



SmartHubs

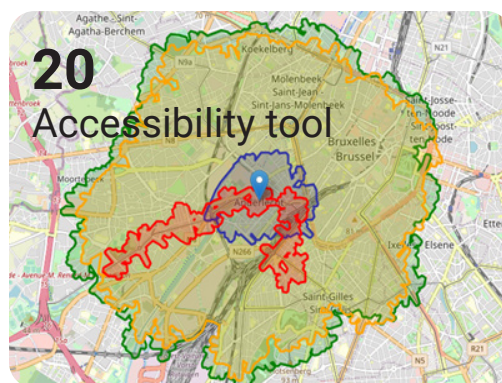
Making mobility hubs smarter

10 recommendations
for practitioners & policy makers



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Preface

Mobility hubs are currently a hot topic amongst policymakers and businesses, stimulated by the steep increase of shared mobility services across European cities. Many different forms of mobility hubs are being developed and implemented, ranging from small neighbourhood hubs to large railway stations. However, mobility hubs are still at an early stage of development, and there are many gaps in knowledge. What should a mobility hub look like? Can mobility hubs act as game changers towards the development of inclusive and sustainable urban mobility and accessibility in European cities? How can mobility hubs be created together with end-users, businesses and governments?

Over the past three years, the SmartHubs project team, comprising researchers, mobility organisations and stakeholders from six European countries, has dedicated itself to answer these questions. We have investigated the various dimensions of mobility hubs, with the goal of assessing if mobility hubs that really put their end-user first can act as game changers towards urban mobility and accessibility. Our research was conducted in living labs in Brussels in Belgium, Munich in Germany, Rotterdam and The Hague in the Netherlands, and Vienna in Austria. It involved almost 3000 residents in experiments, co-creation and co-appraisal sessions and a large scale survey.

In this report, you can read the most important findings and policy implications, derived from the 25+ deliverables we have published on smart mobility hubs. While these deliverables are a deep dive into the topic, using extensive quantitative and qualitative analyses, this final report summarises the three years of work into 10 policy recommendations. These recommendations touch upon the physical, democratic, and digital dimension of mobility hubs, and are relevant not only for public authorities, but also for public transport operators and mobility providers.

We invite you to delve into the recommendations outlined in this report. By prioritising user needs and integrating hubs on all three dimensions, smart mobility hubs have the potential to change urban transportation. Enjoy reading!

Prof. Dr. Karst Geurs

University of Twente
project leader



SmartHubs in short

Name

Smart Mobility Hubs as Game Changers in Transport

Duration

2021 - 2024

Objective

Assess if a co-designed, user-centric development can enable mobility hubs to act as a game changer towards inclusive sustainable urban mobility and accessibility.

Which tools did we develop?

Accessibility tool, Resilience tool, Co-design tool and Appraisal tool

What are we doing?

Examining mobility hubs, dedicated on-street locations where citizens can choose from different shared and sustainable mobility options.

SmartHubs in numbers

30+ partners

Core partners and Living Lab partners

156 hubs

On the SmartHubs Open Data Platform



4 living labs

Brussels
Munich
Rotterdam-The Hague
Vienna



5 symposia

Symposia, workshops and training days



2515 respondents

for the large-scale SmartHubs survey

4 new tools

Developed by our partners

40+ activities

Game sessions, interviews, experiments & many more!

The SmartHubs living labs

Brussels



Focus

Co-creation of a mobility hub in a neighbourhood with primarily vulnerable users.

Rotterdam-The Hague



Focus

Digital & physical integration of shared modes and public transport.

Munich



Focus

Adapting existing infrastructure to co-design a hub and promote the use of active & shared mobility.

Vienna



Focus

Designing a citywide mobility hub network through co-creation processes.

The 10 SmartHubs Recommendations

Making mobility hubs smarter

1. Mobility hubs need to become smarter to be a game changer for urban transport

The integration ladder can be used as a framework to create smarter mobility hubs.

2. The implementation of mobility hubs should be integrated in the local SUMP

Integrating mobility hubs into the local SUMP facilitates the development of inclusive, democratic and effective solutions. This process can be supported by the findings of the SmartHubs project, as well as the tools.



Physical Integration

3. Selection of the appropriate location for mobility hubs is crucial for promoting physical integration

The location and services offered by mobility hubs must be based on their specific purpose and goals.

4. Carefully consider placemaking as part of hub design

Identify positive and negative effects for different mobility hub users and local residents.

5. Inclusive mobility hubs consider the specific needs of vulnerable to exclusion groups

People with physical impairments and low digital skills rarely use shared mobility services because the services are not adapted to their needs.



Activities around the hub can enable trip chaining connected to the hub: stop by the bakery, then take a shared car."

- Expert on location of hubs

Democratic Integration

6. A good participation process has a clear goal, is transparent and allows active debate

Organisers of participation processes communicate the context, structure and scope of the process and actively include different groups of people.

7. Use participatory assessment methods to increase the quality of decision-making processes

A participatory assessment process involves different stakeholders and collects their preferences in a structured and transparent manner.

8. Co-design enables the design of inclusive, context-sensitive mobility hubs

Co-design processes and tools facilitate making decisions that meet the needs of all stakeholders, including vulnerable people.



Co-creation event in Anderlecht, Brussels

Digital Integration

9. Provide training and assistance for citizens with limited digital mobility skills

Initiate training sessions and assistance for citizens with limited digital skills to increase their access to app-based mobility services and reduce the digital gap.

10. User-friendly interfaces contribute to inclusivity and usage of mobility hubs

Digital interfaces need to be simple and intuitive to be useable by everyone.



The digital kiosk is a good addition, since you do not need to rely on your mobility phone and internet connection."

- Citizen of Rotterdam

Mobility hubs need to become smarter to be a game changer for urban transport

The integration ladder can be used as a framework to create smarter mobility hubs



Mobility hubs are available in all sorts and sizes, and more of them are emerging across cities worldwide. A shared mobility hub is defined as a physical location where different shared transport options are offered at a dedicated and recognisable location, with public transport available within walking distance. Within the current development of these hubs, there is an emphasis on the physical characteristics of the hub. However, mobility hubs must be integrated in three dimensions: physical, digital and democratic.

Physical integration

Potential users of mobility hubs are interested in (and willing to pay for) a seamless connection between public transport and shared modes, without having to figure out where the other mode is located first. But a hub is more than the mobility services that is offered. Integration with other services, such as a bike repair shop or a small restaurant, and placemaking elements can improve the user experience at the hub.

Democratic integration

Hubs that are co-created by its (potential) users have a higher chance of succeeding. Therefore, public

authorities must involve local stakeholders in their participatory processes when expanding their network of hubs. Co-designed mobility hubs are a better fit to the needs of (vulnerable) user groups, as well as to the preferences of providers.

