility Plan of the City of Pilsen, which assumed the gradual implementation of this emission-free transport technology from 2016. At the same time, the positive attitude of urban transport companies' top and middle management towards the technology of partial battery trolleybuses was critical.

Funding mix

100% of public funding.
Acquiring battery trolleybuses was partly financed by the Integrated Regional Operational Program (EFRE) and the resources of the City of Pilsen.

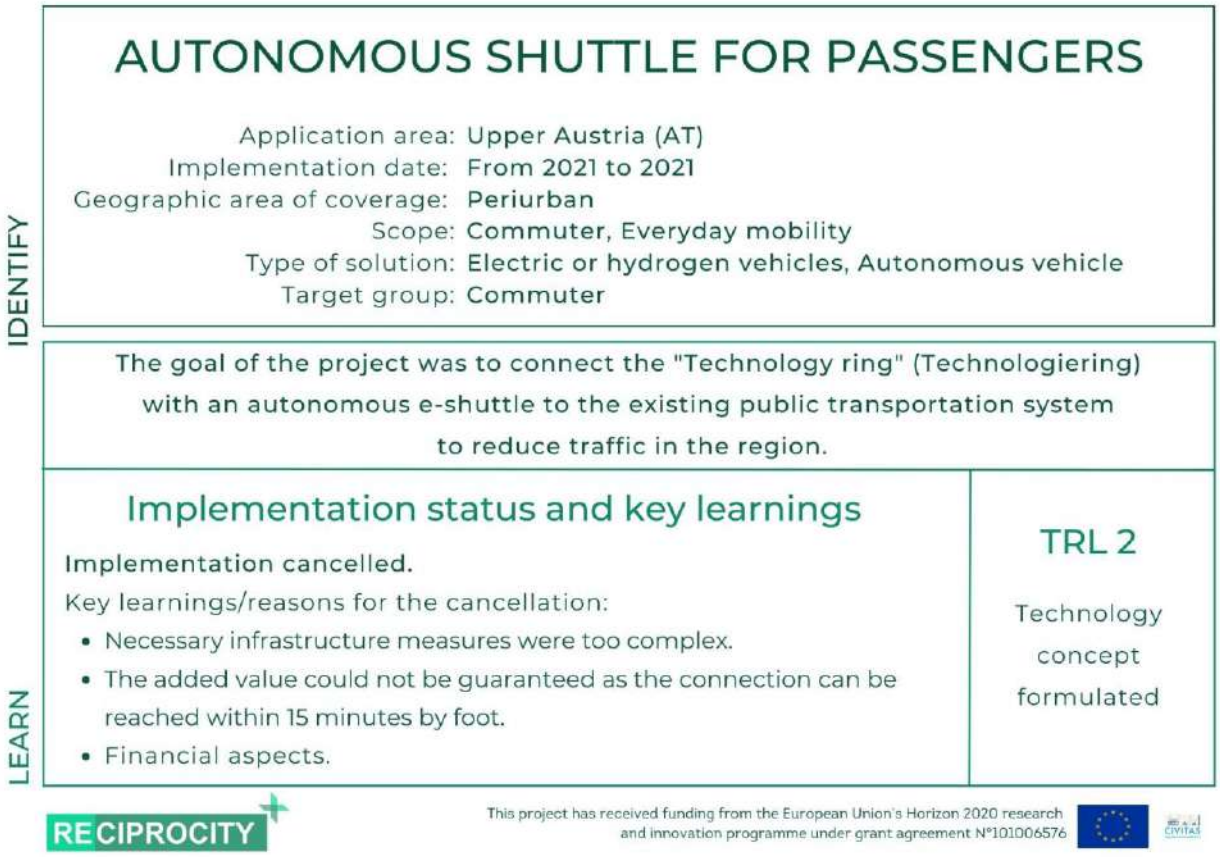
Solution owners

The solution owner, investor, operator and maintainer are the Pilsen Municipal Transport Companies - public transport operating company in the City of Pilsen (the in-house company of the City of Pilsen).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

5.1.3. AUTONOMOUS SHUTTLE FOR PASSENGERS (UPPER AUSTRIA, AT)



ACCELERATE

Investment needed

- Upgrade of the road infrastructure
- Acquisition of the charging infrastructure
- Acquisition costs of the shuttle
- Safety drivers

Solution owners

The ownership and operating structure has not been discussed.

Funding mix

Public funding, municipality, transport providers.

Revenues/incomes

The aim was not to generate income.
In the long term, it should have become a "normal" means of public transport.

Buy-in needed

Municipality and transport providers.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizens and users involvment

Citizens/potential users would be informed through a PR campaign and presentations. An opening day event was planned. After that, the shuttle would have started operating.

Facts and figures

Autonomous shuttles are an opportunity to change mobility behaviour in a sustainable way, if, in the near future they are not so dependent on personnel (e.g. safety drivers).

Tips for replication

Bring different partners on board, also "small" partners and users. Use existing professional structures such as clusters.

Policy enablers for replication

- Clearer definition of the legal framework - there should be a clear set of rules, put on an equal footing with public transport.
- Reduce bureaucratic burden - also for funding.
- New idea for funding projects: at least one municipality/city should be a partner in the project.
- Smaller municipalities/cities should also get more opportunities/funding - include them in the funding measures.

Make autonomous shuttles accessible in a simplified way, especially for decentralised settlement structures.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6. Data collection system and Traffic management system solutions

Data collection and traffic management systems can provide valuable insights into transportation patterns and help to improve mobility and reduce congestion. By collecting and analysing data on traffic flow and other factors, transportation planners and policy-makers can make more informed decisions about transportation planning, control, infrastructure and policies. Traffic management systems can also help to improve safety on the roads, by regulating the movement of vehicles and reducing the risk of accidents.

Overall, data collection systems and traffic management systems are important tools for improving mobility and creating a more sustainable and connected transportation system. Data collection is also the enabler of innovative solutions like autonomous and electric vehicles. By leveraging these technologies, cities can make the transportation systems more efficient, safer, and more environmentally friendly.

Parking management

Parking management solutions refer to a range of technologies and policies aimed at managing parking in cities and other urban areas. The goal of these solutions is to reduce congestion, improve safety, and create more efficient and accessible parking systems that support sustainable and connected mobility.

Overall, parking management solutions are an important component of mobility solutions for cities. By creating more efficient and accessible parking systems, cities can reduce congestion and emissions, improve safety, and support more sustainable and connected transportation options for urban residents and visitors.

Nevertheless, contrary to the advantages mentioned above, more efficient parking management risks encouraging individual car traffic, which can lead to an increase in the number of vehicles in cities. Cities must weigh up individually and context-specifically how to use parking management systems sensibly for a greener city.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Traffic calming

Traffic calming solutions refer to a range of strategies and technologies aimed at reducing the speed and volume of traffic on urban roads and streets. The goal of traffic calming is to improve safety, reduce noise and pollution, and create more liveable and enjoyable communities.

Overall, traffic calming solutions are an important component of mobility solutions for cities. By reducing the speed and volume of traffic, cities can create safer, and more sustainable communities that prioritise the needs of pedestrians, cyclists, and public transit users.

