Transport for Cornwall

Karyans rag Kernow

Bus Service Improvement Plan for Cornwall

Developed by Cornwall Council and the Enhanced Partnership

June 2024





Buses in Cornwall will provide an **excellent connection** between **people, communities, businesses** and **services**

Executive Summary

Cornwall's Bus Service Improvement Plan (BSIP) aims to achieve continuous growth in the use of our bus network, sustaining improvement and enabling excellence. It will enable us to deliver our vision that **buses in Cornwall will provide an excellent connection between people, communities, businesses and services in a way that is reliable, efficient, safe, inclusive and enjoyable and supports the delivery of the aspiration of a low-carbon Cornwall.** Our BSIP directly responds to the requirements of the Government's National Bus Strategy and builds upon the excellent progress already made to improve bus services through ongoing initiatives such as the One Public Transport System for Cornwall (OPTSfC) programme, the country's first Bus Fares Pilot scheme, our ongoing and award-winning partnership and the measures and improvements currently being introduced following the success of our first BSIP (2021) in securing Government funding (£13.3m BSIP Phase 1 and £3.9m BSIP Phase 2).

Forty-four percent (44%) of bus users in Cornwall choose to travel by bus because they are unable to make the same journey in any other way, rather than the bus being the more attractive option[1]. We want buses to be viewed positively, attracting more users out of choice, not necessity. To encourage more users to choose bus, we must continue to improve fares and ticketing (including integration and affordability), network coverage, frequency and reliability, customer service, accessibility, image, the provision of onboard information, and vehicle quality. We must demonstrate that Cornwall can deliver an attractive, sustainable and high-quality network in a rural area.

Our BSIP 2024 builds on the progress already made and reflects the priorities that people in Cornwall want to see, as a reflection of the views and aspirations of the Transport for Cornwall partnership.

Bus patronage has bounced back well following the pandemic. Total passenger journeys are 13% higher now than in 2019. Furthermore, we are encouraged to see that the growth has been amongst fare paying passengers.

Levels of satisfaction amongst bus passengers in Cornwall in 2023 were above the average for rural areas and England as a whole across all aspects of service provision. In particular, satisfaction with the value for money of bus travel was 75%, a significant leap from 57% in 2019, reflecting the success of the Bus Fares Pilot fares reductions along with the Government's £2 fare cap.

However, we are still on a journey of continuous improvement. Recent research amongst local bus users and non-users shows that concerns about consistency of service performance and unreliability still remain. People want more frequent and reliable services that enable them to get to where they want to go, when they want to go. Consequently, the Council and bus operators are committed to ensuring that network reliability is at the forefront of our delivery. This focus will strengthen the existing network and improve the quality of delivery so it can be the mode of choice for passengers, encouraging patronage and revenue growth.

Securing long-term revenue funding to support the network is imperative to fulfilling our vision for buses. The impact of the pandemic on the bus industry was severe and we are proud of the steps taken by the Transport for Cornwall partnership to kickstart our recovery and embrace the changes that have helped us rise to the challenge of collectively bringing Bus Back Better. The patronage growth and delivery of wider improvements since the BSIP 2021 are testament to the collective vision we hold for public transport in Cornwall. However, there remains a shared concern for the future with potential changes to UK Government, governance of the bus industry and therefore the ability for Cornwall to secure the funding required to maintain our current network against this uncertain backdrop. In recent years, BSIP funding has helped to provide much-needed financial support to keep our network stable – this has been the bedrock on which we have been able to achieve success and grow patronage but the future of BSIP and bus industry funding is uncertain. Fares have been reduced through the Bus Fares Pilot and £2 Bus Fare Cap Grant boosting patronage in Cornwall but these schemes and their associated funding are time-limited. Cornwall's bus network cannot afford to experience great change in the funding landscape from the operator, customer or local authority perspective; any changes to LA funding or fares revenue risks negatively impacting the network we have thus far protected and the growth in patronage we have achieved, making the long-term financial security of the network absolutely critical. Further, the ability to achieve our vision that supports the delivery of a low-carbon Cornwall through the long-term transformation of the network, hinges on this requirement to secure funding now.

We look forward to working with bus passengers, operators and other stakeholders to implement our BSIP ambitions in the coming years. We have seen what successful partnership delivery can achieve and are excited for the step-change in bus service provision and customer experience that is ahead.

Our BSIP will continue to deliver:

- **Simpler and more cost effective fares** for all
- **Cheaper fares for young people** to encourage them to become life-long users of public transport
- **An integrated bus network**, with enhanced services that are better aligned with one another
- **One set of integrated information that strives to be accessible for all** – making it easier for passengers to plan and use the network
- **More reliable bus journey times** and, where feasible, better routing to make journeys faster
- **Continued improvement in our infrastructure** that supports our services

1 Transport Focus Your Bus Journey Survey (2023)

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At a glance - Bus Vision

This Bus Service Improvement Plan (BSIP) covers Cornwall, reflecting its specific characteristics and needs, and building on the significant investment and development into the bus network by Cornwall Council and operators over recent years.



Working in partnership with bus operators and other interested parties, an Enhanced Partnership has been in place since early 2022. The Enhanced Partnership Plan incorporates our BSIP ambitions and supports two Enhanced Partnership Schemes which lock-in commitments and requirements for service development and improvement.

“This BSIP outlines the **key measures** that will be developed to help Cornwall **continue to progress** towards this vision, and its aim to **achieve continuous growth** in the use of the bus network that **sustains improvement and enables excellence**.”

The overarching vision for buses in Cornwall is that

“Buses in Cornwall will provide an excellent connection between **people, communities, businesses and services** in a way that is reliable, efficient, safe, inclusive and enjoyable and supports the delivery of a **low-carbon Cornwall**.”





1

Introduction

Buses are vital to the life of Cornwall and its residents. It is one of the few places in the country to have enjoyed steady growth in bus use.

Cornwall Council and its bus operators are confident that this provides a foundation from which to build Bus Back Better. Much has been achieved in the last few years, and this provides the backdrop to wanting to achieve much more.

We want to demonstrate what a truly world class rural bus network can look like and what impact it can make on people's lives. Cornwall set out ambitious plans for its future transport network as part of the 'One Public Transport System for Cornwall' (OPTSfC) programme. The original vision in 2016 to develop a high-quality, integrated and customer-focused network is very much on track. Significant levels of both public and private investment have been made in improving both bus and rail networks, alongside the facilitation, integration and promotion of active travel to raise the standards of the transport network.

Progress has been boosted by the ambitious Bus Fares Pilot project and the measures being introduced with BSIP funding from Government. The Enhanced Partnership has formalised ongoing commitments from transport operators and Cornwall Council to work better together, driving efficiencies and removing local barriers to achieving the vision for the benefit of our customers.

For a largely rural area with dispersed population, Cornwall has an excellent bus network. This comes from recognition by Cornwall Council of the importance of buses to the economic and social wellbeing of residents. As such, the authority has maintained significant levels of funding (committing £192m over 8 years) to provide a comprehensive level of service, supporting 50% of all bus mileage in the county. **Even through periods of pressure on overall Council budgets, the bus has been prioritised . By maintaining services, bus patronage has not only recovered since the pandemic, but increased**, in stark contrast to the picture across England as a whole.

