Improving the convenience of public transport
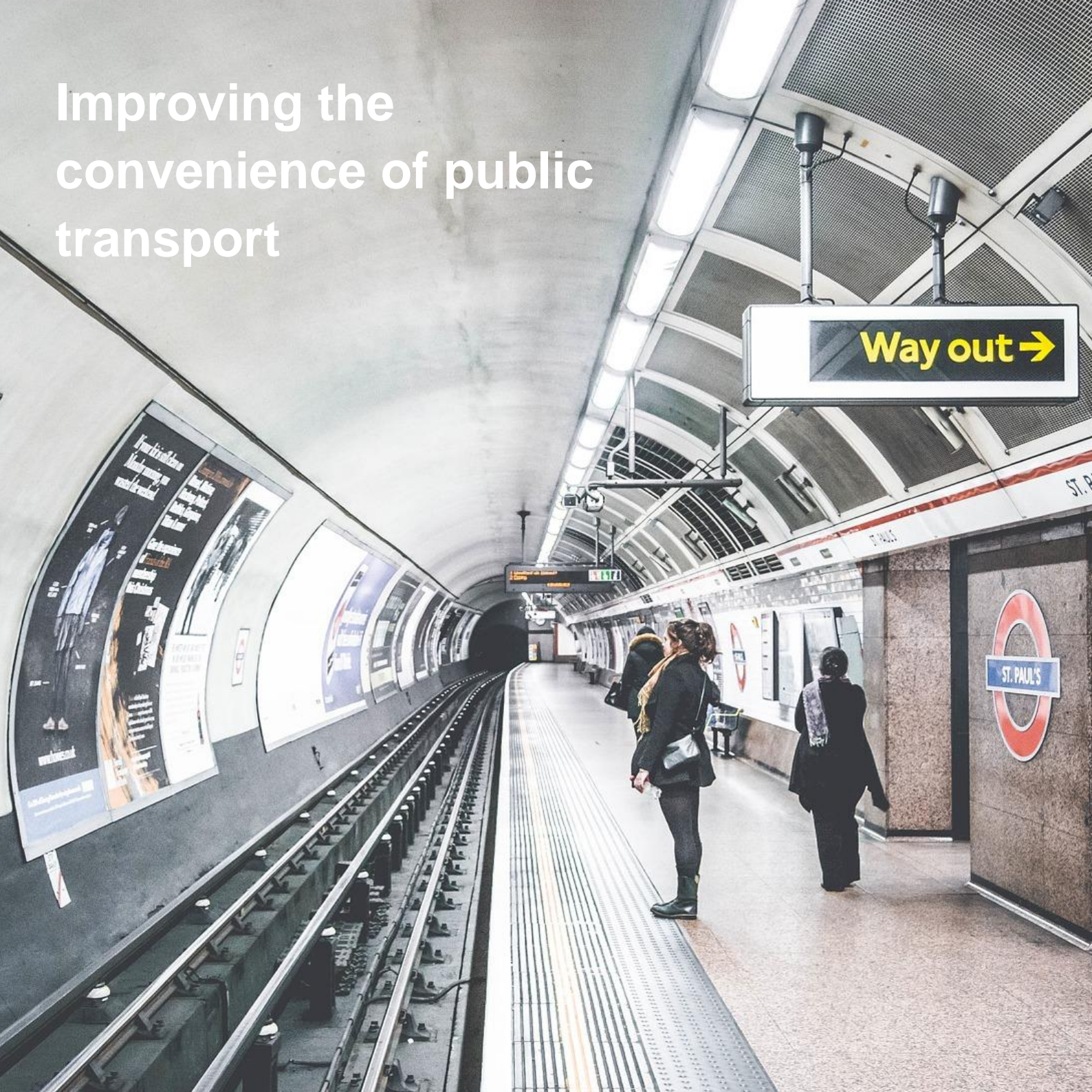
A Policy Brief from the Policy Learning Platform on Low-carbon economy

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Summary

The shift to a low-carbon economy will rely heavily on the use of zero-emission vehicles and increased use of public transport. Whilst cities and regions will need to invest heavily in new vehicles, fleets and infrastructure, there is also a need to encourage citizen behaviour change. One of the major barriers to the use of public transport involves shifting citizen preference from individual modes of transport, by overcoming perceptions that public transport can be slow, uncomfortable or unreliable. Improving the convenience of public transport can help to change these beliefs and also to change behaviours, through interventions such as provision of accurate information and timetables, having easy route planning options, supporting multi-modal connectivity, using integrated smart ticketing options, operating on-demand services, and improving customer comfort.