List of selected mobility cases Traffic calming:

- TRAFFIC CALMING IN THE CITY CENTERS (PILSEN, CZ)
- PUBLIC TRANSPORT PREFERENCE (PILSEN, CZ)
- DIGITAL SAFETY ASSISTANT
- PUBLIC TRANSPORT PREFERENCE (JIHLAVA, CZ)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6.1.1. TRAFFIC CALMING IN THE CITY CENTERS (PILSEN, CZ)

IDENTIFY

TRAFFIC CALMING IN THE CITY CENTERS

Application area:	Pilsen (CZ)
Implementation date:	From 2021 to 2025
Geographic area of coverage:	Urban
Scope:	Tourism, commuter and everyday mobility
Type of solution:	Traffic Management System
Target group:	Pedestrians moving along the calm street, passengers in public transport who are not burdened by delays due to congestion on the street, and residents without the burden of noise and pollution from individual car traffic.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

TRAFFIC CALMING IN THE CITY CENTERS

The aim of the change in the traffic regime in the centre of the City of Pilsen (Americká Street, implemented in August 202) was to calm the traffic on this important business street of the city and to improve the conditions for pedestrians, cyclists and urban and regional public transport.

The measure was implemented in accordance with the valid conceptual documents of the city, in particular the Strategic Plan of the City of Pilsen, and the Sustainable Mobility Plan of the City of Pilsen (SUMP).

Before the exclusion of private car traffic, 14 400 private vehicles were operating per day until August 2021. Americká Street is also intensively served by public transport (1 200 T-buses/day and 24 000 passengers/day). Before the traffic calming measures, there were significant delays for public transport (7 - 16 min in the peak hour); public transport travelled a section of 500 m for 12 minutes at a speed of 2.5 km/h. From August 2021, the street can be accessible only to pedestrians, cyclists, public transport, delivery vehicles and taxis.

The city of Pilsen is trying to turn the street into an urban boulevard, by widening the sidewalks and adding greenery.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

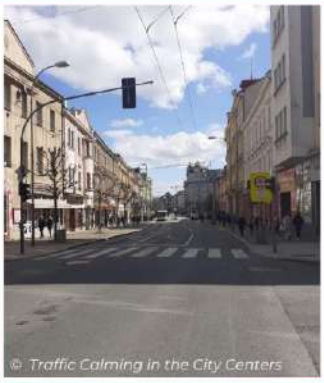
Implementation status and key learning

The **first phase** of the project has been implemented - traffic calming with the exclusion of private car traffic. Through traffic signs, only public transport, taxis and delivery vehicles are allowed to enter the street.

The **second phase** of the project will be the reconstruction/modification of the central part of Americká Street, which will transform the street into an urban boulevard, by widening sidewalks and urban greenery.

One of the driving forces behind the implementation of the project was the efforts of the **Pilsen City Council**, together with the professional public, to calm traffic on one of the main streets in the central part of Pilsen. Intensive individual car traffic was causing significant delays for buses and trolleybuses.

The **main obstacle** to implementation was the concern of political representatives about a significant increase in traffic on alternative routes. Restricting car traffic on Americká Street brought significant improvements to public transport in terms of regularity, punctuality and economy of operations. Alternative routes have absorbed vehicles from Americká Street. The intensity of traffic on these routes has decreased significantly over the past year.



© Traffic Calming in the City Centers

TRL 9

Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies or in space).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

The initial investment required to implement the **first phase** of traffic calming consists of two vertical no-entry signs with additional tables defining the types of public transport vehicles allowed to enter.

The capital cost of the **second phase** (transforming the street into a city boulevard, pedestrian zone with public transport options) is estimated at around €1 million.

The calming of the street has brought **significant savings** in operating costs for the city's transport companies. Thanks to the elimination of delays, a smaller number of vehicles (trolleybuses/buses) and drivers can be used in public transport. The total savings can be calculated at €700,000 per year.

Revenues/incomes

In terms of non-monetary benefits, passengers saved 100 hours of waiting time per day once the traffic had calmed down. This was only during the peak period between 14:00 and 17:00.

Key learnings

The advantage of the proposed solution is that the first phase of street calming is possible without any additional investment or operating costs.

Funding mix

100% of public funding.
These are investment and operating costs from the budget of the City of Pilsen.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Buy-in needed

Political support for the proposed solution was a fundamental prerequisite.

The traffic calming of the Americká Street has been discussed in academic and professional circles for at least 20 years.

It was only after the construction of an alternative high-capacity road that ensured the redirection of individual car traffic away from the city centre that it was possible to convince the political representation of this fundamental decision in the city's transport policy.

Solution owners

The owner of the solution is the City of Pilsen. The City of Pilsen is also an investor. The traffic-calmed street operates and maintains the management and administration of the public property of the City of Pilsen (organisational unit of the City).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

The plan was presented several times by the Deputy-Mayor in charge of mobility issues at meetings with the citizens of the central district of Pilsen.

Public acceptance

Public acceptance (especially among public transport users and residents of Americká Street) is quite positive.

Tips for replication

Developing a detailed transport model in order to determine the change in traffic intensity on alternative routes to a quieter road in the central part of the city.

Incentives to increase uptake

High accuracy and reliability of public transport in the central part of Pilsen.

Policy enablers for replication

A necessary condition for the approval of the project was the resolution of the Pilsen City Council.

Facts and figures

After traffic calming, the delays of public transport buses and trolleybuses have been practically eliminated (from max. 16 minutes before traffic calming to max. 1 minute) and the average speed of public transport vehicles in the critical section during rush hour increased from 3 km/h to 17 km/h after traffic calming.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6.1.2. PUBLIC TRANSPORT PREFERENCE (PILSEN, CZ)

IDENTIFY

PUBLIC TRANSPORT PREFERENCE

Application area:	Pilsen (CZ)
Implementation date:	From 2024 to 2027
Geographic area of coverage:	Urban
Scope:	Commuter and everyday mobility
Type of solution:	Traffic Management System and On-demand Mobility.
Target group:	The customer is the Pilsen Urban Transport Company (PmdP), whose buses and trolleybuses use preferential measures. The end users are the passengers of public transport in the city of Pilsen.

WWW.KORIDOR16.CZ/CZ/OPATRENI/

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

PUBLIC TRANSPORT PREFERENCE IN THE CITY OF PILSEN

Public Transport Preference in the City of Pilsen is represented by a set of organisational and constructional preferential measures on the backbone trolleybus line No. 16 in the City of Pilsen, which carries 25 000 passengers daily and is currently characterised by a high tendency to delays. This public transport preference project is part of the Sustainable Mobility Plan of the City of Pilsen and at the same time it is inspired by the approach to the public transport preference in the City of Jihlava. The aim of the project is to:

- Eliminate the impact of the surrounding traffic on the operation of the line.
- Reduce the travelling time.
- Increase the reliability and robustness of the line timetable.
- Optimise the location of stops.
- Improve the quality of the interchanges on the line.

The planned project includes 8 light-controlled intersections with a priority for the trolleybus line No. 16, 3 sections with a separate lane for trolley buses, the implemented synergy good practice "Traffic calming in the city centre" at the Americká street, construction of a new trolleybus stop with an attractive connection to long-distance and regional railway lines, and system priority for public transport at two intersections.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

A part of the public transport preference measures is already being implemented - 'Traffic Calming in the Center of the City of Pilsen 2021'. Other measures included in the project are at the stage of technical studies. The main driver for the implementation is the effort of the political representation, the public transport company and the technical departments of the city to increase the efficiency of the operation of the backbone trolleybus line with the highest number of passengers transported in the city, compared to the backbone tram lines.

One of the barriers to the implementation is the fear of individual transport users of increased traffic congestion caused by a greater preference for public transport.

TRL 2 Technology concept formulated

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Investment needed

The investment costs have not yet been calculated and will be revealed in the next stages of the project documentation.

Revenues/incomes

The main benefits for users are increased travel speed, reduced travel time, increased reliability and economic efficiency of line operation, increased attractiveness of urban public transport, improved the quality of stops and the surrounding public space.