Over the last 3 years, cheaper fares, tickets that can be used across the network (regardless of operator) and tap-on/tap-off fares capping have all made bus travel more attractive and easier to use. A partnership approach to the funding and provision of comprehensive information provides consistent messaging and the Transport for Cornwall branding helps to promote the network as a whole and develop wider awareness and positive associations with the brand across our communities.

Cornwall is now embarking on a significant marketing, engagement and communication journey, targeting specific potential user groups to encourage travel behaviour change and greater bus use. Recent work to develop fares, ticketing, information and the network itself provide powerful opportunities to promote elements of bus travel to new markets. Furthermore, recently awarded Zero Emission Bus Regional Areas 2 (ZEBRA 2) funding will herald the welcome introduction of zero emission buses in Cornwall and open up new opportunities to attract new users to sustainable transport.

Despite its strong position, there is still more that can be achieved to deliver the vision for bus in line with the National Bus Strategy. Building on the positive sense of partnership between the Council and its public transport operators, the Transport for Cornwall partnership continues to explore opportunities to work with other operators and stakeholders.

Cornwall remains well placed to develop its Bus Service Improvement Plan into the future and use its Enhanced Partnership to facilitate the delivery of further improvements.

Policy Context

Cornwall's Local Transport Plan and the Climate Emergency

Cornwall Council declared a Climate Emergency in January 2019 and set a target to become carbon neutral by 2030. This will require Cornwall to future proof its transport network to be both fit for purpose and sustainable for future generations. To be effective at addressing climate change we need to target investment where it will make the most difference, prioritising the affordability and simplification of bus fares and the provision of a truly integrated public transport network if we are to offer a realistic alternative to the car.

To meet Cornwall's carbon neutral target by 2030, Cornwall Council recognises that it must reduce CO2 emissions from transport by 80% (the remaining 20% will need to be offset) . The new Cornwall Transport Plan identifies three wide categories of policies to address this:

- **Reducing the transport demand** - Reducing car traffic, the biggest portion of transport emissions, can be achieved by reducing the reliance on private motorised transport. This can be done by reducing the distance between jobs, services and homes, making towns and villages more walkable and cyclable and accessible by public transport. A sensible use of technology to allow working, shopping and access to some services from home can also deliver a significant reduction in trips. This approach assumes a systemic change in our approach to planning development and service delivery.
- **Switching transport modes to low carbon modes** - Further development and integration of the public transport network to make transport between main towns and villages as seamless as possible. Better integration with walking and cycling, behaviour change campaigns and the location of public transport hubs at the centre of developments.
- **Switching to cleaner fuels** - An extensive effort will have to be made in co-operation with the Government to decarbonise road vehicles as quickly as possible as car transportation will most likely remain the main mode of transport for many of the more rural communities.

A key factor in achieving the required reduction in emissions will be the provision and promotion of an attractive and efficient bus network for the benefit of those who need to travel. A convenient, affordable and easy to use network will also encourage those making discretionary and infrequent journeys to switch modes for some journeys. The continued adoption of cleaner, lower emission buses powered by alternative fuels and the associated charging/refuelling/depot facilities is addressed in the Council's Ultra-Low Emission Bus Strategy and through the successful award of ZEBRA 2 funding to introduce 14 new zero emission buses to Cornwall in 2025.

This BSIP sits under the Cornwall Transport Plan and will direct the future development of the bus network. Complemented by Local Cycling and Walking Infrastructure Plans (LCWIP) and a forthcoming Transport Decarbonisation Plan, this suite of strategies will work together to address the transport challenges ahead.

Development of the Bus Service Improvement Plan

This Bus Service Improvement Plan (BSIP) covers Cornwall only, reflecting its specific characteristics and needs. Being in the extreme south west of the country it is largely self-contained, surrounded by the sea on all but one border with Plymouth City and Devon County Councils. The main cross-boundary demand for travel is to and from Plymouth. However, the rural and tourism-based nature of Cornwall means that it is very different to the urban environment of Plymouth, where the focus is mainly on travel needs within the city.

Despite the differences between the transport demands of Cornwall and its local authority neighbours, partners across the region work positively together to deliver cross-boundary services and improvements for passengers wishing to travel more widely in the south west. Supported by the work of the Peninsula Transport Sub-national Transport Body, future ambitions exist for a wider regional approach to public transport delivery.



Cornwall's position regarding bus provision is different from other authorities in the south west, having been granted permission to pursue bus franchising powers as part of its Devolution Deal in 2015. The authority has undertaken work to assess the case for franchising whilst pursuing the development of its One Public Transport System for Cornwall (OPTSfC) ambitions through partnership and the conventional specification and contracting of services that covered areas and corridors not provided commercially.

Through the OPTSfC improvement programme, Cornwall Council recognised that an integrated network with appropriate frequency, capacity and affordability was critical to encourage modal shift from the private car and reduce carbon emissions. Cornwall Council and its partners continue to be encouraged to see these themes reflected in the National Bus Strategy: Bus Back Better as priority areas, validating our achievements and endorsing our future direction.

Cornwall's original BSIP (October 2021) was developed in conjunction with public transport operators and local stakeholders, ahead of the formalisation of the Enhanced Partnership. Cornwall's BSIP 2024 has been developed with the Enhanced Partnership using insight from research undertaken to monitor the impact of BSIP and Bus Fares Pilot interventions, as well as feedback from Cornwall's local members, officers and stakeholder groups.

Cornwall's BSIP 2024 references the evidence base presented in BSIP 2021 and moves forward to present a current view of the challenges and opportunities of delivering bus service improvements in Cornwall.

Enhanced Partnership

Cornwall has a strong Bus Partnership Group, established in June 2021, which has overseen the development of an Enhanced Partnership (EP) Plan and Scheme, which were made in 2022. The EP Scheme is guiding the delivery of all bus initiatives, setting out the commitments for Cornwall Council and service requirements on the bus operators. The Scheme has been varied to update on progress and incorporate additional measures. Further, a second EP Scheme is currently being formalised to facilitate the Transport for Cornwall (TfC) marketing campaigns, branding and commitments by Cornwall Council and bus operators to the joint funding of comprehensive information provision across all media.

The Cornwall Bus Partnership, with membership as follows, has regular meetings to discuss and agree all public transport developments and proposals across Cornwall:

- Cornwall Council officers (Public Transport and Highways teams)
- All bus operators
- Transport Focus
- Cornwall Chamber of Commerce
- Great Western Railway

The BSIP and associated EP Schemes are live documents, continually refreshed and updated, aimed at driving improvements to bus services through the implementation of a series of projects and schemes. They will be reviewed annually and performance against targets reported regularly.

Case Study:

Transport for Cornwall Partnership - Best Alliance/ Collaboration of the Year (National Transport Awards 2023)

Demonstrating the successful public-private sector partnership between the Council and transport operators to transform the public transport network for its customers, the Transport for Cornwall Partnership was delighted to be recognised by the prestigious National Transport Awards in 2023 as the winner of its Best Alliance/Collaboration of the Year. The Partnership has worked hard to break new ground, collaborating positively on initiatives that have achieved patronage growth and placed the experience of customers at the heart of the delivery of the network.