Why invest in public transport?

Public transport systems are a longstanding part of Europe's transport system, with the first recognisable 'omnibus' services appearing in the early 1820s. However, systems are constantly evolving and adapting to new technologies, and new customer and societal demands. Today's public transport systems face critical challenges: the climate crisis, crowded and congested cities; and a growing urban-rural divide. Transport remains the most challenging sector of Europe's economy to decarbonise, with emissions higher now than in 1990 (the base-level year for emissions measurements). Transport represents around a quarter of Europe's greenhouse gas emissions, with road vehicles accounting for more than 70% of this.[1] Additionally, transport has a significant impact on health as the main contributor to air pollution in urban areas.

Cities, in particular, need to adapt. The United Nations expects the proportion of global population living in cities to rise from 55% now to 68% by 2050.[2] This will result in greater congestion in cities, and change both urban and rural demographics: greater urban populations will result in more demand for public transport, whilst falling rural populations will see public transport become harder to both fund and maintain. Aging rural populations will also contribute to the challenge, as people become less self-reliant. Whilst the total number of cars on the road continues to increase, ownership rates in cities are falling, as a result of both economic factors and changing mind-sets, with greater support for communal ownership and 'sharing economy' models.

Public transport can adapt to these challenges, and can have a number of clear benefits for European cities and regions.

Environmental Benefits

Using public transport results in significantly reduced emissions compared to private (motor) transport options, thus reducing both pollution and carbon emissions. On a per-passenger kilometre basis, emissions from single-occupancy vehicles are four times higher than that of public transport. Even though many cities and regions still need to invest significantly in modernising their transport fleets, even currently used vehicles are less carbon intensive per person, than private motor vehicles.[3]

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[1] https://www.europarl.europa.eu/news/en/headlines/society/20190313STO31218/co2-emissions-from-cars-facts-and-figures-infographics
[2] https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
[3] https://www.acea.be/uploads/publications/factsheet_buses.pdf

Many cities are making the transition to public transport vehicles that run on electricity (trams, trolley buses, and buses), with no emissions at point of use. Significant effort remains, however - around 50% of Europe's public transport runs on electricity (including trams, light rail and rapid transit systems), but 85% of its bus fleet still operates on fossil fuels. If running on renewable electricity though, emissions are nearly zero. Others are operating on biofuels, natural gas, and hydrogen. As well as the benefits from reduced carbon emissions and pollutants, greater use of public transport also sees an increase in the efficiency of land use. As less space is needed for private vehicles, including parking spaces, land can be used for other applications, including gardens, parks and social spaces (squares, terraces, pedestrianised streets).

Socio-Economic Benefits

Public transport is **egalitarian** – open to everyone. Prices are typically low, giving mobility options to all, to make the most of available social and economic opportunities: accessing jobs further from where they live, getting to the shops, and undertaking other business. Public transport also often works out to be **cheaper than private vehicles**, taking account of costs related to acquisition, licencing, fuel, parking, maintenance, etc., pricing many people out of the market. Cheaper transport means that citizens can use their finances for other activities that can bring them more direct benefit.

A model shift towards public transport can also help to **reduce congestion**, bringing down the amount of time that people spend in traffic and allowing them to be more productive, whilst the time spent on public transport can be used for other activities. Without having to focus on operating a vehicle, individuals can use the time to read, work or use forms of entertainment. Additionally, it can provide a lifeline for those who find it harder to get around – older people, children and those with impaired mobility, for example. Public transportation is also **safer than using private vehicles**, and moving between transport hubs encourages activity – often walking or cycling – which can also contribute to public health.