Buy-in needed

The support and encouragement of the city's political representatives would be an essential prerequisite for the successful implementation of the intention to prioritise transport preference on the backbone trolleybus line No. 16.

Solution owners

The owner of the good practice is the City of Pilsen. The investor is the City of Pilsen - Department of Investments and Administration of the Public Estate of the City of Pilsen. In the case of two partial projects, the investor is the Road and Motorway Directorate of the Czech Republic. The operation should be ensured by the Administration of the Public Estate of the City of Pilsen, the public transport provider of Pilsen Urban.

Funding mix

100% of public funding.
All sub-projects should be financed from public sources. Selected partial projects could be financed from the Integrated Regional Operational Programme.

Key learnings

A mix of construction and organisational preferential measures is important to minimise overall costs, while organisational measures (less costly) should prevail.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

The project is part of the Pilsen Sustainable Mobility Plan, which was discussed with experts and the wider public during its preparation.

Public acceptance

At the current stage of project preparation, public acceptance is neither positive nor negative.

Tips for replication

Developing a detailed traffic model to determine the likely delays for car transport users in case of implementation of public transport preference on relevant sections of the city's road network.

Incentives to increase uptake

High accuracy and reliability of public transport in the central part of the City of Pilsen as a result of the implementation of the sub-project and good practice of "Traffic calming in city centres".

Policy enablers for replication

The necessary condition for the approval and implementation of the project will be the resolution of the Pilsen City Council and Representation.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6.1.3. DIGITAL SAFETY ASSISTANT

IDENTIFY

DIGITAL SAFETY ASSISTANT

Application area:	• Test phase: Regensburg (DE), Singapore (SGP) • Demonstration phase: Hamburg (DE), Frankfurt (DE), Singapore(SGP), Daegu (KR)
Implementation date:	Planned commercialisation mid-2024 (POC 2020/2021, MVP 2023)
Geographic area of coverage:	Urban, periurban and rural
Scope:	Tourism, commuter, everyday mobility and public transport and other mobility service providers. Electric vehicles, autonomous vehicles, data collection systems.
Type of solution:	Data collection and Traffic management systems, Mobility as a Service (MaaS) and Shared Mobility.
Target group:	Urban planners, traffic management centres, mobility service providers, insurance companies, factory management, road users.

TRL 7 System prototype demonstration in operational environment

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

DIGITAL SAFETY ASSISTANT

Challenge:

- > 50% of all road traffic deaths are of vulnerable road users: pedestrians, cyclists & motorcyclists.
- Road traffic crashes cost most countries 3% of their GDP.

Goal:

Increased safety for all road users, including cyclists, pedestrians and other VRUs. Fewer fatalities, identification of critical traffic areas in the city (Near Miss Accident Map).

Offer:

- Collision Warning/ Danger Alert: Provide a "Safety Shield" for each road user.
- Mobility risk analysis of your city: Accident & "Near Miss Accident" heat map.
- Speed warning to prevent speeding accidents.
- Understanding traffic flows

Implementation status and key learning

Implementation status: the first demonstrations have taken place with the test phase in various locations.

Key learnings:

- Working with customers to define benefits and key parameters of the solution.
- Convincing the end users of the value of the solution: ensure that the solution is robust otherwise the value of the security assistant is not visible.
- App approval (e.g. Apple, Appstore) is very important for market penetration: Currently, Apple does not approve the App; on Android, it is running.
- GDPR needs to be considered and may increase implementation time.
- Technical implementation is very simple and quick as software can be used via smartphone; if it needs to be downloaded on vehicles, e.g. telematics, the implementation time will vary.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

SHARE

Citizen and user involvement

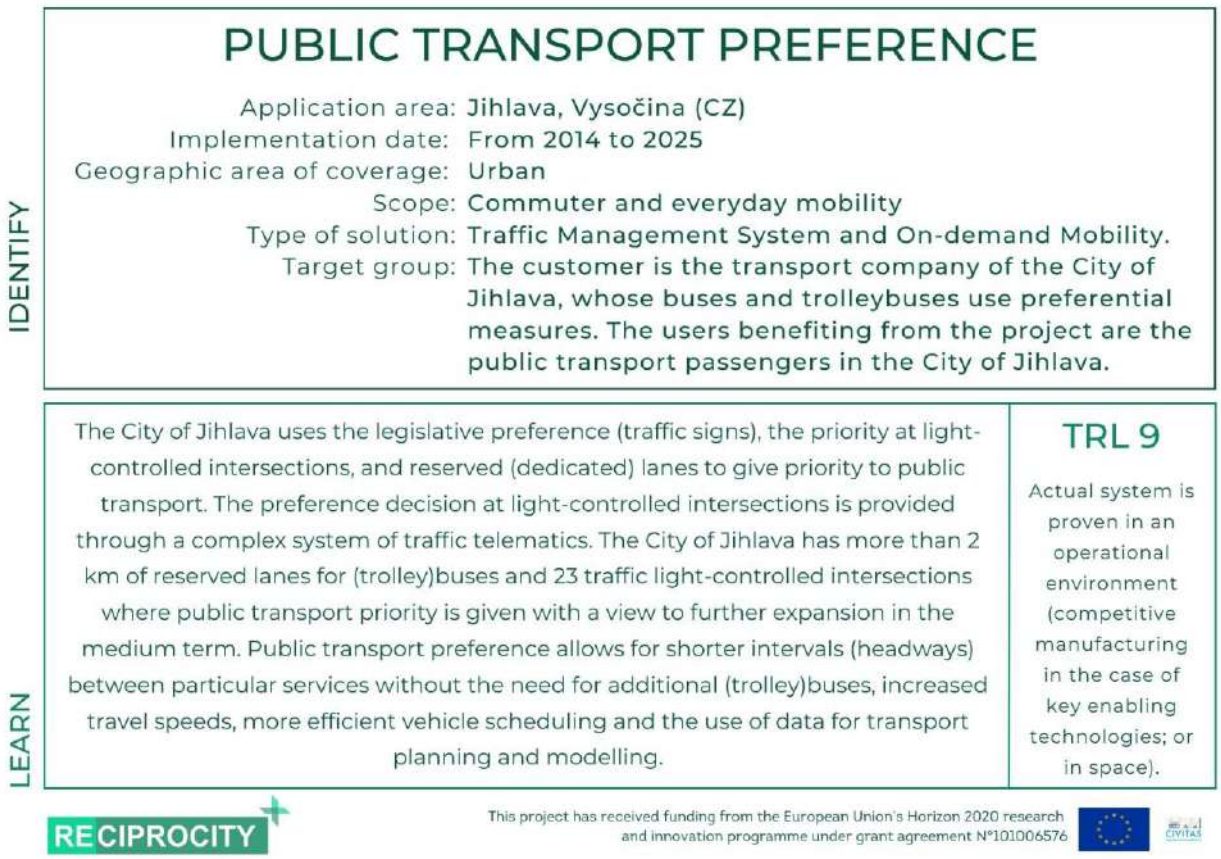
- Digital Safety Assistant Demonstration days.
- Direct communication to involve users already in the development/testing phase.