Franchising remains an option

Cornwall's Devolution Deal for transport aimed to identify a sustainable delivery model for public transport in a rural setting. In parallel with a programme of public transport improvements delivered in partnership with operators under OPTSfC, a business case was prepared to explore the option of pursuing a franchising model to meet the OPTSfC objectives.

The financial assessment of the business case was updated in 2021 so that the baseline services represented the re-tendered network which commenced operating in March 2020, with assumptions to offset the patronage and other impacts of COVID-19. This update provided an opportunity to validate the responses of the model to the changes in service levels between 2015 and 2020.

The results of the financial modelling indicate that franchising is now a viable operating model for Cornwall.

The results of the financial modelling indicated that franchising is now a viable operating model for Cornwall. Prior to the re-tendering, it was difficult to build a business case for franchising as the gap between the additional costs of operating a more comprehensive bus network for Cornwall residents and the savings that could be achieved through per kilometre operating cost reductions and additional revenue from increased patronage was too high. The targeted network improvements incorporated into the 2020 tender exercise moved us closer to our objectives, meaning that moving to a franchising model, supported by the growth achieved through the delivery of the DfT Bus Fares Pilot, now becomes financially sustainable.

The tender exercise demonstrated how better value could be achieved – resulting in a strong customer-focused package bid that delivered significantly more mileage at lower cost, better quality and introduced strong incentives for growth, at operator commercial risk, compared to traditional local authority tendering. Central to this was the innovative, whole contract life approach taken by the operator, which included significant investment up front in over 100 new vehicles, an overhead savings partnership with other small operators and a third-party maintenance and property provider. It also included improved network coverage, new and improved connections, improved integration with rail, plus the integration of over 100 school routes.

The financial modelling for franchising demonstrated that the increased patronage above baseline levels as a result of Bus Fares Pilot combined with operating cost savings and investment in quality improvements would result in a viable franchising position from 2026 compared with the existing network.

The Enhanced Partnership modelled did not include operating cost savings or additional investments in service quality improvements. The financial modelling predicted an additional deficit per annum from 2026 when compared with the existing network. However, if operating cost savings could be achieved through the Enhanced Partnership model, together with quality improvements, then it could be possible to achieve a similar level of financial performance to the franchising model.

The National Bus Strategy provides clear focus around delivering a 'one network' approach. Opportunities exist in Cornwall to drive operating efficiency through a one network approach and to better integrate the uplift in summer services to drive value across the network. Competing for passengers drives costs, Cornwall does not have sufficient passengers for competing services or services that cherry pick hotspots and leave others unserved. Delivering one core network that can provide enhancements in service provision to cater for increased demands such as seasonal uplifts, whilst servicing the demand for schools and colleges in an integrated manner has the potential to deliver best value for all.

Potential future changes to national government create uncertainty around the governance models and funding available to deliver public transport across the country. What is known is that Cornwall remains committed to delivering a high-quality bus network for its residents working in partnership with its operators. Cornwall believes that the vision for buses in the area can be delivered through the Enhanced Partnership, however if this is not the case, franchising remains an option for the authority to pursue.

Aims and objectives of the BSIP

There is a shared ambition to build on the significant progress already achieved in Cornwall over recent years, and partners have agreed, the vision and objectives in the first BSIP. These are set out below and remain relevant to the current position.

Vision:

Buses in Cornwall will provide an excellent connection between people, communities, businesses and services in a way that is reliable, efficient, safe, inclusive and enjoyable and supports the delivery of a low-carbon Cornwall.

BSIP Goals:

Develop a bus network that increasingly meets more people's needs and provides an attractive alternative to the car.

Achieve increasing commercial viability of the bus network to:

- Enable operators to invest in service improvements, expansion and decarbonisation
- Free up public sector funding to kick start new initiatives and projects

Overall aim:

To achieve continuous growth in the use of the bus network that sustains improvement and enables excellence.

BSIP Objectives & the National Bus Strategy Objectives they support:

To achieve a bus network that is:

1) **Excellent**
- Buses that are more frequent
- More comprehensive bus services
- Buses that are better to ride in
- Greener buses

2) **Affordable**
- Buses that are cheaper to use

3) **Dependable**
- Buses that are faster and more reliable
- Buses offer a safe means of travel

4) **Accessible**
- Buses and services that are inclusive by design

5) **Effortless**
- Easier to understand bus network
- Easier to use bus network
- Buses integrated with other modes and each other
- Innovative provision of services

Overview of Cornwall

Located in the far south-west of England, Cornwall sits within a unique position having only one border with Plymouth City and Devon County Councils. Internationally renowned for its coastline (697km), countryside and attractions, Cornwall is a desirable location for business, living, tourism and leisure.

Cornwall's peninsula is 132km long - from Land's End in the south-west to the north-eastern boundary at Morwenstow, although the distance between its north and south coasts is highly variable, ranging from 8km in the west to 72 km in the east.

Key Demographics

Cornwall has a population of 573,000 people (2021), up 7% on 2011, with an average population density of 160 people per km^2, compared to an average UK population density of 281 people per km^2. Nearly two thirds of Cornwall's population live in small, dispersed settlements in areas that are defined as rural (ONS 2011).

Cornwall has an ageing population. Average age in Cornwall is 44 years old, compared to 40.4 years for the UK. Almost 30% of the population is over the age of 60, compared to 22% on average across the UK, whilst just over 21% of the population is aged 19 or under, compared to a national average of 23.5%. Cornwall's population is predicted to increase by over 10% to reach 631,531 by 2031, with clear expected changes in the age profile which will have a direct influence on the requirements of bus services in Cornwall, in particular:

15 – 29s: This might reflect expectations for a growing higher education sector, and on a positive note, gives Cornwall a growing young working age population – we need to give greater priority for how we meet the needs of the young person's travel market (and implications for funding discounts between 19-25yrs).

Over 60s: Population growth in this category far outstrips other age categories and will influence the requirement to provide bus services that enable continued accessibility, recognising that a bus service can provide a lifeline to those who have no other means of transport. This does, however, increase the local authority's re-imbursement costs to operators at the same time as potentially reducing farebox revenue.



Map 1: Cornwall and local authority boundaries

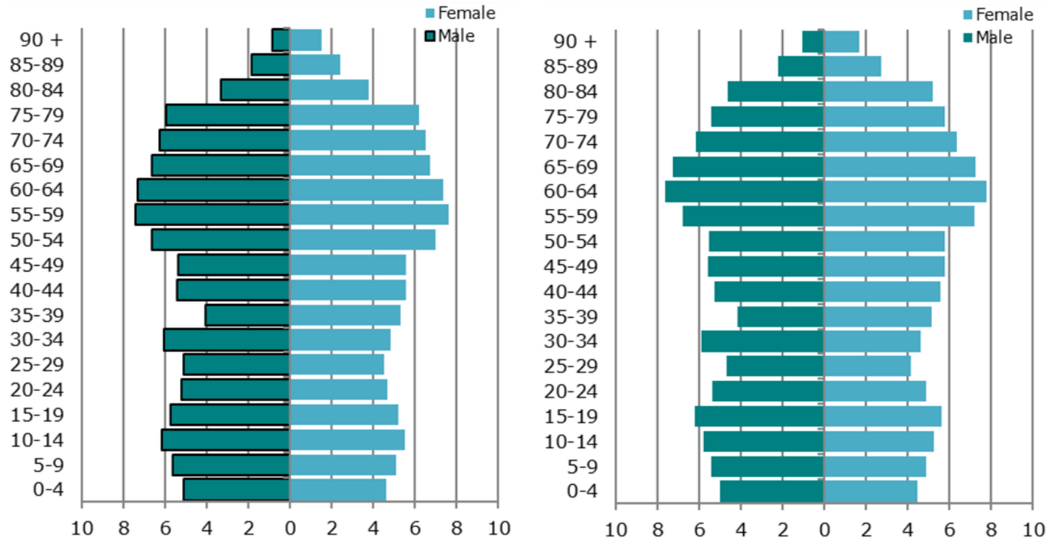
The population of Cornwall is dispersed and centred around towns (and cities in the case of Truro) although around half of the population live in small, dispersed settlements of less than 3,000 residents.