> *"A developed country is not a place where the poor have cars. It's where the rich use public transportation." – Gustavo Petro, Former Mayor of Bogotá, Colombia*

The impact of convenience

Increasing the use of public transport will be essential for tackling our carbon emissions. This does not rely only on providing low-carbon vehicles, but also on stimulating behaviour change. Behavioural scientists have long linked behaviour and habit with effort – both mental and physical. The widely used 'two systems' model states that we have two modes of thinking – fast and impulsive, and slow and effortful. (See the Interreg Europe Policy Learning Platform Policy Brief on 'Behaviour change for energy efficiency,' for more on this.) Most of our behaviour is determined by the first system – hence we mostly act automatically, by habit. Behaviour change relies on reducing overall effort, and making change easy.

This is where '*convenience*' can help us to change behaviour. *Convenience* can be considered as having two aspects: *time savings*, and *effort savings*. It is this effort saving aspect in particular that is relevant: the aim of convenience is to make decisions and actions quick, easy and stress-free.

Both time and effort are limited and scarce resources – we only have so much time each day, and only so much energy, and must be careful of where we expend it. Time usage also influences perception of effort, with waits and delays contributing to mental, physical and emotional effort (anxiety, stress, boredom, annoyance).

The less thought and planning people have to put into an action, the more likely they are to take that decision. Convenience is especially important now, when so many competing solutions are available. If public transport is to compete in this new marketplace of on-demand ride-sharing apps, then it needs to provide a similar level of convenience, and it also needs to provide clear benefits over individual mobility solutions. Service *inconvenience* can lead citizens to seek other service providers.

Behavioural and consumer studies identify five main types of convenience relevant to how consumers make decisions[4]: decision convenience, access convenience, transaction convenience, benefit convenience, and post-benefit convenience:

- **Decision Convenience** – How much time and effort has to be put into deciding on a course of action;
- **Access Convenience** – How much time and effort has been expended to access and initiate the benefits of a service (from decision to beginning transaction);
- **Transaction Convenience** – How much time and effort has gone into the implementation of the transaction;
- **Benefit Convenience** – How much time and effort has gone into gaining the core benefit (mobility – from A to B);
- **Post-benefit Convenience** – Of only marginal concern for public transport provision; how much time and effort goes into following-up with the service provider in case of problems.

Actions for improving convenience

"Turnaround in transport policy is mandatory and requires a strong, **attractive** public transport system which is **demand oriented,** uses **latest technologies,** is **integrated** in a sustainable transport chain, and is **easy to use**." – Dr. Klaus Bongartz, Ministry for Infrastructure and Agriculture of Thuringia (OptiTrans Project)

Decision Convenience relates to how easy it is to decide on a course of action, and user perceptions of the time and effort that need to be expended in taking that decision. Before making a journey, a public transport user needs to work out where to get public transport from, which route to take, which line/mode changes are needed, and how far is needed to walk between stops. If this information is difficult to determine, a user may simply revert to the simplest form, which is often a private motor vehicle.

Public transport operators can increase usage of their services by providing decision support tools, including provision of information (maps, timetables), and increasingly, mobile apps and websites that can find the easiest, fastest and cheapest route from a starting point to an end point.

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[4] Berry, et al., 'Understanding Service Convenience', in, 'Journal of Marketing' (2002)

Information should be as accurate as possible, and may provide multiple solutions for the user to choose from, offering shortest journey length, or fewest changes, for example. Information can be provided remotely (apps, websites), but should also be provided at the transport hub/stop and within the vehicle itself with maps and screens. In all cases, real-time information systems are preferable to static timetables, and expected by today's users as standard.

GOOD PRACTICE: Transport Consortium of the Metropolitan Area of Zaragoza (CTAZ)

Zaragoza, the capital and largest city of the autonomous community of Aragon, is composed of thirty municipalities, with a population of more than 700,000, and served by six public transport operators. This made transportation across the city complicated, requiring different tickets for different mobility providers. Working together, the Aragon Government, Zaragoza Provincial Council, and the thirty municipalities created the CTAZ Transport Consortium, to work together for the integration of transport offers, and the creation of a single tariff. As a first step, CTAZ developed mobility guidelines and a strategy to follow for creating an integrated transport system to ensure a common vision. The co-operation of the municipalities led to the creation of a single card for bus travel across the whole region, followed by the introduction of the LAZO card; a single card to pay for journeys across multiple transport modes (tram, bus, local train, bike rental and even parking meters). CTAZ has also established apps and websites to offer travel information to its citizens, linking up the timetables of different services and enabling multimodal transport.