Digital integration

Shared modes are primarily offered using single digital applications. The integration of information, planning, booking and payment could increase the uptake of shared mobility hubs. However, providers and public authorities should keep in mind that digitalisation is not for everyone: for people with low digital skills, key information must remain available in an analogue format as well.

The three dimensions together form the SmartHubs integration ladder. Each dimension has five levels, ranging from no integration (level 0) to full integration (level 4). The higher a hub scores on the ladder, the more impact a mobility hub has on urban mobility, accessibility and inclusivity. Our Open Data Platform of hubs in Europe shows that hubs definitely need to become smarter!

The SmartHubs Integration Ladder A multidimensional mobility hub typology

	Physical Integration	Digital Integration	Democratic Integration	
Smart mobility hub	4	Conflict free & place making	Integration of societal goals and policies & considerations of universal design principals	Social learning
	3	Visibility & branding	Integration of services offers & considerations of universal design principals	Integration of different knowledge
	2	Wayfinding & considerations of universal design principals	Integration of booking and payment & considerations of universal design principals	Deliberative engagement of stakeholders, including (vulnerable) user groups
Mobility hub	1	Acceptable walking distance to shared and public transport & minimum inclusive design standards	Digital integration of information	Appropriate representation of stakeholder interests, no or limited attention for vulnerable user groups
Single mobility services	0	No physical integration	No digital integration	No stakeholder involvement & consideration of (vulnerable) user needs

The higher a hub scores on the ladder, the higher the impact of the hub.



Mobility hub Bruno-Marek-Allee in Vienna, shows the potential of becoming a smarter mobility hub. Find out more [here](#).

Want to read more on this topic?

- A multidimensional mobility hub typology: [Deliverable D2.1](#)
- The SmartHubs integration ladder: [An English Summary](#)

Recommendation 2

The implementation of mobility hubs should be integrated in the local SUMP

Integrating mobility hubs into the local Sustainable Urban Mobility Plan facilitates the development of inclusive, democratic and effective solutions

A Sustainable Urban Mobility Plan (SUMP) is a strategic plan aiming to satisfy the mobility needs of people and businesses in cities. A SUMP is structured into four specific phases in which the implementation of mobility hubs must be considered:

The **'Preparation and Analysis'** stage sets the groundwork for the implementation of mobility hubs by understanding the context, the available resources, as well as the main problems and opportunities.

The **'Strategy Development'** defines the strategy with stakeholders such as public authorities, transport operators, shared mobility providers and citizens.

The **'Measure Planning'** stage moves from the strategic to the operational level. The implementation of the plan is prepared at this stage, and KPIs for mobility hubs are selected according to the local context and the strategy.

The **'Implementation and Monitoring'** stage focuses on

implementing the measures and monitoring the outcome to assess the results and ensure learning.

The results of the SmartHubs project are relevant to inform these four stages and ensure the inclusive design of mobility hubs, their democratic governance, as well as to improve the accessibility of the (digital) transport systems in which they are implemented. In this regard, the four [SmartHubs tools](#) are relevant to support the development of SUMPs at different stages. [Deliverable D6.2](#) discusses how all SmartHubs tools and deliverables contribute to the different SUMP stages.

Governmental implications

A SUMP moves the traditional focus of transport planning policies from traffic to people's accessibility and quality of life, emphasizing sustainability across transport modes. The planning process adopts a participatory approach, involving stakeholders and fostering interdisciplinarity, while enhancing transparency through systematic impact assessment.

The SUMP Cycle The 12 Steps of Sustainable Urban Mobility Planning



The SUMP cycle, 2nd edition ¹

© Rupprecht Consult 2019



More than 1000 SUMPs were implemented in Europe by 2018!² A good example is [The Good Move Plan](#) from the Brussels region.³

Want to read more on this topic?

- Integrating mobility hubs in SUMP: [Deliverable D6.2](#)
- Training to use the SmartHubs Tools: [Deliverable D6.3](#)



Physical Integration

Where? Which services? For whom?

Recommendations

3. Selection of the appropriate location for mobility hubs is crucial for promoting physical integration
4. Placemaking should be part of hub design
5. Inclusive mobility hubs consider the specific needs of vulnerable to exclusion groups

Recommendation 3

Selection of the appropriate location for mobility hubs is crucial for promoting physical integration

The location and services offered by mobility hubs must be based on their specific purpose and goals

For the optimal strategic location of hubs, there must be an alignment with key objectives. These objectives include a) complementing public transport, b) improving last-mile public transport connections and resilience, and c) promoting accessible and sustainable forms of mobility. We developed a multi-stage approach to identify suitable locations for mobility hubs systematically. The process starts at the macro level (e.g., neighbourhoods, districts) and subsequently delves into the micro level (e.g., street level)

Macro level

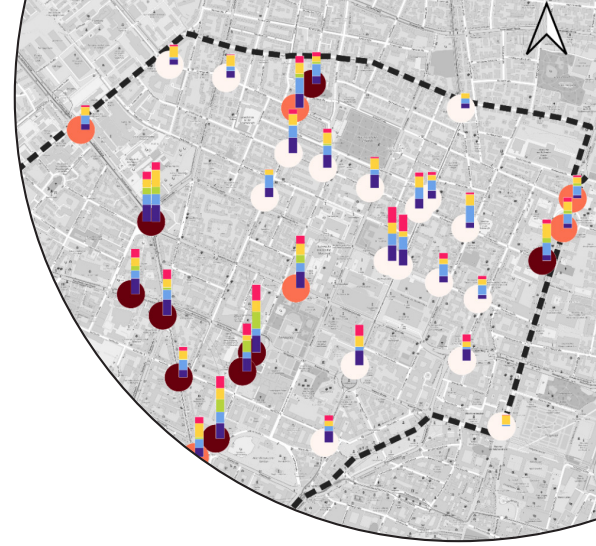
An overall assessment derived from key spatial factors and weighted criteria defined by stakeholders is the first step in ranking potential hub locations. For instance, if the objective is to complement public transport, all areas with low proximity to public transport are selected. When the objective of the mobility hub is to improve public transport connectivity and resilience, with shared modes used as first and last-mile options, the assessment must prioritise areas with high population density and availability of amenities, as these are linked to high usage of shared modes. For sustainability-oriented objectives, the location of hubs must also consider environmental and social factors.

Micro level

At this level, the ranking of locations depends on the hub's desired functionality and level of physical integration. Mobility hubs have different functions, such as neighbourhood hubs, city centre hubs, and suburban hubs. Physical integration involves factors such as acceptable walking distance between shared modes and public transport stops, availability of signage and information, branding and visibility, to resolve potential conflicts between different mobility options.

Governmental implications

When identifying potential locations, it is important to involve citizens or groups of interest in the decision-making process as their input helps weigh the spatial factors in the macro-level assessment. In addition, the selection of a mobility hub location should also consider the availability of vacant land and avoid conflicts with other land use purposes and existing infrastructure, such as electricity, water, retail, and parking lots.



Did you know?