Cornwall has a population of

573,000

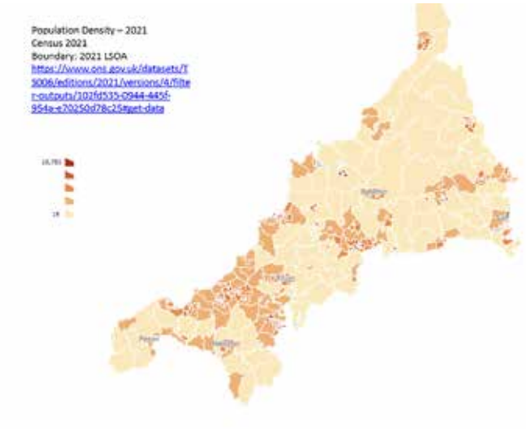


Fig 1: Cornwall's Expected Population Changes 2023 to 2028



Source: Population Projections - Cornwall Council
https://www.cornwall.gov.uk/health-and-social-care/public-health/joint-strategic-needs-assessment/population-projections/

Cornwall has a number of strategically important urban areas, which are formed from the towns of Camborne, Pool and Redruth (CPR), Falmouth and Penryn, St Austell, Penzance and Newlyn, Truro and Threemilestone, and Newquay. These are the only 6 urban centres in Cornwall with populations exceeding 20,000 and are the focus for employment, education and essential services.



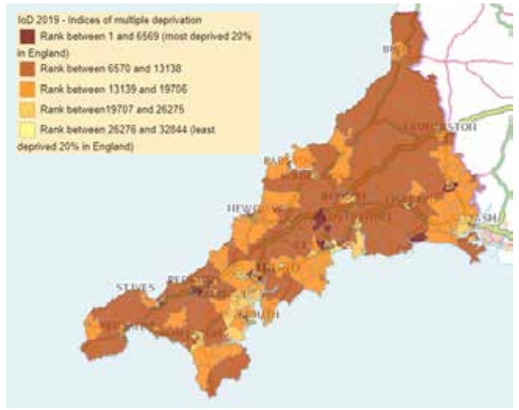
Map 2: Cornwall's population density

Half of the population live in small, dispersed settlements of less than

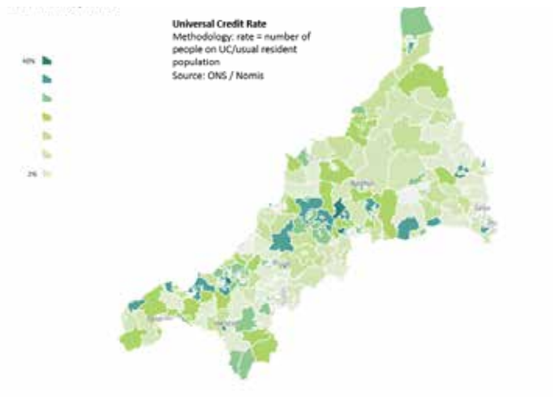
3,000

Deprivation levels

Deprivation manifests itself in low car ownership, low wages, high unemployment and high crime rates. Deprivation levels in Cornwall are high. 58% of Lower Layer Super Output Areas (LSOA) in the county, representing over 68% of the population, are within ranks 1 – 5 of the Indices of Multiple Deprivation (2019). Map 3 shows the Indices of Multiple Deprivation rank for all LSOAs in the county. Although deprivation is higher than in other areas of the country, unemployment levels are currently over 0.5% lower than the UK average. Map 4 shows the density of Universal Credit claimants.



Map 3: Deprivation levels



Map 4: Universal Credit Claimants 2021

> **Deprivation levels** in Cornwall are **high**.

Transport and travel

Road layout

The Cornish transport network is dominated by several strategic roads – the A30, A38 and A39 along with the main railway line to Penzance. The A30 (which is currently being upgraded in central Cornwall) provides the key strategic corridor between Penzance and Exeter, linking Cornwall with the regional and national road network via the M5 motorway. The A38 links south east Cornwall with Plymouth across the Tamar Bridge. The A39 provides a north west link to Bude and across to North Devon. A network of much smaller roads serves Cornwall's towns and villages, connecting them to the main centres.



Map 5: Road network

Car ownership

Cornwall has relatively high levels of car ownership, particularly in the more rural areas where often there is little alternative to driving. In 2021, just 15% of households had no car, down from 17.3% in 2011. 42% of households had 1 car and 43% 2 or more cars.



42% of households have at one car and **43%** 2 or more cars

Mode share

Cornwall has six Travel to Work Areas (TTWA) fully located in the county and three spanning the border between Cornwall and Devon and/or Plymouth.

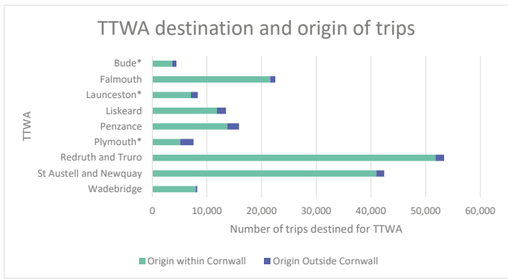


Fig 2: TTWA destination and origin of trips

*Destinations within the Cornwall area of this TTWA (excludes destinations within Devon and/or Plymouth area of the TTWA)

In terms of travel to work, Census 2021 indicated that 25% of workers were mainly working at home. 60% of workers used the car to work and just 1.3% (3,410) used the bus. This rose to 1.9% for all public transport, much lower than 3.4% for the South West as a whole and 7.9% for England and Wales.

(Note: the pandemic was still impacting workplace locations and commuting habits during the Census 2021.)

The Challenges for Cornwall

As a largely rural county with a dispersed population, the delivery of a comprehensive public transport network is challenging for both commercial operators and Cornwall Council, which provides significant support for bus services to provide a good standard of access and connectivity. The long journey times, challenging connectivity and high costs of delivery mean the bus has not compared favourably as a viable alternative to private car use. Such issues also create operational inefficiencies, jeopardising the viability of the services.

But for those without access to a car bus services are vitally important, particularly older and younger people, and for those that want to move away from a reliance on private vehicles. Buses can be key to levelling-up; users are disproportionately from less advantaged social groups and places. Improved services will strengthen communities, sustain town centres and reduce social isolation. Buses also have a critical role to play in the declared climate emergency.