For more information, visit the DEMO-EC website.

Some regions are also investigating personalised travel advice, whereby individuals are advised on their travel options to encourage behaviour change. This is typically done at an institutional scale (e.g. all employees within a company, or public body as in Manchester, UK), advising the individual on changes they can make to their daily routine and mapping out, for example, possible routes from home to work.

Access Convenience relates to the time and effort expended to access the benefits of a service. In public transport, this means the frequency and reliability of the service, accessibility (especially for those of reduced mobility), or whether any pre-engagement is required (booking by call or app, pre-buying tickets). Transport authorities can support access convenience by considering the suitability of transport stops for those of limited mobility (ramps, handrails, provision of seats for waiting), and can make use of ICT for both real-time information provision and ticketing. Consideration also needs to be made regarding increased frequency of service (with new vehicles) and infrastructure development, with multimodal hubs that can facilitate modal changes, and integrated ticketing options with single fares for cross-modal transport (more below).

Demand-responsive transport (DRT) and Mobility as a Service (MaaS)

DRT systems have been widely used throughout Europe to provide transport options for specific social groups – typically the elderly and less mobile. Increasingly though, they are being seen as solutions for rural and suburban areas. Usually, systems would require the traveller to call and arrange a pick-up, but more and more systems are using apps and websites. Systems can have pre-set routes (running only when there is demand), or fully flexible routes, determined by where people need to be picked up or dropped off.

MaaS is an emerging field, with only a few cities having operational systems. It integrates public transport and private companies (including vehicle sharing companies and taxi operators), with a single app and payment transaction.

For more information and Good Practices, see the Interreg Europe Policy Learning Platform Policy Brief on Demand Responsive Transport.

REGIO-MOB
Interreg Europe

GOOD PRACTICE: Bus + Bike Service

The Bus + Bike Service is a service in Malaga, providing access to bikes at bus stations and bus stops to enable public transport users to make the last stretch of their journeys by bicycle, rather than walking. It aims to boost the combined use of both bus and bike, shifting from private vehicle use, with bikes free of use for one year for anyone who acquires a public travel card. After one year, a small subscription cost (20 EUR per year) is incurred if the user still wishes to use the service. In both cases, the bicycle may be used for up to thirty minutes, free of charge, with a price per minute applied beyond that time. It is intended also that the system enables links between different modes of transport, with bike stations also available at train stations.

For more information, visit the REGIO-MOB website.

Transaction Convenience relates to the time and effort in implementing a transaction – exchanging money for access to the service. A service that can only accept cash, or correct change, adds complexity by requiring the individual to have cash on them, or visit a bank in advance. Increasingly, public transport is enabling contactless payment by bank cards or mobile technologies when boarding a vehicle (see Transport for London). Otherwise, it is possible to top up pay-as-you-go cards online, meaning that the user does not need to find a payment point in advance of boarding (Stockholm Public Transport). Season tickets and auto-top-up systems can also be used (Brussels Intercommunal Transport Company and Malta Public Transport). This also includes integrated ticketing – the use of one ticketing system for multiple transport modes.

Smart ticketing can also give confidence to public transport users that they will be charged the minimum possible for their journey – many systems apply a daily, weekly or monthly cap, to ensure that the individual does not spend more than the cost of a travel pass for that period. Season tickets and concessionary fares can be used to incentivise use, offering a discount to users if they pay for longer periods, meaning that the user does not have to consider their options each day, locking in longer-term behaviour change.

SMART-MR
Interreg Europe

GOOD PRACTICE: Anda – The ticketing system of Porto

The Metropolitan Area of Porto, home to more than two million people, and a main hub for tourism in Portugal, has sought to develop a convenient and simplified ticketing system to encourage both residents and tourists to use public transport. The ticketing system – Andante – uses a pre-paid transport card that can be used on any of Porto's public transport modes (bus, tram, metro and urban train networks). Prior to this, the intermodal ticketing system had been very complex, with more than 140 zones in the city, requiring simplification to overcome knowledge barriers to increase convenience for passengers. Following initial success with Andante, Porto developed the Anda App, which enables smart phone users to use their mobile phones for payments, whilst the app also integrates a route planner and timetables. Users validate their trip using their mobile at the beginning of the journey, and Anda then calculates the cost of the trip, summarising the costs into a single bill at the end of month, ensuring that the cost is no higher than the equivalent monthly subscription.