The acceptable walking distance between mobility opportunities for users is usually between **250-500 metres**, similar to 3-5 minutes of walking time. [D3.1](#)

The most common factors to locate hubs are the **density of population and points of interest**. [D3.1](#)



The willingness-to-pay of potential users is **4.6 time higher** for physical integration of mobility services than for having MaaS-applications. [D5.5](#)

Want to read more on this topic?

- SmartHubs Accessibility Tool: [Available on our website](#)
- SmartHubs Resilience Tool: [Available on our website](#)
- Integrating hubs in urban space guidelines: [Deliverable D3.1](#)
- Accessibility tool and assessment: [Deliverable D5.2](#)
- Resilience and vulnerability assessment: [Deliverable D5.4](#)

Best practice Finding hub locations in Munich

In this case study, the **Maxvorstadt district** was selected at a **macro level** due to its high demand factors, including population density and the high availability of amenities.

Within this district, **38** existing, non-branded hubs were identified that had varying values and levels of integration, particularly in terms of public transport connectivity.

For the **micro level**, the selection of the location of a pilot mobility hub was based on its proximity to the university and the existing public transport network. [D3.1](#)

Carefully consider placemaking as part of hub design

Identify positive and negative effects for different mobility hub users and local residents



In order to make mobility hubs thrive, be accepted and supported by the community and promote their use, it is essential to consider people's needs. This can be done through a co-creation process in order to design a place in which people identify themselves with. Integrating the diverse opinions of the community will help to shape a vision for a place, and that can later be translated into a plan to be implemented.

More than transportation!

A mobility hub is not only a transport connection point, but can also serve diverse purposes, such as a place to sit and take a break, a space that increases the greenery on the street and a reference meeting point for the community. Placemaking strategies are on Level 3 of the Physical Integration Ladder, contributing to the attractiveness of the hub. This can be translated in a Mobility Hub, by not just incorporating mobility options (parking and offering connection to different mobility services), but also co-creating this space together with the final users and thinking about it as a public space that offers benches, greenery, shops, services, etc. An attractive hub may have a positive effect in increasing the ridership of public transport (and shared modes) but could also bring externalities and nuisance if people start using the benches as places to stay.^{D4.5} When it comes to willingness-to-pay for mobility hub elements, our survey results indicate that respondents prioritise having multiple options of shared modes within walking

distance to public transport stops, making placemaking strategies “good to have” but not “need to have” elements of shared mobility hubs.^{D5.5}

Beyond mobility, hubs have the potential to cultivate a sense of community and contribute to a more liveable environment. Mobility hubs can serve purposes beyond just parking vehicles. Public acceptance of using the space for mobility hubs tends to be higher when various other activities are accommodated, such as sitting areas, urban gardening, cafés, kiosks, etc. Factors like a sense of safety, a “cosy design,” cleanliness, and barrier free accessibility further enhance acceptance.

“ A hub should have a cool appearance and a good design, so that citizens feel attracted!”

- Expert interview

Governmental implications

Services that are offered at a hub should depend on potential users, local offer of current services and private partners that are willing to work together in the hub's development. Additional elements in the hub should be flexible: aligning with temporal needs (events) and helping the uptake. Ensure long-time responsibility for these placemaking elements, such as snow cleaning.

Best practice The Munich mobility hub parklet

Using a co-design approach, the elements required to set up a mobility hub were identified in an experimental parklet in Munich, near the university. The parklet already had bicycle parking, a seating area, an urban garden, and a café area. There were also additional services beyond mobility such as plants, lighting, decorative items, a shelf for books and objects people wanted to give away.

To transform the parklet into a mobility hub, the following elements were incorporated: a bicycle repair station, an e-scooter station, signposts, and information components, also aimed at wheelchair users.^{D4.5}



The mobility hub parklet in Munich, with both mobility and placemaking elements.

Want to read more on this topic?

- Needs of vulnerable users: [Deliverable D3.2](#)
- Equity assessment: [Deliverable D5.3](#)
- Integration of public transport and hubs: [Deliverable D5.5](#)

Inclusive mobility hubs consider the specific needs of vulnerable to exclusion groups

People with physical impairments and low digital skills rarely use shared mobility services because the services are not adapted to their needs



When planning mobility hubs, it is crucial to consider the needs of various vulnerable groups. These groups may include children, teenagers, women, older people, socially isolated citizens, migrants, ethnic minorities, informal care givers, people with cognitive, physical or sensory impairments and peri urbans and rural citizens. It is important to note that these groups are heterogeneous, and solutions to address their mobility challenges may not be universally applicable. To ensure that mobility hubs are inclusive, the design of the spaces and the vehicles must be thoroughly considered, their availability and reliability should be granted, and their use should be made possible without requiring a personal digital device. Furthermore, the pricing and ticketing, as well as the provision of necessary information should also be tailored to the diverse needs of individuals.

Mobility chameleons

The analysis uncovers that the typical shared mobility users are so-called “mobility chameleons” that alternate and combine various shared, private and public transport modes to satisfy their travel needs.^{D5.1} Contrary to this group, other population groups currently face barriers in using mobility hubs and their shared mobility services. High usage cost, lack of information or assistance, and strong dependence on private mobility discourage

Inclusive hubs Needs of digitally excluded citizens

Digitally excluded citizens are less frequent users of public transport and shared modes, due to the specific barriers they face.^{D5.3} This often goes hand in hand with other barriers regarding a lack of financial resources or not having an internet connection at home.^{D3.2}

When planning mobility hubs, care should be taken to improve the accessibility of these services and modes, focusing on both physical as well as digital accessibility. Digitally excluded citizens rely on analogue information, printed maps and information screens, to be able to travel autonomously.

individuals from embracing shared mobility systems. Children and teenagers seem to be more equipped to overcome some of the existing barriers, such as the more advanced digital skills requirements, and have greater interest in shared mobility.

Governmental implications

To increase the usage of mobility hubs and shared mobility by vulnerable groups, governments and mobility service providers need to accommodate their current and future needs. This will contribute towards an inclusive and sustainable mobility transition.

For example, for people with physical impairments or low digital skills, mobility hubs need to be adapted, which incurs extra investments. Policy regulations, such as those used to improve public transport accessibility for people with disabilities, can be extended to mobility hub policies.^{Accessible EU} Governments can also take a financial supporting role by subsidising low-income groups or an educational supporting role by offering training sessions and guidance on the use of mobility hubs.

Did you know?