And so, Cornwall Council and its bus operators are pressing ahead to deliver an ambitious bus network. By working together to address the challenges of planning and providing a high-quality bus network in a rural area, they believe that a significant change in travel behaviour can be achieved, delivering further passenger growth. Cornwall is a county that is recognised as progressive and forward-thinking in its transport ambitions and the alignment of the National Bus Strategy with Cornwall's vision will support the provision of its residents and visitors with a public transport system to be proud of.

> **Buses have a critical role to play** in the declared climate emergency.



2

At a glance

…We have made significant progress on delivering improvements to bus services as a result of the Devolution Deal, the One Public Transport System for Cornwall (OPTSfC) programme and the subsequent award of Bus Fares Pilot and BSIP funding to enable the delivery of schemes to further improve the public transport offer for our customers.

Prior to COVID-19 we had seen increases in patronage that were not being experienced in other parts of the country. Since the pandemic, Cornwall's bus patronage has bounced back and we are now seeing greater numbers of journeys being made on bus than ever before. This section explores the improvements that have been introduced since 2021 and insight into the passenger response:

- The Bus Fares Pilot and £2 Bus Fare Cap Grant are improving passenger satisfaction with value for money and lower and simplified fares are cited as a contributing factor to a greater use of bus. We are especially encouraged by a growth in fare paying passengers which positively supports the sustainability of the network. This growth is reinforced by stable levels of satisfaction - above average for rural areas and England as a whole - across all aspects of service provision, and most notably a growth in satisfaction with value for money.
- Reliability, frequency and buses that go more directly to more destinations remain key concerns for both users and current non-users. Improving the current reliability will help to instil confidence in the bus network which is vital is a rural area where many communities do not have the benefit of frequent and direct services, meaning that reliable services really are a lifeline for many. Our programme of BSIP bus priority works will help to address this going forward, along with a focus from operators that aims to deliver consistent reliability across the network.
- The customer information offer has significantly improved with the progression of integrated roadside and timetable information, plus a single website/app in development and new coordinated marketing under the Transport for Cornwall brand. Work continues to ensure that Transport for Cornwall is fully understood by our customers and that the benefits of engaging with the public transport network are portrayed positively to them.
- Branding and publicity is characterised by local operators, leading to a lack of cohesion and commonality across the network. The BSIP should therefore invest further in the **Transport for Cornwall** branding to ensure passengers are given a consistent and coherent message.

Introduction - The journey so far...

Before focusing on the priorities, it is important to recognise the excellent progress already made in improving bus services across Cornwall.

The Devolution Deal agreed with the Government in 2015 provided Cornwall with the mechanism to shape its transport services more effectively to meet the needs of residents and make journeys less fragmented. This OPTSfC work to date to introduce infrastructure improvements, lower emission and more modern buses, contactless payments and better information has been undertaken in partnership with operators and funded by the Local Growth Fund, Cornwall Council and the operators themselves, demonstrating the positive commitment to achieving our aims.

The delivery of OPTSfC interventions was focused specifically on the core network, taking a route-by-route approach to upgrading the basic waiting facilities (flags, timetable cases and shelters) and the addition of new vehicles into the fleet. Analysis undertaken at the end of 2019 showed that these upgraded routes achieved an average increase in patronage of 18% over the baseline (2015/16).

Since 2016, Cornwall has achieved continued progress in the development and enhancement of its public transport network. The award of £23.5m funding from Government to deliver the country's first reduced Bus Fares Pilot built on our foundation of improvements to date and provided the opportunity to address the challenging areas of fares that was set to make a significant impact on the attractiveness of bus.

The commencement of the Bus Fares Pilot from April 2022, aligned with the award of £13.3m BSIP (Phase 1) funding to implement a package of measures agreed with DfT that would help Cornwall work towards the delivery of its vision.

This was followed by a further award of £3.9m BSIP (Phase 2) funding in 2023.

Highlights of these three programmes so far are shown in the diagram on the following page:



Highlights of the Bus Delivery Programmes

One Public Transport System for Cornwall (2016-2020)

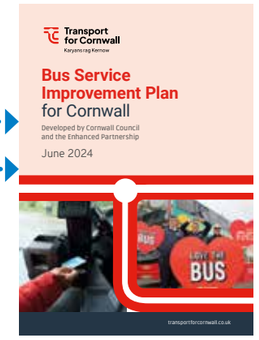
- £35m of private investment from operators on new, low emission buses.
- Innovative 8-yr local bus contract seeing investment in buses, additional mileage, integration with rail and schools.
- Development of single brand - Transport for Cornwall.
- Bus station upgrades at Newquay, Truro and Penzance.
- 80 new bus shelters and stop upgrades on core corridors. 2,300 new Transport for Cornwall branded bus stop flags and 2,400 new timetable cases.
- 335 real time information displays at bus stops, with real time information and wayfinding at rail stations.
- Removal of time restrictions for English National Concessionary Travel Scheme, allowing free travel at all times.

Bus Fares Pilot (2022-2026)

- Interoperability and introduction of Any Ticket, Any Bus.
- Most fares reduced by one third.
- Single range of fares products across all operators.
- Common discounts and eligibility for child fares.
- Tap-on / tap-off fares capping.
- Government-funded £2 Bus Fare Cap Grant, with both main operators participating.
- Evolving Product & Pricing Strategy.

Bus Service Improvement Plan (2022-2025)

- Bus priority schemes being delivered on our busiest bus corridors.
- Joint timetable and map showing all bus services and rail network.
- Young person's discount scheme to be launched in Summer 2024.
- Memorandum of Understanding with operators underpinning commitment and resource to consolidated information and marketing , engagement and communication activities.
- Single website/app in development.
- Annual marketing plan agreed including behaviour change campaigns.
- Focus group programme undertaken to gain insight on the impact of our delivery and to set future priorities.





Sources of funding for bus services

The table below identifies the revenue funding streams that deliver Cornwall's local bus network and the capital investment in bus since the BSIP (Phase 1) scheme delivery commenced in April 2022.

Budget/ funding	Source	Purpose	2022-2023		2023-2024	
			Capital	Revenue	Capital	Revenue
Local bus service support	Cornwall Council	Supported bus services contract	-	10,791,000	-	11,900,000
ENCTS Reimbursement	Cornwall Council	Reimbursement to operators	-	5,479,000	-	6,500,000
BSIP Phase 1	DfT		119,299	40,000	738,207	1,232,576
BSIP Phase 2	DfT		-	-	-	1,969,162
Bus Fares Pilot	DfT	Reduced fares trial	-	5,233,332	-	10,166,257

Note: This table does not include the current spend (c.£30m) on delivering statutory home to school travel assistance

Table 1: Sources of funding for bus services





What do people think about buses in Cornwall?

Your Bus Journey - 2023

The Transport Focus 'Your Bus Journey' survey in 2023 highlighted high levels of satisfaction with Cornwall's bus services, scoring higher than the average for rural areas and England as a whole on all measures.