For more information, visit the SMART-MR website.

Finally, **Benefit Convenience** is related to user perception of the overall experience and the effort expanded in gaining access to the core benefit. This can involve consideration of overall time and cost, comfort, safety and the environment. Issues here relate to overcrowding, cleanliness of the vehicle, air conditioning/ventilation and proper functioning of the vehicle. Overall experience will determine the chances of repeat custom. Behaviour change also relies on user satisfaction, determined by both convenience of the service, and post-service opinion. To this end, it is essential that public transport providers improve their customer-perceived convenience, to boost user satisfaction and long-term behaviour change.

Providing real time information on public transport, via either screens or public-address system, can help to reduce anxiety and discomfort by explaining delays and giving information on when vehicles can be expected.[5] As well as integrating new technologies and systems into existing vehicles, regions can also invest in enhancing vehicles and purchasing new vehicles. This can include longer or higher capacity vehicles, which are also cleaner, quieter and more modern.

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[5] https://www.papercast.com/insights/predict-accurate-bus-arrival-journey-times/

Additionally, infrastructure development (new tram lines, bus lanes, etc.) can improve overall speed and convenience.

GOOD PRACTICE: Real-time crowd information

Comfort is a major contributor to the satisfaction of public transport users, and a key issue related to this is overcrowding. Overcrowding, as well as being uncomfortable, can cause anxiety and stress, leading people to avoid public transport and seek other mobility options. In Stockholm, KTH Royal Institute of Technology trialled a real-time information system that demonstrated how crowded the carriages of metro trains were, in order to distribute passengers at peak time. The information screen at the metro stop showed not only the real arrival times of the next three trains, but also used a red-yellow-green colour code to show which carriages were crowded. This information could enable the public transport user to determine where to stand on the platform to get the least crowded carriage, or even whether to wait for the next train. The practice saw the share of passengers in the most crowded cars reduce by 4%, with 25% of passengers taking account of the information when boarding the train.

For more information, visit the CISMOB website.

GOOD PRACTICE: Upgrade and extension of the public transport system in Cluj

The city of Cluj-Napoca in Romania sought to improve the attractiveness of public transport by implementing a wide-ranging project for modernising transport stops and integrating e-ticketing. The project modernised 87 public transport stations, integrating benches, shelters, bins and information screens for providing information on arrivals and departures. Additionally, 35 stations were equipped with improved lighting to improve safety and security for travellers. To improve the convenience of ticketing, Cluj implemented a common hourly tariff that could be used across all transport modes, and installed 61 machines for automating ticket sales, and around 500 validators at stations and on vehicles, to ensure that ticketing was always available.

For more information, visit the OptiTrans website.