Likelihood to travel via a mobility hub is:^{D5.3}

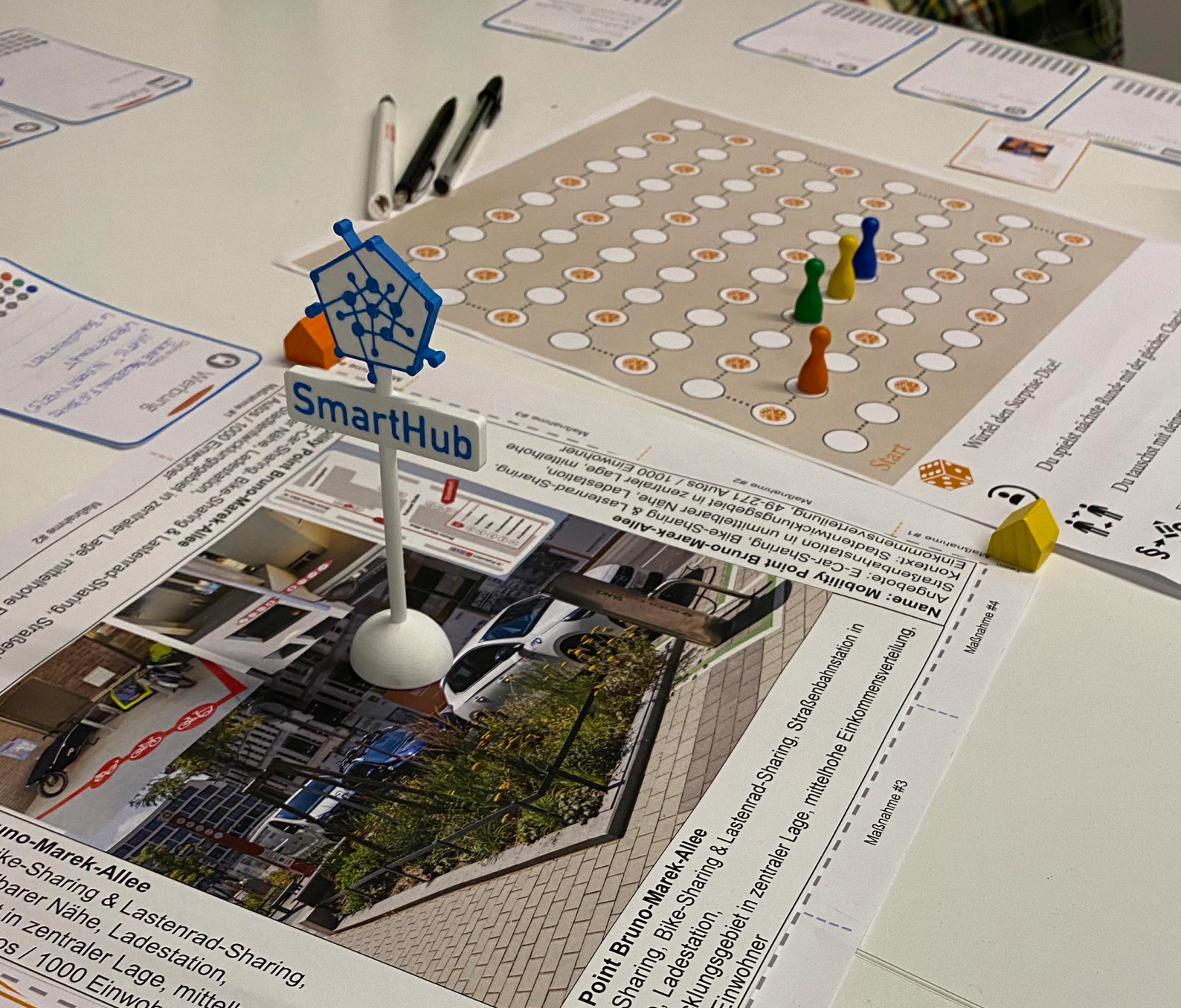
- 1.76 times **less** likely for **females**
- 1.71 times **more** likely for people with a **high income**
- 1.73 times **less** likely for people with **low digital skills**

The effect of digital exclusion:^{D5.3}

- Share of **non-users of trains**: 40% from the digitally unskilled and only 14% of the digitally skilled.
- Share of **bike-use**: 21% from the digitally unskilled and 41% from the digitally skilled.
- Use of private car and taxi also significantly less frequent for digitally unskilled.

Want to read more on this topic?

- Needs of vulnerable users: [Deliverable D3.2](#)
- Impact of mobility hubs on travel behaviour: [Deliverable D5.1](#)
- Equity assessment: [Deliverable D5.3](#)



Democratic Integration

Participation, appraisal & co-design of mobility hubs

Recommendations

6. A good participation process has a clear goal, is transparent and allows active debate
7. Use participatory assessment methods to increase the quality of decision-making processes
8. Co-creation enables the design of inclusive, context-sensitive mobility hubs

Recommendation 6

A good participation process has a clear goal, is transparent and allows active debate

Organisers of participation processes communicate the context, structure and scope of the process and actively include different groups of people

Participation processes have various forms which equally deliver positive governance implications. Therefore, organisers face both the opportunity and challenge to create individual and context-specific formats. However, there are several learnings from the SmartHubs participation processes that impact the democratic integration: [D6.1](#)

1. Include participation in each planning process, from the very beginning.
2. Create a clear participation structure and formulate clear tasks and goals.
3. Ensure inclusion of feedback loops and transparent communication.
4. Enable stakeholders to not only inform about or (dis)agree with advanced proposals, but include people in defining the problem, finding possible solutions and allowing open discussions.
5. Employ co-creation tools (such as a serious game, see p.20) as a relaxed and engaging way to start a discussion.

Best practices Involving everyone!

Open invitations do not necessarily result in 'everyone' participating. The **place** (distance, accessible with public transport, barrier free, etc.), **time** (workday, daytime, etc.) and **availability of childcare** has a crucial influence on the openness of an event.

Also, to include specific (vulnerable to exclusion) groups, locations are chosen that people visit **regularly**.

Therefore, researchers from SmartHubs project organised meetings at **local community centres, libraries**, or at the premises of **cultural and religious associations**. Furthermore, they hosted **on-street events** in highly visible locations, such as a central square.



6. Moderators will promote citizens to focus on the scope of the process, structure discussions and document important arguments. Moderators should be external, neutral and, if needed, multilingual.
7. Create a safe environment for everyone with organisers formulating a 'code of conduct' and ensuring compliance.
8. Express gratitude for participants who give up their time to give input and treat them as what they are: local experts of their everyday life and mobility.

Governmental implications

A good participation process can support a more inclusive hub design, a successful implementation and more regularly used mobility hubs. It can raise the quality, acceptance and legitimacy of political decisions. Also, participation can empower citizens, especially vulnerable to exclusion groups. However, meaningful participation is time- and resource-intensive which must be considered from the beginning.

Did you know?

14%

Only 14% of the SmartHubs survey respondents have participated in a participation event before. [D5.3](#)

However, there is a lot of potential: 66% is willing to take part in future participation. [D5.3](#)

66%

Want to read more on this topic?