	Total satisfied (%)		
Element	Cornwall	Rural areas	All England
Overall satisfaction	85	80	80
Value for money	75	69	67
Bus stop where bus was caught	76	75	76
Length of time waited for bus	71	69	68
Punctuality of bus arriving at stop	75	72	70
Bus driver	90	87	85
Length of time of bus journey	83	80	81

Table 2: Headline results from Your Bus Journey survey 2023

Those most satisfied with their bus journeys were older people (65+ years), many of whom would be travelling free under the English National Concessionary Travel Scheme. Lowest levels of satisfaction were expressed by young people (16-25 years).

Particularly of note is the value for money score at 75%, which was significantly up on the 57% in 2019. Whilst it is clear that the availability of the £2 fare cap has improved satisfaction, Cornwall has achieved an even greater increase in satisfaction than other areas where the £2 fare cap is in place, highlighting the success of the Bus Fares Pilot in reducing and simplifying fares and the ability to use any ticket on any bus through a full interoperability agreement between operators. With regards to dissatisfaction with bus services, by far the biggest cause was service punctuality.

Twenty-eight percent (28%) of respondents were using the bus to commute to/from work. The next largest groups were those travelling for leisure (19%) and shopping (18%).

Whilst 44% of passengers were travelling by bus because they did not have an option of travelling by any other means, encouragingly 14% were using the bus because it was more convenient than the car – significantly higher than the average figure across England of 8%. The survey also indicates that a higher proportion of bus stops in Cornwall had facilities such as shelters and information than other rural areas. Ratings for the on-board experience on buses in Cornwall, including security, comfort and cleanliness, were all higher than other areas. This was also the case for the bus driver in terms of helpfulness, attitude and smoothness of ride. These findings suggest that the Cornwall bus network has the potential to attract more use if improvements are properly targeted.

In order to understand the impact of some key interventions, additional 'local' questions were included in the Transport Focus surveys. 57% of passengers asked were aware of the Transport for Cornwall (TfC) brand and 62% were aware of the reduced fares offered through the Bus Fares Pilot. This insight has fed directly into developing the Transport for Cornwall brand strategy and promotion of bus fares and products.

Of those passengers indicating that they were using buses more often, the biggest reasons were to do with a change in personal circumstances (52%) and lower or simplified fares (37%). In Cornwall, compared to other places, the ability to use tickets with different bus companies and the combined bus operator timetables were significant factors.

Focus Group Programme

Whilst the findings of the Your Bus Journey survey are very encouraging and demonstrate the impact of the improvements we are delivering, there is clearly more to be done. Between 2016 and 2019, Cornwall Council commissioned its own customer research by way of a programme of focus groups to better understand what people want specifically from the bus network in Cornwall. This was refreshed in 2023 to provide comparisons with the situation pre-COVID and to help establish what our priorities for the bus network should be in the next few years.

The research highlights that:

- **Almost half of respondents are using buses more frequently, mainly due to lower fares.**
- **The more people use buses, the more likely it is to become part of their routine.**
- **Two fifths said they had made more bus journeys as a result of the reduction in bus fares.**

Key issues identified were service frequency, reliability and buses that go more directly to more destinations.

Bus users suggested that service performance had deteriorated and was inconsistent. Equally, non-users perceived that services were unreliable.



Fig 3: Word Cloud - bus network issues

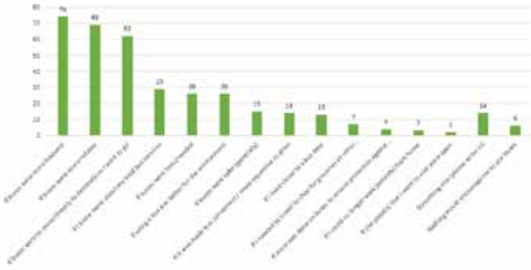


Fig 4: What would encourage greater bus travel?

> **"The prices are really good,** but ....buses are definitely unreliable **"**

Fares and ticketing were viewed positively:

- Reduced fares have encouraged more bus use, the £2 flat fare is perceived as good value for money and helps makes buses simpler to use and more accessible.
- £2 fare reversed negative customer views on flat fares encountered in previous research where respondents felt that it was unfair to charge the same flat fare for short and long journeys.
- Strong awareness of the headline fares promoted in Cornwall.
- Any Ticket, Any Bus was strongly supported and 'expected' in many cases.

> "Accepting tickets across the operators is **really convenient**"

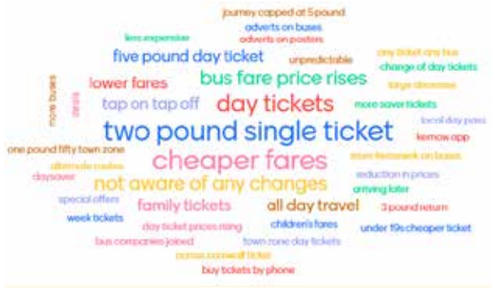


Fig 5: Fares and ticketing

> "**I think the flat fare is really good** because it makes it easier to use because you know what you will pay each time, and it makes longer journeys more accessible"

Understanding people's perceptions and experiences is helpful in setting future priorities, as follows:

One Network

- Focus on delivering the current network better, with consistently reliable services.
- Ensuring that the network offering can meet travel demand.
- A network that offers viable journey options with the availability of attractive services.

One Ticket

- Maintaining reduced fares to help provide good value and make buses easier to use.
- Important to maintain awareness of fares and ticketing offers.
- Maintaining interoperability.

One Brand, Timetable and Standard

- Consistent messaging and information for all, regardless of operator.
- Improve and simplify passenger information and its availability.
- Better promotion of journey opportunities so people understand what is on offer.

The findings of the research were shared with the Enhanced Partnership Group and an EP workshop held to discuss future priorities. Bus operators recognised the key issues and agreed that immediate priorities must focus on delivering our existing network to the consistent quality intended. This service reliability is central to encouraging greater confidence in the use of the network, providing a sound foundation for future development.

One Ticket

BSIP 2021 provides the evidence base around Cornwall's fares and ticketing. This section gives an overview of the fares and tickets available to bus users in Cornwall and looks at ticketing usage in relation to recent interventions.

Bus Fares Pilot (BFP)

Designed to assess the impact of lower fares on bus patronage, the Government-funded (£23.5m) 4-year Bus Fares Pilot (BFP) was launched in April 2022. The Pilot aimed to subsidise bus fares over a 4-year period with a view to incrementally increasing the public-facing fares while reducing the reimbursement to operators until such a time as fares were deemed to deliver a sustainable exit from the Pilot.

In the 3 months leading up to the launch, operators entered into an interoperability agreement to accept one another's tickets and began offering standardised child discounts for young people under 19.

Adopting a common approach to ticketing and ticketing products set the foundation for the commencement of the BFP in April 2022. At the time of the launch the Pilot initially provided an average reduction of 36% across all ticket types and introduced a number of 'headline fares' such as £5 Adult Cornwall Day (down from £9) and £20 Adult Cornwall Weekly tickets that allowed unlimited travel across the county. Town Zone fares were also introduced to encourage greater local bus travel.

These fares were complemented by 5 single and return fare bands, Town Zones and the Cornwall-wide products across adults and child fares. A family ticket for day and weekly travel was also introduced.

Tap & Cap technology was introduced in July 2022, allowing passengers to tap and tap off using their contactless payment device and having their journeys capped at the Day or Weekly ticket price.