Summary of convenience considerations

Topic	Considerations
Decision Convenience	
Information provision	- Simplify route maps for easy reading and provide up-to-date timetables. Using real-time information increases user confidence; - Integrate multiple modes of transport into a single information platform; - Provide information at multiple points – both online and via non-digital materials: display information for use by different audiences (e.g., is it understandable for tourists); - Provide helpdesks and assistance where possible.
Route planning	- Establish websites and apps that can automatically plan journeys, and find cheapest and quickest route to take; - Consider transport problems and congestion in route suggestions (using real-time information).
Access Convenience	
Ease of access	- Consider distance between stops in spatial planning, and provide last mile solutions for reaching stop where needed (such as bike rental); - Consider ease of boarding/disembarking (ramps, handrails) – with specific consideration of elderly/disabled people, people with pushchairs, etc.
Ease of exchange	- Support multimodality by having bike spaces at transport hubs and on trains; - Develop transport hubs, bringing together multiple lines and modes at one space; - Provide clear sign-posting at stops for interchange.
Transaction Convenience	
Payment Method	- Support multiple payment modes – card, cash, pre-paid ticketing/transport card that can be purchased on board, electronically (in advance), or at stop. Discounts for prepaid journeys can help to prevent hold-up as fewer people will pay on board; - Automated systems can be used at transport hub and also on board to avoid delays, but in-person service should also be possible to avoid putting off tourists or those who are not technologically literate and may be unfamiliar with automated services. If automated, ensure systems are well labelled and explained
Integrated ticketing	- Integrate services so that there are not many ticketing systems, making interchange between modes complicated; - Consider a single transport tariff across modes, (e.g., a cost per hour no matter how many modes are used)
Benefit Convenience	
Customer comfort	- Use on-board information system to reduce anxiety, including information on next stops and possible interchanges; - Peak times and tariffs can be used to try to shift users from the most crowded services; - Consider physical comfort: maintaining a comfortable temperature with heating/cooling system and ventilation, and ensure overall cleanliness of the vehicle. Priority seats should be provided for the elderly and disabled; - Use campaigns to improve behaviour of users, such as reducing noise from headphones, preventing littering, respecting quiet carriages; - Ensure a feeling of safety, with use of CCTV, and security guards/transport police presence (e.g., on-board emergency contact services).

Supporting European regions

The European Union sees the roll out of sustainable public transport as a key priority, and from the 2001 Gothenburg Strategy onwards, it has aimed to develop its transport sector to be both integrated and sustainable. The Urban Mobility Package (2013) is a key initiative, setting out the concept of Sustainable Urban Mobility Plans (SUMPs), which consider the entirety of an urban area and encourage joined-up and collaborative policy-making across different policy-areas, different levels of government, and different stakeholder groups.

To help achieve these aims, the European Union provides many support options for regions looking to shift to low-carbon mobility. Its main portal is Eltis – the Urban Mobility Observatory – financed by European Commission DG Mobility and Transport. It provides hundreds of case studies related to clean public transport, as well as statistics, reports, tools, handbooks and training materials. The SUMP Guidelines (updated in late 2019) provide step-by-step advice to regional authorities in developing a SUMP, including a number of topic guides exploring specific issues in depth.

The EU also provides support via the URBACT programme for knowledge exchange and capacity building on sustainable urban development, and the CIVITAS initiative which supports local partnerships for testing urban mobility approaches in real conditions. CIVITAS also provide a number of handbooks, including Manuals on SUMP Measure Selection, which highlight lots of practices and examples for public transport enhancement and integration of new public transport systems.

The EU also provides financial support via the European Structural and Investment Funds (ESIFs) for promoting regional development and infrastructure development, as well as under Horizon 2020, for developing new and innovative transport approaches. Under the current ESIFs, Investment Priorities 4 ('supporting the shift towards a low-carbon economy in all sectors') and 7 ('promoting sustainable transport and removing bottlenecks in key network infrastructures'), support these approaches. Although the current budget period for both the ESIFs and Horizon 2020 are coming to an end, both will be renewed in 2021-2027 with slightly adapted priorities. Regional Development and Cohesion Policy in 2021-2027 will focus on five priorities[6], all of which will provide opportunities for supporting public transport development. Horizon Europe will also provide significant support for sustainable transport and urban development, though the strategic planning is ongoing at the time of writing.

Improving convenience with Interreg Europe

Of the sixty projects funded by Interreg Europe under the low-carbon economy theme, twenty-six are looking into low-carbon transport. Projects are examining issues which affect regions across Europe, including introduction of e-mobility, development of regional strategies, public engagement, and improvement of public transport. The following projects are particularly relevant for this last theme:

- 2050 CliMobCity – 2050 climate-friendly mobility in cities
- CISMOB – Cooperative information platform for low carbon and sustainable mobility;
- DEMO-EC – Development of sustainable mobility management in European cities;

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[6] Smarter Europe; Greener, carbon free Europe; Connected Europe; Social Europe; a Europe closer to its citizens.

- OptiTrans – Optimisation of public transport policies for green mobility;
- REGIO-MOB – Interregional learning towards sustainable mobility in Europe;
- SMART-MR – Sustainable measures for achieving resilient transportation in metropolitan regions;
- TRAM – Towards new Regional Action plans for sustainable urban mobility.