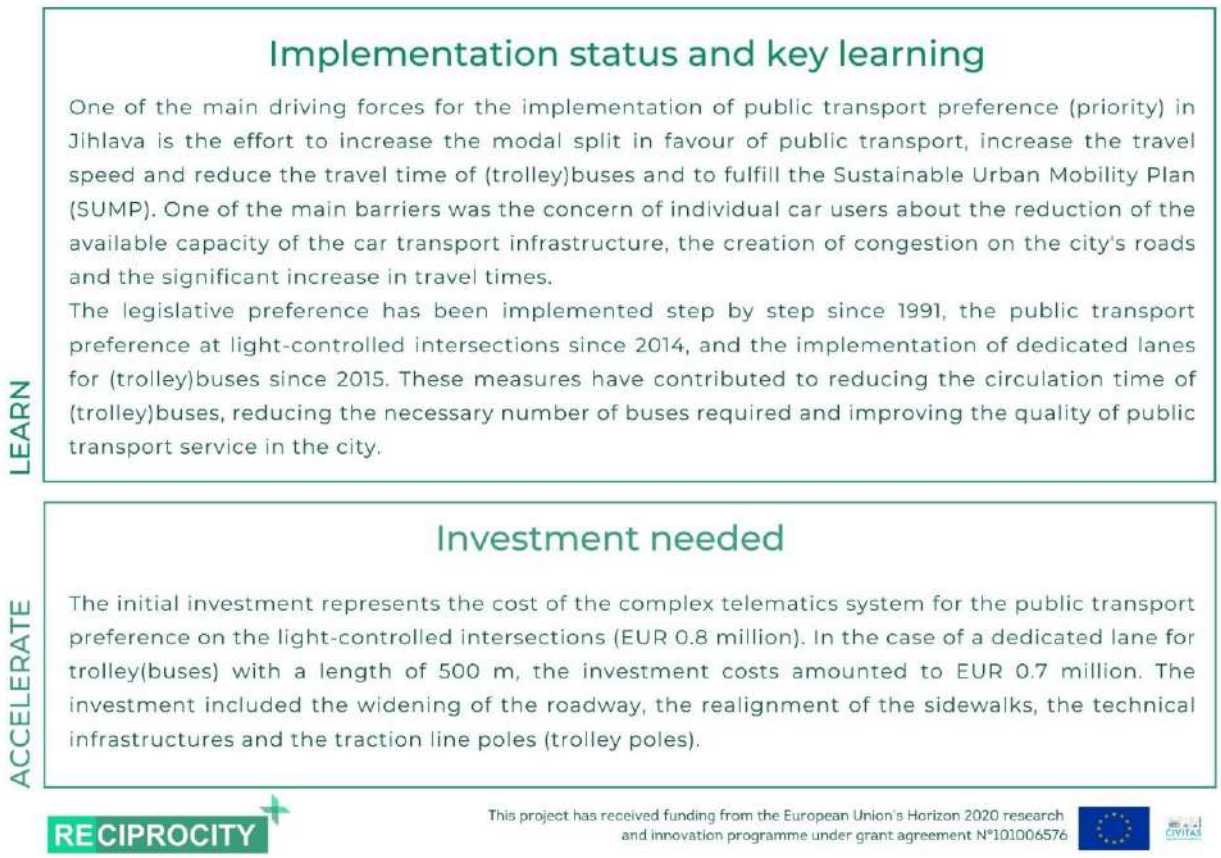
Incentives to increase uptake

- Find other mobility applications already installed by users that can be added to the Digital Safety Assistant.
- Explore different use cases for the uptake of the solution, e.g. safer mobility for confined areas or for cities, autonomous driving (making pedestrians, cyclists, and scooter riders feel safer).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6.1.4. PUBLIC TRANSPORT PREFERENCE (JIHLAVA, CZ)





ACCELERATE

Revenues/incomes

The main benefits include an increase in travel speed by 14%, reducing of the interval between services (headway) without the need to operate additional trolley(buses), an increase in the number of transported passengers by 12%, an increase of journeys realised with public transport per inhabitant by 14%, more efficient planning of (trolley)bus circulation, driver rostering and effective elimination of delay on preferred lines.

Solution owners

The owner of the solution is the City of Jihlava. The City of Jihlava is also an investor. The telematic system of traffic signalling operates and maintains the Management and Services of the City of Jihlava (organisational unit of the city) and the Urban Public Transport Company of the City of Jihlava.

Key learnings to reduce the overall costs

One of the key learnings is the effort to maximise the use of the existing infrastructure without the need for the implementation of fundamental new roads and large investments. As part of the project, the strategy of less investment-intensive measures on the road network and the massive involvement of transport telematics ("more technology instead of concrete") was implemented.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

ACCELERATE

Buy-in needed

The support and encouragement of the city's political representatives was an essential prerequisite for the successful implementation of the intention to give priority to public transport on parts of the bus and trolleybus routes.

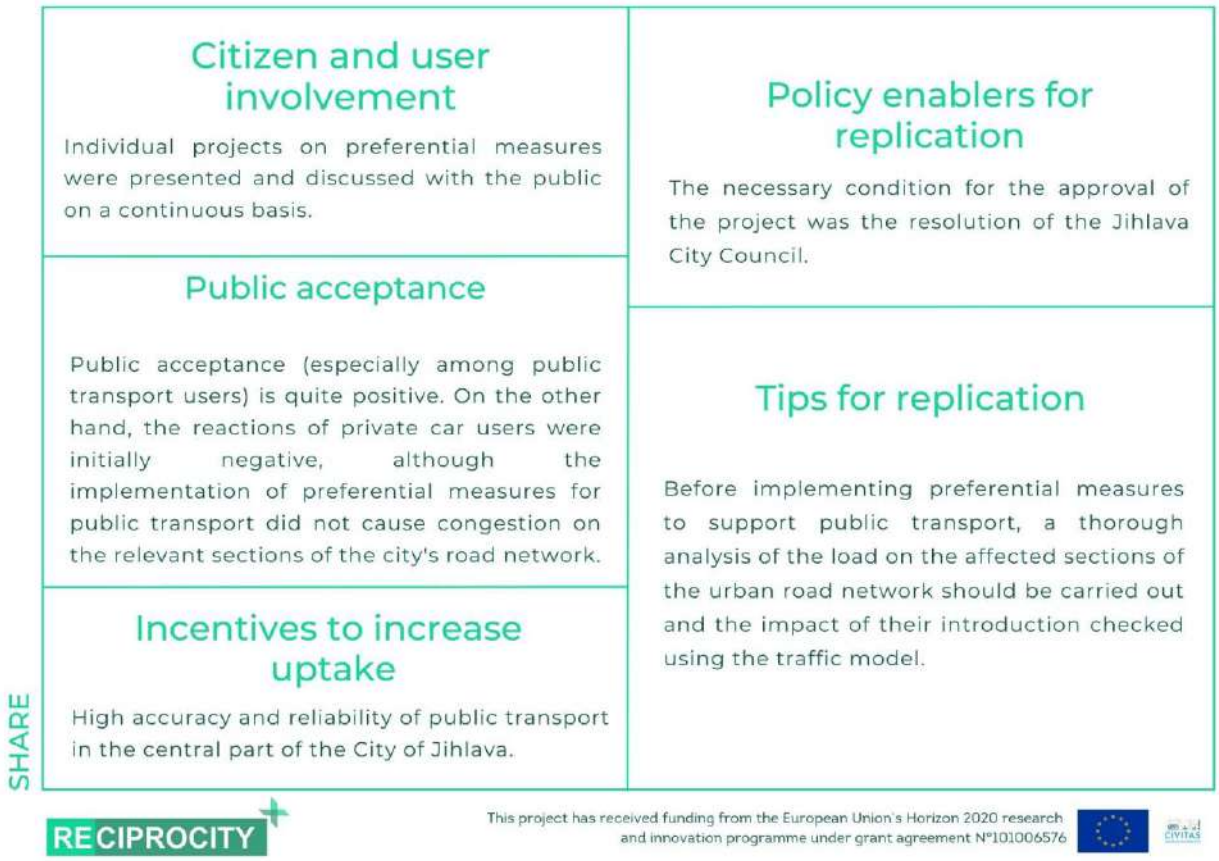
Prior to the implementation of a number of public transport priority measures, there were obvious concerns from private cars users about the deterioration of the city's accessibility by private car. However, after the implementation of the preferential measures, there was no significant deterioration in the city's accessibility for car users.