Table 3: Bus fares pre-BFP - current

Demographic	Ticket Product	Pre-BFP	Apr-22	Jul-23	May-24
Adult	Cornwall Day	£9.00	£5.00	£7.00	£7.00
	Cornwall Week	£28.00	£20.00	£25.00	£25.00
	Cornwall Month	£100.00	£80.00	£90.00	£90.00
	Town Day	£3.00	£2.50	£2.50	£3.50
	Town Week	£13.00	£10.00	£10.00	£14.00
	Town Month	£50.00	£40.00	£40.00	£56.00
Child	Cornwall Day	£4.50	£4.00	£4.50	£4.50
	Cornwall Week	£14.00	£13.50	£15.00	£15.00
	Cornwall Month	£50.00	£45.00	£50.00	£50.00
	Town Day	£1.50	£1.50	£1.50	£2.20
	Town Week	£6.50	£6.00	£6.00	£8.80
	Town Month	£25.00	£22.50	£22.50	£33.00
Family	Cornwall Day	£18.00	£10.00	£15.00	£15.00/*10.00
	Cornwall Week	£56.00	£40.00	£50.00	£50.00/*30.00

*Fares reduced for the summer period to encourage sustainable tourism and assist with seasonal demand management on Cornwall's highway network

£2 Bus Fares Cap Grant (BFCG)

In January 2023, the Government introduced a national grant to cap single bus fares at £2 under its Help for Households scheme. Initially announced as a 3-month scheme, the BFCG was extended and is currently due to end in December 2024.

Since January 2023, both the BFP and BFCG have operated in parallel. Cornwall's bus passengers have therefore benefitted from the reduced fares delivered by both schemes.

The table below shows the changes to adult single fares from the period prior to the Bus Fares Pilot to May 2024.

Table 4: Adult single fares from pre-BFP - current

Demographic	Ticket Product	Pre-BFP	Apr-22	Jul-23	May-24
Adult	Single band 1	£2.00	£1.60	£1.60	£2.00
	Single band 2	£3.00	£2.00	£2.00	£2.00
	Single band 3	£4.00	£2.60	£2.00	£2.00
	Single band 4	£5.00	£3.00	£2.00	£2.00
	Single band 5	£6.00	£3.50	£2.00	£2.00

Impact of Fares Schemes

Key facts

- Over 6.6m discounted tickets have been sold, with over 12m journeys made, since the start of the BFP in April 2022.
- Passengers in Cornwall have saved over £14m since the Pilot began.
- As a result, total journeys on Cornwall's bus network are 13% higher in 2023 compared to 2019.
- Fare paying passengers have increased by 56% since 2019 and make up a far larger proportion of the total bus passengers (55% in 2023 compared to 40% in 2019).
- Interoperable ticketing has made travel easier to understand and more flexible – over 1m interoperable journeys have been made since the Pilot's introduction.
- Consistent ticket classifications mean more people can access cheaper fares: over 17,000 16 -18 year olds in Cornwall have access to child fares.
- 72% of all BFP journeys were on an adult ticket in 2023/24.
- 27% on a child ticket.
- 1% on a family ticket – currently very seasonal.
- The Pilot changed the tickets people buy, with notable growth in great value day tickets in the first year – during this time 30% of BFP journeys were made on day or bundle tickets.
- Since the introduction of the national £2 single fare cap, overall patronage growth has remained strong – but many passengers have shifted back to buying single tickets.
- Seasonal peaks normally experienced in the summer are not currently as extreme as previous years, suggesting patronage growth in the off-season.

Cornwall is now seeing record numbers of passengers using bus, with faster recovery from the pandemic attributed to the availability of lower fares in Cornwall from April 2022.

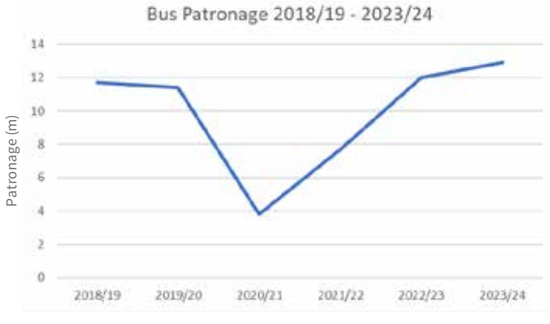


Fig 6: Bus patronage

Product Shift

In the first year of the Pilot, the headline £5 day ticket encouraged a notable product shift from single and return tickets, with the added value of all day travel attracting people to this ticket. In 2022/23 these accounted for 9% of BFP ticket sales and were being used, on average, 2.8 times. As the price of the day ticket was increased in July 2023 to £7, reflective of the availability of the £2 BFCG fares, the popularity of the countywide tickets reduced by 36% and accounting for 3.4% of sales, although ticket usage itself rose to an average of 3.1 times.

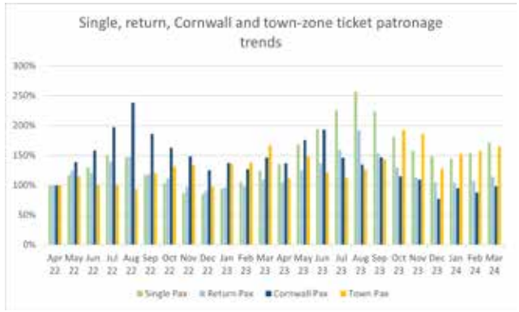


Fig 7: Ticket type trends

Throughout 2023 single ticket patronage was higher than the levels seen in 2022, demonstrating the appeal to users of cheaper and easy to understand fares. A 59% increase on the number of single tickets sold in 2023/24 was seen, compared to 2022/23.

Fare band 1 represents the shortest fare band in Cornwall – it has consistently been the most popular of the single bands, indicating the use of the bus for shorter distance trips remains strong.

Whilst growth of single tickets has been seen across all fare bands. There has been specific growth in the longer fare bands (Fare band 4 & 5) and the proportion of their sales now makes up 33% of single journeys, compared to 24% in 2022/23.



Fig 8: Adult single ticket sales

People are responding to best value and this graph shows the shifts between the share of discounted tickets at key points in Cornwall's fare journey:

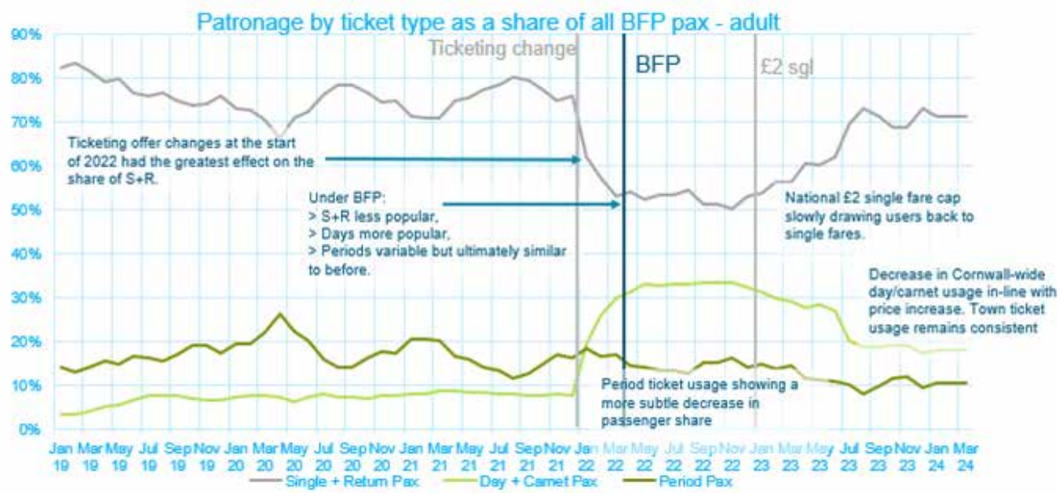


Fig 9: Patronage by ticket type as a share of all Bus Fares Pilot Passengers (Adult)

Cornwall has delivered a growth in farepaying passengers throughout the term of the BFP so far – now accounting for 55% of all bus patronage. Growing the farepaying passenger base was an aim of the Pilot and we are comforted by this growth, recognising the impact on the financial viability of the network going forward.