- Participatory governance: [Deliverable D6.1](#)
- Governance frameworks for mobility hubs: [Deliverable D2.3](#)
- Living Lab Eastern Austria: [Deliverable D4.2](#)
- Living Lab Brussels: [Deliverable D4.3](#)
- Living Lab Rotterdam - The Hague: [Deliverable D4.4](#)
- Living Lab Munich: [Deliverable D4.5](#)
- Integration of hubs in SUMP: [Deliverable D6.2](#)



Use participatory assessment methods to increase the quality of decision-making processes

A participatory assessment process involves different stakeholders and collects their preferences in a structured and transparent manner

Participatory assessment methods, like the [SmartHubs Appraisal Tool](#), aim to facilitate the co-design process of a smart mobility hub, allowing stakeholders to identify the most preferred option among a range of alternatives. The tool enables obtaining the criteria that are relevant to all stakeholders as well as the criteria relevance and assesses to what extent each option meets each criteria.

“ The SmartHubs Appraisal Tool offers a clear structure, encouraging participants to reflect on their objectives while showing direct relationship between criteria, evaluation, and results.”

- Facilitator that applied the tool in Vienna

Improving the quality of decision-making

Participatory assessment methods are key for enhancing decision-making quality. In this context, stakeholders are experts from different institutions (e.g., public transport, public administration) and citizens. To complete the assessment process, a minimum of two meetings with

stakeholders are recommended: (1) to identify and weight the criteria of stakeholders, and (2) to discuss the results of the assessment tool. [D3.5](#)

Reaching a consensus

The outcome of the tool supports the opinion-forming process of each stakeholder group and can also lead to changes in evaluation regarding different alternatives, as well as better understanding of the evaluation of other stakeholder groups. Thus, the tool can facilitate reaching a consensus among the different stakeholders concerning possible solutions or designs of mobility hubs.

Governmental implications

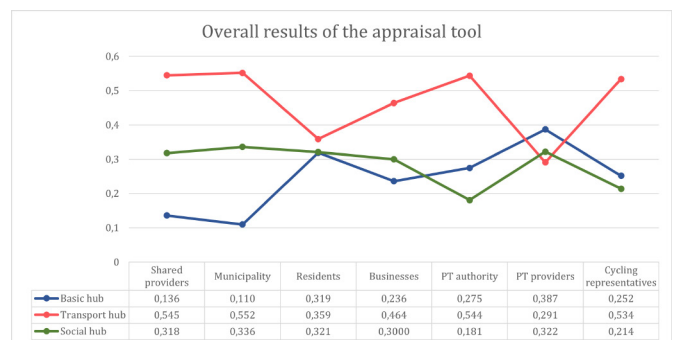
Participatory assessment improves decision-making processes in terms of structure and transparency. It offers a tool to define relevant criteria and weight arguments of different stakeholders accordingly. However, it raises concerns regarding resource limitations and managing expectations. Careful planning, clear communication and adequate facilitation are crucial to ensure successful implementation.

Applying the tool What to expect?

Experiences with the SmartHubs appraisal tool show that **collaborative workshops** are the most relevant method to apply participatory assessment.

It requires involving a **facilitator** that can apply the tool and adequately support the participants. Including residents, public authorities, and service providers ensures that decisions are inclusive, sustainable, and meet relevant community needs.

The results show that safety, service availability, visibility, reliability, accessibility, signage, inclusive design, pricing, and alignment with local needs are **crucial criteria**. [D5.7](#)



The figure shows the results of performing the SmartHubs Appraisal Tool in the Living Lab of The Hague, the Netherlands. A multi-actor multi-criteria analysis (MAMCA) was used, which is part of the Appraisal tool. It involved seven stakeholder groups in the appraisal of three mobility hub alternatives, based on weighted criteria per stakeholder group.

Want to read more on this topic?

- The SmartHubs Appraisal Tool: [Available on our website](#)
- Explanation of the tool: [Deliverable D3.5](#)
- Application of the tool in the Living Labs: [Deliverable D5.7](#)

Recommendation 8

Co-creation enables the design of inclusive, context-sensitive mobility hubs

Co-design processes and tools facilitate making decisions that meet the needs of all stakeholders, including vulnerable people



Co-design integrates the ideas, needs of stakeholders, and enables the design of inclusive mobility hubs. For this, the format must be context-specific and sensitive to actively include vulnerable to exclusion groups. It is key to choose adequate locations and timings. Also, short and simple activities with clear explanations as well as visualisations can support better understanding. Public social events raise awareness and can attract more participants. Additionally, small incentives, such as drinks, food or other activities can facilitate the recruitment.

Go co-design!

Co-design tools, like the serious games used in the SmartHubs project, empower participants to directly influence the development of mobility hubs. These tools foster a collaborative design process where stakeholders creatively brainstorm solutions tailored to the specific needs of local communities. Co-design tools provide a structured yet playful way to express ideas, consider diverse perspectives, and address the unique challenges

faced by vulnerable groups. While it is important to manage expectations about what can be implemented, these tools offer valuable insights. Their adaptability makes them a scalable solution for refining mobility hubs or other project in public space across locations and contexts.

“ It doesn't have to be the best, greatest co-design game. It has to get people talking and discussing things!”

- Participant, The Hague

Governmental implications

Co-design processes and tools can increase acceptance and legitimacy of decision-making as well as the output quality. However, participation raises concerns about power imbalances, resource needs, and managing expectations. Careful planning and clear communication are essential to ensure meaningful participation from all and successful implementation.

Best practice The success of co-design in Brussels

In the Brussels living lab, a co-design process was developed during the 2022, with over **130 participants**.

Firstly, the needs and requirements of users concerning the implementation of a mobility hub were identified. Later, the stakeholders gave input and imagined solutions for the future mobility hub.

As a result, **four co-designed options** were obtained and visualised. Lastly, in the co-evaluation stage, stakeholders assessed the co-designed options and the process.



One of the four co-designed mobility hub visualisations in Brussels.⁴

Want to read more on this topic?

- The SmartHubs co-design tool: [Available on our website](#)
- Co-design Tool: [Deliverable D3.4](#)
- Application of the co-design tool: [Deliverable D5.6](#)
- Governance applications: [Deliverable D6.1](#)
- Living Lab Eastern Austria: [Deliverable D4.2](#)
- Living Lab Brussels: [Deliverable D4.3](#)
- Living Lab Rotterdam - The Hague: [Deliverable D4.4](#)
- Living Lab Munich: [Deliverable D4.5](#)



A successful and inclusive co-design process is **simple** and adapted to the **availability** and **location** of target participants.