Funding mix

100% of public funding.
The sub-project "Comprehensive transport telematics system for ensuring public transport preference on all traffic signaling lights in the city" was financed from the city's own financial resources (20%) and from the Integrated Regional Operational Programme (ERDF - 80%).
The other related projects were financed from the city's own resources.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576


Citizen and user involvement
Individual projects on preferential measures were presented and discussed with the public on a continuous basis.
Public acceptance
Public acceptance (especially among public transport users) is quite positive. On the other hand, the reactions of private car users were initially negative, although the implementation of preferential measures for public transport did not cause congestion on the relevant sections of the city's road network.
Incentives to increase uptake
High accuracy and reliability of public transport in the central part of the City of Jihlava.
Policy enablers for replication
The necessary condition for the approval of the project was the resolution of the Jihlava City Council.
Tips for replication
Before implementing preferential measures to support public transport, a thorough analysis of the load on the affected sections of the urban road network should be carried out and the impact of their introduction checked using the traffic model.
SHARE
RECIPROCITY
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

Data collection & usage

Data collection and usage is a crucial component of mobility solutions for cities, particularly when it comes to reducing emissions and improving air quality. There are several ways that cities can collect and use data to inform their mobility strategies and reduce emissions.

Overall, data collection and usage is an essential component of mobility solutions for cities, particularly when it comes to reducing emissions and improving air quality. By using data to inform policies and programs, cities can create more sustainable and connected transportation systems that prioritize the health and well-being of residents and visitors.

List of selected mobility cases Data collection and usage:

- ITS SYSTEM IN TRANSPORT VEHICLES (OLSZTYN, PL)
- MOBI SMART PORT (LE HAVRE, FR)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

6.1.6. ITS SYSTEM IN TRANSPORT VEHICLES (OLSZTYN, PL)

IDENTIFY

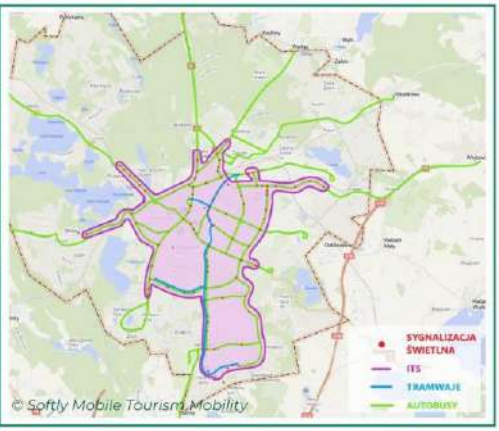
SOFTLY MOBILE TOURISM MOBILITY

Application area: Olsztyn, Warmia and Mazury (PL)
Implementation date: From 2015 - ongoing
Geographic area of coverage: Urban
Scope: Commuter and everyday mobility
Type of solution: Data Collection and Traffic Management System
Target group: Public transport passengers and road traffic users in Olsztyn

LEARN

HTTPS://WWW.ZDZIT.OLSZTYN.EU/PL/

The system is being used by the city's traffic management unit to improve intersections, regulate the frequency of public transport and identify road accidents.



RECIPROCITY

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SOFTLY MOBILE TOURISM MOBILITY

The need to create an ITS system in Olsztyn was linked to the planned reactivation of the tram traction, and thus, the introduction of a new communication system. The **ITS tasks** included:

- Monitoring the functioning of public transport.
- Assigning priorities at intersections for public transport vehicles (especially trams).
- Providing a range of passenger information and transport accessibility facilities.

The **ITS system** includes:

- Traffic control subsystem, including priority for public transport vehicles.
- A video monitoring subsystem at intersections covered by the traffic control system.
- A red light crossing detection subsystem (it is operational but not in permanent use due to current legislation).
- A subsystem for detection of temporary speeding of vehicles (functioning but not in permanent use due to current legislation).
- A subsystem for controlling the movement of public transport vehicles on bus and tram lines.
- A subsystem for passenger information on the Internet (WWW) and at stops and in vehicles.
- A subsystem of gates for counting passengers in selected public transport vehicles (the number of vehicles increases every year).
- An electronic ticket (city card) with a charging system and on-board devices in trams and buses.
- A meteorological information subsystem.
- A subsystem for controlling the distribution of traffic flows in the communication system.

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The system is managed and supervised by two centres, Traffic Management and Public Transport Management and Control. The system was designed with the participation of, among others, Olsztyn City Council, the Municipal Transport Authority (currently ZDZiT), the Road and Bridge Authority (currently ZDZiT) and the Municipal Transport Company. The contractor was SPRINT. The solutions were modelled on those used in other cities, such as Warsaw.

TRL 9

Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

LEARN

Implementation status and key learning

The main difficulty was the fact that **a very large system**, with many different subsystems, **had to be launched in a short time**, practically from scratch. In addition, **the system had to be launched in parallel with the introduction of tram services** and a **comprehensive reconstruction of the bus network**. Some of the assumed solutions had to be corrected in practice. Another difficulty was the **lack of experience of staff in managing and operating this type of system**.

The ITS system must be constantly expanded and modified to meet current needs. New stops and junctions are constantly being added to the system. New passenger information panels at stops, stationary ticket vending machines, a subsystem for counting passengers on selected trams and buses, the possibility of storing tickets on bank cards and the functionality of the application for passengers have been introduced.

Thanks to these changes, the ITS system introduced in 2015 is still an indispensable tool for the functioning of public transport in Olszyn. It is also a key system from the point of view of traffic control, and its further expansion is planned along with the expansion of the tram network.

Nevertheless, the disadvantages of the current ITS system are, first of all, **very high costs of system implementation and maintenance**, as well as a rather high failure rate of individual system components.

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ACCELERATE

Investment needed

It was necessary to invest in: software, data transmission networks, servers, creation and equipment of the Traffic Control Centre and the Public Transport Management Centre, etc.
When the system is expanded, it is possible to add new devices such as cameras, ticket machines, dynamic passenger information panels, autocomputers, or traffic light controllers together with software.

Key learnings

Some of the detailed technical solutions turned out to be ineffective. Therefore, before making a decision on individual components, it is worth carrying out detailed needs analyses and consulting the cities in which the ITS system will operate.

Revenues/incomes

Not directly, but the system also partially covers ticket sales.
in addition, improving the quality of public transport services may increase revenues. It is also important to reduce the external costs of transport (pollution, noise, lost time, etc.) by developing collective transport or improving the general traffic flow.

Solution owners

The investment was carried out by the Municipality of Olsztyn. The ITS system is generally managed by ZDZiT in Olsztyn (from pol. Department of Roads, Greenery and Transport), although the operators are responsible for the proper operation of the system components in the vehicles (buses and trams). Maintenance/repairs are largely outsourced.