TRAM project to support roll out of e-ticketing in Italy and Hungary

A successful example of Interreg Europe co-operation is the TRAM project (Towards new Regional Action plans for sustainable urban Mobility), running since mid-2016, which has sought to support the shift to low-carbon mobility in its five partner regions from Italy, Spain, Sweden, Hungary and Romania. Through the project the regions have shared experiences to draft, and jointly review, action plans, which present lessons learnt from interregional co-operation and each region's intention to integrate them into their policy frameworks.

In order to improve overall convenience of public transport, both Marche Region (Italy) and the Municipality of Miskolc (Hungary) expressed an interest in **e-ticketing**. E-ticketing can help to drastically reduce the complexity of transport, with common tariffs and cross-modal compatibility. As well as making things easier for travellers, e-ticketing systems can also deliver valuable data for public authorities – informing them about consumer behaviour, and identifying the public transport lines of heaviest use.

Marche intend to develop a multi-modal e-ticketing system. Learning from the Andalusia travel card, the Marche system will include standardised communications technologies to be compatible with the widest number of devices possible, whilst also being modular so that other public institutions might make use of the system in future. Marche will ensure that its e-ticketing system will provide data to public authorities on route usage, to inform mobility planning.

Miskolc will also establish an e-ticketing system to harmonise the different systems already existing in the municipality, integrating both municipal and non-municipal owned public transport providers. It is planned that in future it should also be possible to use the card to pay for parking, museums and other costs. The roll-out of e-ticketing is expected through 2020.

Find out more at the project website, or at the TRAM project feature.

Interreg Europe projects entail the sharing of experience and development of regional action plans to improve policy frameworks. Each project gathers and studies policy examples, hundreds of which are available through the Policy Learning Platform's Good Practice Database, some of which have been featured in this brief. The Policy Learning Platform can provide a number of on-demand services which can support regions in their transition, including a peer review service to provide expert guidance for overcoming regional challenges.

Recommendations

- Determine your baseline: review already implemented measures and the status of your city's current transport system. As the partners of the TRAM project have done, start with a regional analysis to work out the most critical issues to challenge, and find examples from other regions that could be transferred – learn from what works!
- Like in Zaragoza, develop a governance structure that brings together the regional players in public transport. Creating a consortium or stakeholder group can institutionalise co-operation and the establishment of joint plans and strategies that can lead to win-win results for all parties;
- Use available resources – Eltis and CIVITAS – to develop regional strategies and plans, as well as engaging policy-makers to set a long-term vision and targets for improvement;
- Consider public transport from the user perspective. Involve stakeholders and the public in the process: use available usage data, consultations and user-preference surveys to determine where interventions are most needed;
- Prioritise interventions: create a list of measures from the menu of successful cases that can achieve the city's vision and targets;
- When convenience measures have been introduced, they need to be promoted to reach new users;
- Convenience needs to be considered holistically; it is not only ease of access and transaction, but also the overall mental effort of the journey. This includes on board conditions and waiting times, both of which can cause stress and discomfort;
- Convenience works both ways; people can also be discouraged from certain actions, such as private car use, by reducing parking spaces, increasing charges, low-carbon emission zones, etc.
- European Structural and Investment Funds (ESIFs) are available for improving public transport – consider now what interventions you may need and contact your Structural Fund Managing Authority to influence the next Operational Programmes for 2021-2027.

Sources and further information

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- Eltis – Guidelines for implementing a sustainable urban mobility plan, second edition (2019)
- ERTRAC – Integrated Urban Mobility Roadmap (2017);
- European Commission – Remaining challenges for EU-wide integrated ticketing and payment systems (2019)
- European Commission's Expert Group on Urban ITS – Draft Guidelines on Smart Ticketing
- Interreg Europe Policy Learning Platform Policy Brief on 'Behaviour change for energy efficiency' (2018)
- Interreg Europe Policy Learning Platform Policy Brief on 'Demand Responsive Transport' (2018)
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- UITP – Climate Action and Public Transport (2014)

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#LowCarbon
#PublicTransport #Ticketing

Low carbon economy

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