Digital Integration

Making digital mobility solutions accessible to all

Recommendations

9. Provide training and assistance for citizens with limited digital mobility skills
10. User-friendly interfaces contribute to inclusivity & usage of mobility hubs

Provide training and assistance for citizens with limited digital mobility skills

Initiate training sessions and assistance for citizens with limited digital skills to increase their access to app-based mobility services and reduce the digital gap

Digitalisation is growing fast in the mobility industry. Public transport operators are increasingly prioritising digital alternatives for planning and booking trips while shared mobility operators offer their services mainly via smartphone applications. This strategy does not cater sufficiently well for the approximately 45% of Europeans who lack basic digital skills⁵. Concrete reasons for travellers being less inclined to use shared mobility and mobility hubs are not having a smartphone, data subscription or credit card; being unfamiliar with mobility apps; a distrust in digital payments; or a general fear for making mistakes. We observe in our [Open Data Platform](#) that only few mobility hubs provide support and assistance despite the fact that there is a considerable demand for training and assistance among digitally excluded citizens and other vulnerable groups.^{D3.2}

Training sessions

To reduce digital mobility inequalities, we recommend organising training sessions that focus on basic skills: installing apps, explaining how a digital information kiosk works, providing assistance with booking and payment, or searching for departure time or vehicle availability. By teaching how digital mobility solutions work and

providing on-site assistance, low digitally skilled citizens will have better access to the shared mobility market and mobility hub usage will increase. Key information such as network & neighbourhood maps and timetables should still remain available in an analogue format at hubs.

“ The first time I use a mobility hub, I would like to go with someone that can help me. Like that, after two or three times, I would get used to it and I could use it by myself. But I would not try it on my own.”

- Citizen with low digital mobility skills ^{D3.2}

Governance implications

Public authorities should take the lead in organising hands-on training sessions aimed at digitally excluded citizens or outsource this trainings via tendering. Training sessions can take place in the weeks following the opening of a hub or, when available, on market days. They need to be well communicated and sufficiently visible to ensure high attendance.



Did you know?



Higher age & lower educational level are highly correlated with **lower digital mobility skills**.^{D5.3}

People with low digital mobility skills have additional needs concerning **assistance & training**, and must have access to **non-digital alternatives** to book and pay a service.^{D3.2}



Want to read more on this topic?

- Needs of vulnerable users: [Deliverable D3.2](#)
- Digital integration & signage: [Deliverable D3.3](#)
- Impact of mobility hubs on travel behaviour: [Deliverable D5.1](#)
- Equity Assessment: [Deliverable D5.3](#)

Best practices Training Initiatives in Europe!

Various initiatives can be found across European cities: **Wiener Linien** (Vienna's public transport provider) is offering [free training sessions](#) for seniors to use their mobile application, the WienMobil app.

In **the Netherlands**, where [public transport-ambassadors](#) provide courses on how to use public transport. Yet, it mostly concerns initiatives geared towards public transport-usage.

An interesting case that combines training on public transport and shared mobility, is **Brussels**, where [mobility coaches](#) are available to provide information on the public transport and shared mobility offer, as well as to experience different modes.

User-friendly interfaces contribute to inclusivity & usage of mobility hubs

Digital interfaces need to be simple and intuitive to be useable by everyone



More than 70% of the population has never used mobility hubs. ^{D5.1} Given that this concept is new for most potential users, information regarding how mobility hubs work, and which services are on offer, is key to increase the uptake of mobility hubs. This is especially for vulnerable users, where providing information regarding the hubs and services is essential. ^{D3.2} Digital information kiosks (or webpages accessible via a QR-code) can be useful in this respect. Firstly, these kiosks increase the visibility of a hub because they serve as a recognisable beacon, and secondly, they integrate information from different providers into a single platform.

Using a digital information pillar

Tests with a digital information pillar in Brussels and Rotterdam show that 71% of participants would use digital information kiosks that provide essential information such as departure times of public transport or the shared mobility offer in the neighbourhood. There are no differences between respondents with high and low digital skills. However, we observed that people with low digital skills need more time to execute manipulations at the digital kiosk and are prone to making more mistakes. This might lead to frustration and decrease usage of these devices.

User-friendly interfaces

It is therefore essential to make interfaces as user-friendly as possible: make use of universally recognisable pictograms, simplified and reduced text, and provide information in multiple languages. This provides better information provision to all potential users, regardless of their education, digital skills or knowledge of local languages. Specifically for the visually impaired, allowing increasing font size and changing colour contrast are recommended features.

Governmental implications

When tendering for digital infrastructure, the authorities can stipulate that universal design principles or [INDIMO-guidelines](#) should be considered when developing digital interfaces. Also, it is advised to test interfaces with low digitally skilled users, which was noted during the digital kiosk experiment in Brussels and Rotterdam. ^{D3.3}

Experiment Digital Pillar in Anderlecht (Brussels)



Citizens testing the digital information pillar in Brussels (2022)

Did you know?



Real-time departure information was valued the most, 54% of the participants thought it was the best feature of the digital pillar. ^{D3.3}

The share of participants stating that a digital pillar would help them to use mobility services! ^{D3.3}

82%

Want to read more on this topic?

- Needs of vulnerable users: [Deliverable D3.2](#)
- Digital integration & signage: [Deliverable D3.3](#)
- Living Lab Brussels: [Deliverable D4.3](#)
- Living Lab Rotterdam-The Hague: [Deliverable D4.4](#)
- Equity Assessment: [Deliverable D5.3](#)

The SmartHubs Open Data Platform

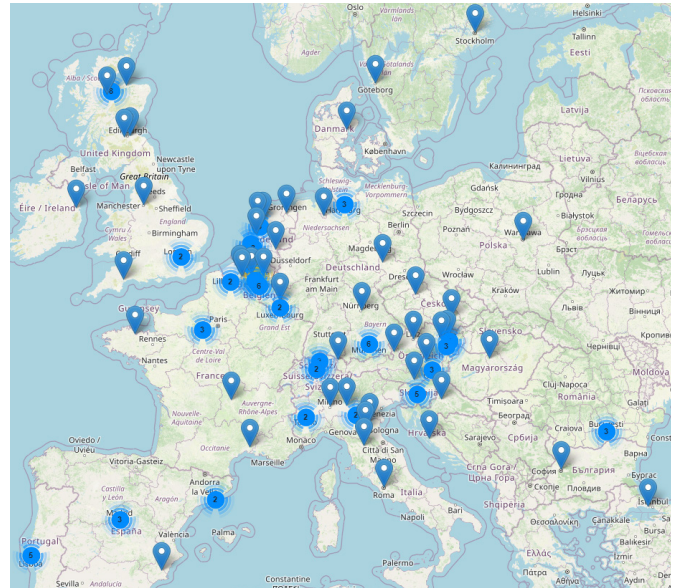
The SmartHubs [Open Data Platform](#) is the place to learn more about different mobility hubs in Europe and find best practices for all different types of mobility hubs, ranging from large, urban hubs to rural hubs.

The platform is an open data platform allowing planners and researchers to view, edit and compare mobility hub learning examples. Over 150 hubs from over 25 countries in Europe are described in the platform. The mobility hubs can be categorised in different ways, allowing a comparison of similar hubs and to generate overviews in regions. Moreover, all data can be downloaded for further analysis.