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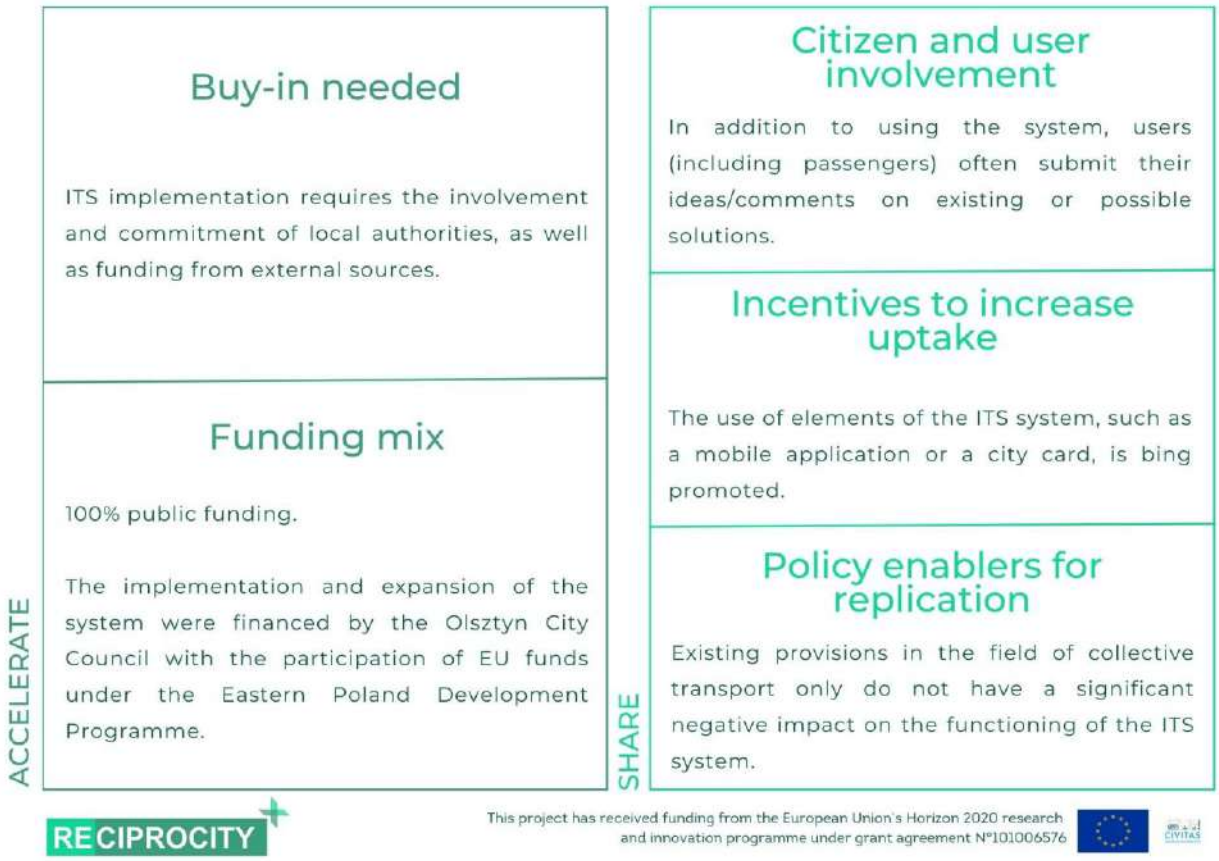
Buy-in needed
ITS implementation requires the involvement and commitment of local authorities, as well as funding from external sources.
Funding mix
100% public funding.
The implementation and expansion of the system were financed by the Olsztyn City Council with the participation of EU funds under the Eastern Poland Development Programme.
ACCELERATE
Citizen and user involvement
In addition to using the system, users (including passengers) often submit their ideas/comments on existing or possible solutions.
Incentives to increase uptake
The use of elements of the ITS system, such as a mobile application or a city card, is bing promoted.
Policy enablers for replication
Existing provisions in the field of collective transport only do not have a significant negative impact on the functioning of the ITS system.
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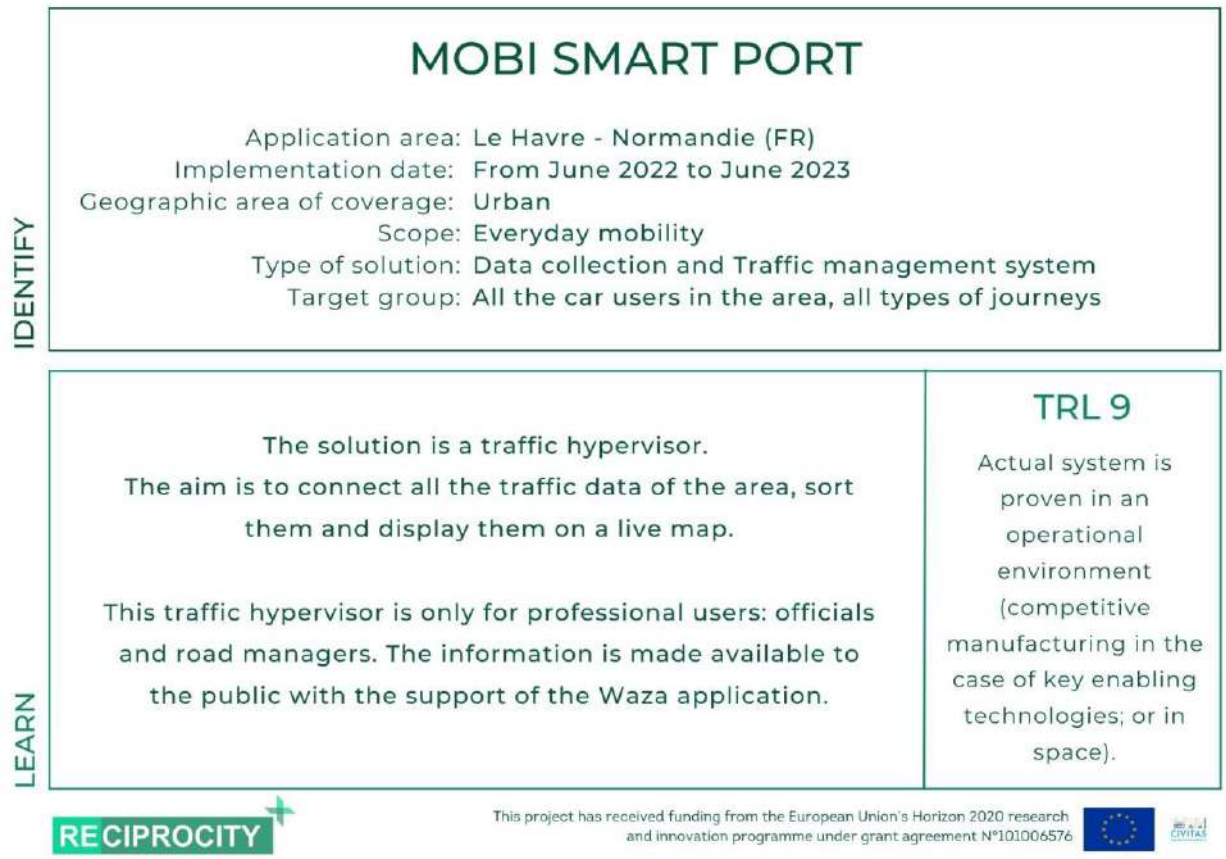
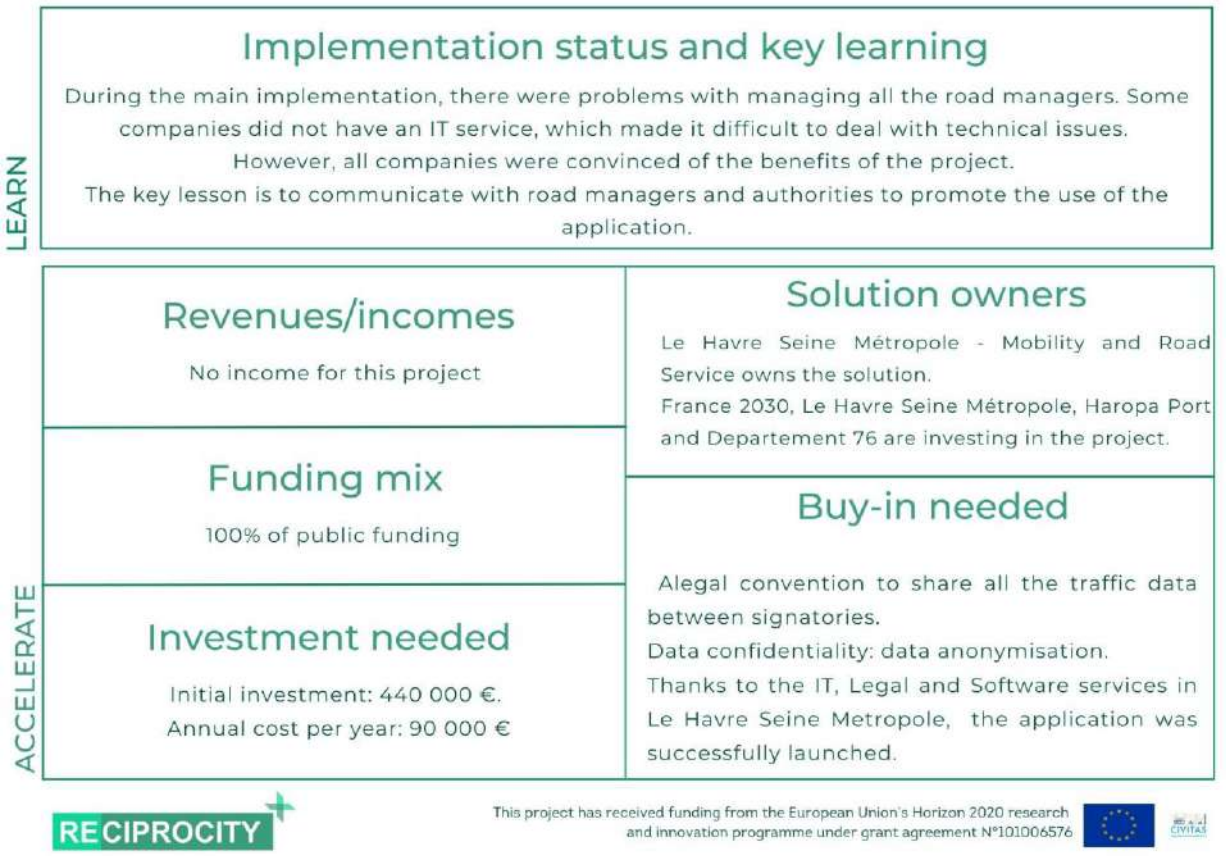
6.1.7. MOBI SMART PORT (LE HAVRE, FR)





SHARE

Citizen and user involvement

Citizens are involved by sharing data with the Waze company. An agreement has been made with this company to share data on the map, thanks to which users receive information on the best routes.

Incentives to increase uptake

Many meetings, demonstrations and training sessions.

Tips for replication

Anonymise data and be careful with security data: Fire, Security and Ambulance Service (SAMU).

Sort data.

Work with all the services involved.

Explain the main benefits to citizens.

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7. Other solutions

In addition to the previously described mobility solutions, there are a number of other innovative approaches being explored for improving urban mobility. These solutions often involve the use of emerging technologies and new business models to provide transportation services in novel ways. While many of these solutions are still in the early stages of development, they hold great promise for transforming the way that people move through cities. In this section, we will explore some of these other solutions.

Passenger and logistic dronesAir taxis and drones are emerging forms of transportation that are being developed to offer faster and more flexible mobility options in urban areas. Air taxis are small, electric-powered aircraft designed to carry passengers short distances within urban areas. They typically have vertical take-off and landing capabilities, allowing them to take off and land in tight spaces such as parking lots or rooftops.

Drones, on the other hand, are unmanned aerial vehicles (UAVs) that can be used for a variety of purposes, including delivery of goods and surveillance. They are also being explored as a potential mode of passenger transportation, particularly for short trips within cities.

Both air taxis and drones have the potential to significantly reduce travel times and ease congestion in urban areas. They can also offer increased flexibility and accessibility, particularly in areas with limited road infrastructure. For example, air taxis could offer a fast and convenient way to travel between downtown areas and airports, while drones could be used to deliver goods and services to remote or hard-to-reach areas.

However, there are also a number of challenges associated with the development and implementation of air taxis and drones. These include issues related to safety, privacy, and noise pollution. In addition, the infrastructure required to support these technologies is still in the early stages of development, and there are significant regulatory and legal challenges to be addressed before these solutions can be widely adopted.

Overall, air taxis and drones represent exciting new frontiers in the field of urban mobility. While there are still many hurdles to be overcome, these technologies have the potential to significantly transform the way that people move through cities in the coming years.

List of selected mobility cases:

- AIRTAXI FOR PASSENGERS (LINZ, AT)
- URBAN-AIR PORT (COVENTRY, UK)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

7.1.1. AIRTAXI FOR PASSENGERS (LINZ, AT)

IDENTIFY

AIRTAXI FOR PASSENGERS

Application area: Linz, Upper Austria (AT)
Implementation date: From 2019
Geographic area of coverage: Urban
Scope: Tourism and everyday mobility
Type of solution: Autonomous vehicle - Urban air mobility
Target group: Inhabitants of the city, tourists, workers and taxi users

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LEARN

AIRTAXI FOR PASSENGERS

The project's goal involving EHang, FACC and LINZ AG is to implement passenger flights as autonomous air taxis in Linz.
The drones will fly on predefined routes to/from designated locations, and passengers can choose where to enter and which stop they want to fly to.
Each drone will have space for two passengers.

Implementation status and key learning

Air taxis are ready for use and are already used in some countries. (e.g. in China).
The main barriers are the regulations and bureaucracy for testing the solution in Europe. Several workshops have been conducted to discuss, e.g. business models, public acceptance, ticketing, and safety regulations.
Linz AG and FACC are waiting for a permit to test the drones without passengers in a closed area.
After those tests, further planning and workshops can go on.

TRL 6

Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies).

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

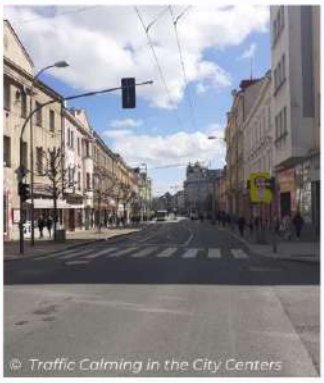
Implementation status and key learning

The **first phase** of the project has been implemented - traffic calming with the exclusion of private car traffic. Through traffic signs, only public transport, taxis and delivery vehicles are allowed to enter the street.

The **second phase** of the project will be the reconstruction/modification of the central part of Americká Street, which will transform the street into an urban boulevard, by widening sidewalks and urban greenery.

One of the driving forces behind the implementation of the project was the efforts of the **Pilsen City Council**, together with the professional public, to calm traffic on one of the main streets in the central part of Pilsen. Intensive individual car traffic was causing significant delays for buses and trolleybuses.