Several characteristics of each hub are described, including the:

- **Typology** (i.e. (inter)national hub, central urban hub, rural hub, suburban/urban fringe hub, urban neighborhood hub),
- **Mobility services** available at the hub (e.g., walking distance to car sharing, bike sharing and public transport),
- **Design characteristics** (e.g. if universal design standards are used),
- Availability of **digital apps** and information platforms
- **Participatory planning** approaches used in the development of the hub.

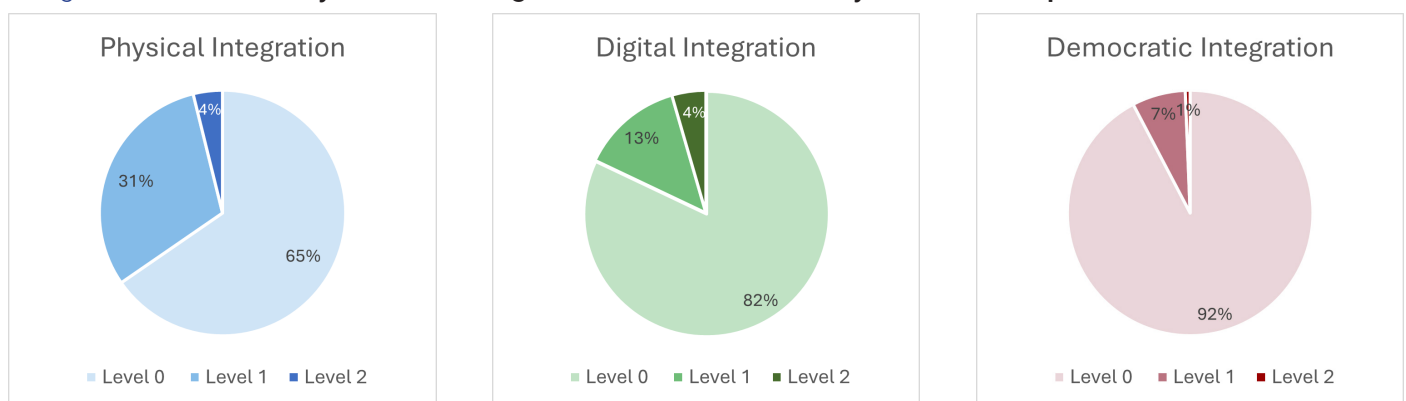
Open Data Platform 156 hubs in the database



Location of the ODP's mobility hubs in Europe.

Based on the information provided, the SmartHubs Integration levels (see [recommendation 1](#)) are determined. From the hubs made available in the open data platform, it can be seen that existing hub development in Europe has focused on physical integration and/or digital integration, and democratic integration (including citizen participation, reaching out to vulnerable user groups) is less common.

Integration of hubs Analysis of the integration level of the mobility hubs in the Open Data Platform



The 156 hubs in the Open Data Platform mostly focus on physical integration. None of the hubs score level 2 on all three dimensions, so the hubs in the ODP cannot be considered smart hubs yet. The "smartest" hubs are located in Vienna, and are part of the SmartHubs living lab.

Best practices

The Open Data Platform includes some best practices of mobility hubs, scoring high on one or more dimensions of the integration ladder. For example:

- **Physical integration:** [WienMobil Station Maria-Tusch](#)
- **Digital integration:** [Easymobil Griesfeld](#)
- **Democratic integration:** [Quartierhub Holstenstrasse](#)

Interested in analysing all hubs? Visit our [Data Export](#) page!

How smart is your mobility hub?

The SmartHubs Open Data Platform is the place to check how smart your hub is!

What you need? Information on the available services, visibility & branding, use of design standards, use of planner apps, and the participation process of the hub.

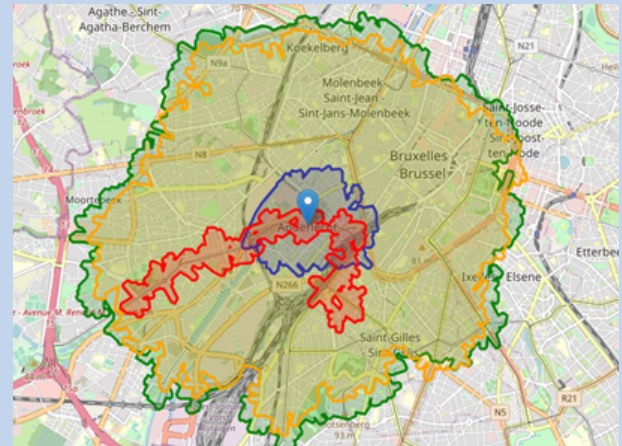
Submit your own hub at the [Open Data Platform submission](#) page.

Accessibility Tool

The SmartHubs Accessibility Tool is an **easy-to-use web tool** that lets users analyse the accessibility of mobility hubs. The tool relies on open data sources to automatically perform an accessibility analysis using different transport modes.

It can be easily applied anywhere in the world and requires three main inputs: transportation modes, amenities, and locations. If the user has access to GTFS data, a more detailed public transport analysis can be performed.

The tool presents results in the form of a map showing the areas accessible from the given locations and a summary table of the amenities that can be reached from each point. Users also have the opportunity to download the geospatial data and process it further.



An example of what the accessibility tool can do: analysing the accessibility with different modes in Brussels.

Interested in using the tool?

[Find the Accessibility Tool here](#)

What to read more on the application of the tool?

[Deliverable D5.2](#)

Co-design Tool



The augmented reality version of the SmartHubs co-design tool.

Interested in using the tool?

[Find the Co-design Tool here](#)

What to read more on the application of the tool?

[Deliverable D5.6](#)

Design Games provide a playful approach to generating design ideas. An actual game, including gaming material and specific rules, is designed to be played with potential users or other relevant stakeholders. The players need to explicitly articulate their perspectives on particular tasks throughout the play, providing designers with new insights and ideas.

Design games can be used to develop a shared understanding of complex problems. Usually, design games are realised as haptic games, such as a board game or a card game.

The SmartHubs co-design tool comprises a set of **gaming materials** and a **guiding handbook** to enable living labs to design tailored Design Games. A ready-to-use Design Game for re-structuring a public area by adding needed elements and discussing them among the players is also part of the co-creation tool. The gameplay of this game is supported by augmented reality layers, where players can explore the designed scene virtually.

design, appraise and assess your smart mobility hubs!

Resilience Tool

The SmartHubs Resilience Tool (SHRT) is designed to investigate the **impact** of mobility hubs on urban transport resilience. The tool comprises two main components:

Connectivity Component: This software, provided as R code, is capable of generating a public transport (PT) network, integrating it with sharing systems, calculating indicators based on network analysis, and modifying the network to simulate both PT disruptions and additions of mobility hubs near PT stops.

Accessibility Component: This software, provided as an interactive webpage, can rank areas based on an accessibility indicator, which is computed using a doubly constrained spatial interaction model.

Both components can be used to compute the variation of the related indicators following disruptions.