The **main obstacle** to implementation was the concern of political representatives about a significant increase in traffic on alternative routes. Restricting car traffic on Americká Street brought significant improvements to public transport in terms of regularity, punctuality and economy of operations. Alternative routes have absorbed vehicles from Americká Street. The intensity of traffic on these routes has decreased significantly over the past year.



© Traffic Calming in the City Centers

TRL 9

Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies or in space).

RECIPROCITY

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7.1.2. URBAN-AIR PORT (COVENTRY, UK)

IDENTIFY

URBAN-AIR PORT

Application area:	Coventry, West Midlands (UK)
Start date:	25/04/2022
End date for demonstrations:	15/05/2022
Geographic area of coverage:	Urban
Scope:	Commuter, logistics.
Type of solution:	Drones and E-VTOL, Electric Vehicles, Autonomous Vehicles, Data collection and Traffic Management systems, MaaS.
Target group:	Potential customers and users include transportation and logistics operators, event organisers, emergency response teams, freight companies, and individuals in need of transportation services.

WEBSITE: WWW.URBANAIRPORT.COM

RECIPROCITY

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LEARN

URBAN-AIR PORT

Urban Air Port is designing and developing the world's smallest airport, a 'pop-up' airport that could be deployed in urban areas to support transport and logistics operations associated with major events, incident response, or as a freight hub using autonomous drones for the onward distribution of medical supplies or parcels.

The partnership behind the project is interested in using Coventry as a base for a pilot project that can be used to showcase the concept and the supporting technology. This innovative programme is called Air-One.

TRL 6

Technology demonstrated in relevant environment.

RECIPROCITY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

LEARN

Implementation status and key learning

Implementation status: In April 2022, Urban-Air Port successfully launched Air One, a groundbreaking demonstration of its vertiport technology (drones and eVTOL). Over the next five years, the company has ambitious plans to establish more than 200 vertiports worldwide. These ultra-compact and rapidly deployable operational hubs will facilitate the efficient operation of both manned and unmanned vehicles, offering essential services such as aircraft command and control, charging/refueling facilities, and cargo and passenger loading capabilities.

Key learnings: By hosting the facility, Coventry City Council will benefit through the ability to link the project to City of Culture 2021 and the Transport Innovation Showcase, the opportunity to showcase the city and its vibrant transport technology industrial base, to potential inward investors, and to market the city as a place to do business.

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ACCELERATE

Investment needed

The funding for the project comes from the UK government's Future Flight Challenge and totals £1.2 million (about $1.6 million).

Solution owners

The Urban Air Port Air-One has been launched in partnership with Hyundai Motor Group, Coventry City Council, the UK Government, and the startup Urban Air Port.

Revenues/incomes

This was a demonstration project and no revenue / income was generated.

Buy-in needed

- Local authorities, developers, emergency services, Legal, Civil Aviation Authorities (CAA), Airport operators.
- Engaging with all to understand what was required to operate legally in an urban environment.

Key learnings to reduce the overall costs

This could be a shared resource with various organisations such as, emergency services , medical organisations, logistic operators, local authorities and commercial land surveyors.

Funding mix

Local authorities were 100% funded and all other partners had to have match-funded.

RECIPROCITY

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Citizen and user involvment

Consortium partner Coventry University carried out a public engagement work package which gave the project a kick start. Once the structure was open to the public for three weeks, we had over 15 000 visitors who left a positive feedback.

Policy enablers for replication

Current regulation and policies did restrict the full demonstrations as a site. The partners will need to work with CAA and policy makers to adhere to a safe operating model for the new mode of transport operating in an urban environment.

Public acceptance

Feedback from the open days was positive and the proposal and development was widely accepted.

Tips for replication

Engage with local authorities and all interested operators to minimise the number of airspace users. Support the development with end users and urban planners to integrate this development.

Incentives to increase uptake

- Attract potential customers, boost aviation and manufacturing sectors, creative jobs, advance environmental goals.
- Potential to establish a UK UAM Centre of Excellence, driving innovation, improving connectivity, productivity, and transforming cities.

Facts and figures

Current legislation in the UK states that the drones can only be flown whilst they are in Visual Line Of Sight (VLOS). We should work with all authorities like CAA and Airports to develop flights that can be developed for Beyond Visual Line Of Sight (BVLOS).

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Local Traffic Coordination: Cycling routes

The use of bikes in cities is becoming increasingly important as a means of sustainable transportation. Bikes are an environmentally friendly option that can help reduce traffic congestion, air pollution, and carbon emissions. They also offer a number of health benefits, including increased physical activity and improved cardiovascular fitness.

In addition to the environmental and health benefits, bikes are also a practical and cost-effective mode of transportation for many urban residents. They can be easily parked and are often faster than cars for short trips, particularly in busy urban areas where traffic can be slow-moving.

To encourage the use of bikes in cities, it is important to invest in bike infrastructure, such as dedicated bike lanes and secure parking facilities. Cities can also implement policies such as bike sharing systems and subsidies for bike purchases to encourage more people to use bikes as a means of transportation.

Overall, the use of bikes in cities offers numerous benefits for individuals, communities, and the environment. By promoting sustainable transportation options like biking, cities can reduce their carbon footprint and create more healthy, and connected communities.

Tramway and light rail

Tramways and light rail systems are popular modes of public transportation that provide efficient and sustainable mobility solutions for cities. They typically operate on dedicated tracks or lanes, allowing them to bypass traffic congestion and offer reliable and frequent service to passengers.

One of the main advantages of tramways and light rail systems is that they can carry a large number of passengers in a single trip, making them an efficient and cost-effective mode of transportation. They also have a low carbon footprint, as they are powered by electricity and produce fewer emissions than cars or buses.

To ensure the success of tramways and light rail systems, it is important to invest in high-quality infrastructure and technology, including modern vehicles, advanced signalling systems, and well-designed barrier free stations and platforms. It is also important to coordinate these systems with other modes of transportation, such as buses and bike-sharing systems, to provide passengers with seamless and integrated mobility solutions.

Overall, tramways and light rail systems offer a sustainable and efficient mobility solution for cities, providing reliable and accessible transportation options for residents and visitors alike.

Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) is a high-capacity, rapid transit system that provides fast, frequent, and reliable bus service on dedicated lanes or separate rights-of-way. BRT systems typically offer features such as pre-boarding fare collection, level boarding, and priority at intersections to ensure fast and efficient service for passengers.

One of the main advantages of BRT systems is that they can be implemented quickly and at a relatively low cost compared to other forms of rapid transit, such as light rail or subway systems. They can also be flexible, allowing for changes to routes and schedules as demand changes. Additionally, BRT systems can be integrated with other forms of transportation, such as bike-sharing systems or park-and-ride facilities, to provide seamless and sustainable mobility solutions.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

BRT systems can provide many benefits to cities and their residents. They can help reduce traffic congestion and air pollution, improve access to employment, education, and other opportunities, and support economic development. Additionally, BRT systems can improve mobility options for underserved communities and help address issues of social equity.

To ensure the success of BRT systems, it is important to invest in high-quality infrastructure and technology, such as modern buses, advanced signalling systems, and well-designed stations and platforms. It is also important to ensure that BRT systems are integrated with other modes of transportation and are accessible to all residents, including those with disabilities. Overall, BRT systems offer a sustainable and efficient mobility solution for cities, providing fast and reliable transportation options for passengers.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101006576

RECIPROCITY (Replication of innovative concepts for peri-urban, rural or inner-city mobility), coordinated by R-Tech Regensburg (Germany), involves 10 partners including clusters, regional development agencies, innovation accelerators and universities. The project started in February 2021 and will run for 32 months.

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