The combined use of these two components enhances our understanding of urban resilience. Here, urban resilience is defined as the degree of variation in connectivity and accessibility following disruptions to the PT network and/or additions of mobility hubs.



The full public transportation network of a city can be assessed with the resilience tool.

Interested in using the tool?

[Find the Resilience Tool here](#)

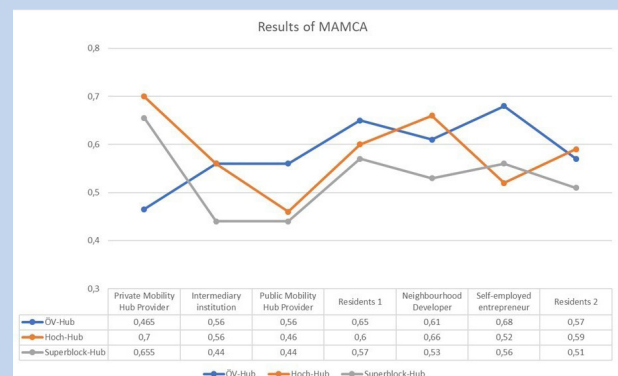
What to read more on the application of the tool?

[Deliverable D5.4](#)

Appraisal Tool

The SmartHubs Appraisal Tool supports the **decision-making** processes concerning the implementation of mobility hubs. The tool visualises the relevance of each option of a mobility hub for the stakeholders involved in the process, on the basis of stated criteria as well as their importance. The tool can also show the positive and the negative impacts of the different options.

Through the different steps of the tool, participants gain a better understanding of the **needs and preferences of other stakeholders**. The outcome of the tool supports the opinion-forming process of stakeholders, and it can facilitate reaching a consensus between the different stakeholders.



Results of the MAMCA - which is part of the SmartHubs Appraisal Tool - for different mobility hub options in Vienna. [D5.7](#)

Interested in using the tool?

[Find the Appraisal Tool here](#)

What to read more on the application of the tool?

[Deliverable D5.7](#)

The SmartHubs Core Partners



UNIVERSITY OF TWENTE.

The University of Twente *Transport Systems Cluster*, is located in Enschede (the Netherlands), and focuses on monitoring, analyses and optimisation of transport networks and travel behaviour. The UT is the SmartHubs project leader.

[Transport Systems Cluster \(UT\)](#)



Research group *Mobilise* from the Vrije Universiteit Brussels (Belgium) aims to accelerate the transition to a more sustainable and inclusive mobility and logistics system.

[Mobilise Research group \(VUB\)](#)



Technische Universität München

The Technical University of Munich's *Accessibility Planning* research group focuses on evaluation of impacts and processes based on empirical evidence by case-studies as well as accessibility analysis & spatial research.

[TUM Accessibility Planning](#)



The *Institute of Political Science* at the University of Münster (Germany) is characterised by internationally visible research in its three main profile areas Governance, Civil Society and Globalisation and Regionalisation.

[IfPol \(Uni MS\)](#)



The *Institute for Transport Studies* at the Universität für Bodenkultur is located in Vienna (Austria). Its focus on analysing and forecasting mobility, digitalisation and automation, environmental impacts of transport, active mobility, and more.

[BOKU Institute for Transport Studies](#)



The University of Bologna (Italy) is one of the most prestigious universities across Europe. The UNIBO team of the SmartHubs project belongs to the *Department of Economics*.

[UNIBO Department of Economics](#)



The *Center of Transportation System Planning* at the TU Wien (Vienna, Austria) is active in applied research, consulting, and teaching in the field of transportation, focusing on social and organisational innovations.

[TU Wien MOVE](#)



Research unit ACUR, *Artifact-based Computing & User Research*, at the TU Wien focuses on socio-technological aspects of design, empowerment of users, and innovative interactions to increase user experience in design.

[TU Wien ACUR](#)



Mpact is a Belgian non-profit organization, expert in shared and inclusive mobility with entities in Brussels, Wallonia and Flanders. Since 1975, it promotes and enables solutions for shared and sustainable mobility.

[Mpact](#)



The SmartHubs project is supported by the European Commission and funded under the Horizon 2020 ERA-NET Confund Scheme under grand agreement N.875022



Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie



Footnotes

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2. Durlin, T., Plevnik, A., Balant, M., & Mladenović, L. (2018). Status of SUMP in European member states. [link](#)
3. Brussels Mobility (2021). Good Move Plan. Gewestelijk Mobiliteitsplan 2020-2023. [link to summary document \(English\)](#)
4. The hub visualisations for the SmartHubs Living Lab in Anderlecht, Brussels are made by [Frame architects](#).
5. Eurostat (2021). How many citizens had basic digital skills in 2021? [link](#)
6. Picture from Maestromobile by Espaces-Mobilités. [Mobility Visit](#) in the context of the 'Mobility Manager' training in Brussels

Colophon

SmartHubs 2024

Smart mobility hubs as game changers in transport

Funding agencies

JPI Urban Europe (99950070)

NWO (Grant 438-21-431)

Innoviris (Grant EU UAC 2021 2A-2C)

BMK (Grant 884274)

BMBF (Grant 01UV2151A, 01UV2151B)

Project Core Partners

University of Twente (UT) - project leader, Vrije Universiteit Brussel (VUB), TU Munich (TUM), University of Münster (Uni MS), University of Natural Resources and Life Sciences (BOKU), University of Bologna (UNIBO), TU Wien - Transport System Planning (MOVE), TU Wien - Artifact-based Computing & User Research (ACUR), Mpac.

Living Lab Partners

MO.Point, Lojika Field Labs, Anderlecht Municipality, HTM Personenvervoer, RET, NS Stations, The Hague Municipality, Rotterdam Municipality, Metropolitan Region Rotterdam-The Hague (MRDH), CROW, Brussels Mobility, Federal Govt. of Lower Austria, ITS Vienna Region, Wien 3420 Aspern Development AG, aspern.mobil LAB, Mobility Lab Graz, Stadt-Umland-Management Wien-Niederösterreich, MVV, City of Munich, Istanbul Metropolitan Municipality.

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Pictures

Lluís Martínez (p.2, p.5, p.13, p.18), Karst Geurs (p.3, p.4 (game), p.15 (top)), Anna Grigolon (p.4 (symposium)), David Duran Rodas (p.9, p.10), VUB Mobilise & Frame (p.5 (top), p.6 (top), p.15 (bottom)), Rupprecht Consult (p.7 (bottom)), Christoph Kirchberger (p.12, p.14), Hilda Tellioglu (p.20), OpenStreetMap (p.9, p.19), Maestromobile by Espaces-Mobilités⁶ (p.16), Kelt Garritsen (p.18 (top)).

Picture front/back page: VUB Mobilise & Frame (2023)

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Version 1.0

 SmartHubs
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SmartHubs

Making mobility hubs smarter

10 recommendations
for practitioners & policy makers