Whilst concessionary passengers are slowly returning to bus following the pandemic, they currently account for 23% of passengers (32% in 2019) and Cornwall is keen to encourage the return of these passholders.

Education now accounts for 14% of bus patronage – similar to 2019, but with a lower proportion of movement on University tickets.

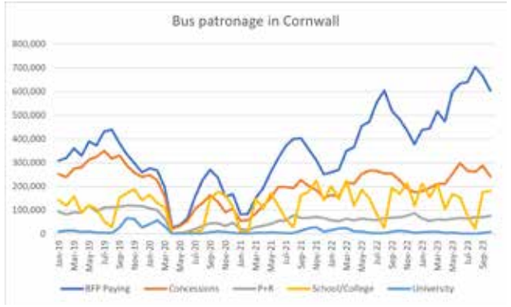


Fig 10: Bus patronage by passenger type

Other fare schemes

In 2023/24, the Council and its operators have achieved real progress in establishing ticketing schemes to help targeted groups:

- Funded by Cornwall Council, free bus travel for care experienced young people under 25 yrs old was launched in June 2023. Nearly 5,000 journeys were made in the first 10 months of the scheme, providing vital social, employment and educational links for this cohort.
- Funded by operators, Transport for Cornwall became a Recognition Partner of the Tempo Time Credits charity to reward the valuable work that volunteers undertake across the community. Volunteers can exchange volunteering time credits for bus tickets to assist access volunteering opportunities or to enjoy at their leisure.
- Funded by the Government, Cornwall Council was awarded funding in 2024 to reduce health inequality and make active lifestyles more attractive and achievable. Bus operators have agreed to work in partnership with the Council's Active Travel Social Prescribing team. This team 'prescribes' free bus travel to enable access to active travel opportunities, supporting adults to change and embed sustainable travel into their lives.

Looking forward

Ensuring that fares remain at a financially sustainable level for bus operators and the public is vital to maintain and grow both patronage and the network further.

Cornwall and its operators are committed to working together to ensure that the fares and ticketing offer remains attractive and affordable, recognising the impact that the simplified and more affordable fares introduced by the Bus Fares Pilot and Bus Fares Cap Grant have had on patronage.

Having reduced child fares and standardised the eligible age to all under 19s, Cornwall is now exploring discounts targeted at local young people to reduce the transition from child to adult fares as young people move into higher education and employment. with the aim of keeping young people up to age 25 years loyal to bus travel for longer.

Following the success of Cornwall's pilot providing free bus travel to care leavers, there is a wider recognition that targeted fares discounts for those most in need carries many benefits in terms of access to essential services and wellbeing. Additional groups will be considered for targeted fare discounts in the future.

A Product & Pricing Strategy is currently in development which will help to manage a sustainable exit from the Bus Fares Pilot. This Strategy will identify fares and ticketing products that are attractive to passengers, aimed at encouraging wider bus use, as well as generating the revenue required to support the network. It will also identify opportunities for future product development and transitioning

One Network

BSIP 2021 provides the evidence base around Cornwall's network. This section gives an overview of the network in relation to recent interventions.

Supported Service Contract

Cornwall Council supports circa of 50% of the mileage operated in Cornwall. The supported network is currently contracted to Go Cornwall Bus until March 2028 (8-yr contract). This followed the Council's aim to identify opportunities to create strategic relationships with key suppliers that would share the same vision and ambition for Cornwall and allowed long term planning and investment into Cornwall's transport network.

The awarded contract represented a significant milestone to the transport provision in Cornwall, with a strong focus on quality, increased focus on customer experience and value-adding opportunities, while retaining the presence of small operators in the market via sub-contracting arrangements. The starting date of the contract, March 2020, coincided with the outbreak of COVID-19. This delayed the materialisation of the ambitious growth aspired to with the amalgamation of all supported routes into one single package and the integration of over 100 school routes at the point of award. Better connections with rail were also introduced, reducing waiting times in stations and allowing a holistic approach for end-to-end journeys.

Additional school routes have been integrated into the public transport network (now over 130), providing operators with certainty of revenue and allowing the Council to offer a greener solution by minimising the need for additional vehicles. The opportunity for integration is reviewed at each network review.

Network Communications

Network updates and changes are communicated to Elected Members via an All Members Briefing hosted by the Council and with the operators in attendance. This provides an opportunity for building a culture of 'no surprises' with Members so changes can be confidentially communicated in advance and for feedback to be received after the Spring and Autumn changes. This has resulted in strong support for public transport, with Members playing a crucial role in developing and introducing initiatives such as the Newquay Pop-up Park & Ride (now in its 3rd year) and the Saltash Red Bus service.

Working Together – Network Improvements

With the "making" of Cornwall's Enhanced Partnership (EP) in Apr 2022, Cornwall was able to share its aspirations with commercial operators and work towards an integrated network. The making of the EP seals the commitment of Cornwall Council, its bus operators and stakeholders to further improve public transport connectivity and access to facilities and services, offering a viable alternative to car use. This combined approach aimed to overcome the drop in patronage suffered during the pandemic and re-establish the virtuous cycle of growth and development that was underway before the pandemic.

With an emphasis on keeping the network stable, the Council and operators work collaboratively to carry out intelligent network reviews, led by data and evidence to maximise the utilisation of resources and provide the public with the best travel opportunities.

Using BSIP funding, a new approach to delivering rural transport was launched in April 2023 in partnership with a community transport provider, Saltash Red Bus (SRB), and Go Cornwall Bus (GCB). This innovative approach sees GCB provide support for service registration, planning and the supply of ticket machines while SRB provide the vehicles and drivers that facilitate vital links for extremely rural communities.

Case Study:

Saltash Red Bus



In October 2022, following the withdrawal of a handful of underused bus services in south-east Cornwall by Go Cornwall Bus (GCB), a new Community Bus service to plug some of the gaps left by the service withdrawals was developed.

Local Councillors and residents were concerned that some very rural communities would be left isolated without access to public transport and approaches were made to bus operators and Cornwall Council.

Utilising BSIP revenue funding for 2 years, Saltash Red Bus (SRB) and GCB began working together to operate 7 routes under a Section 22 Registration in April 2023.

GCB assisted with timetabling, supplied ticket machines and associated infrastructure and supported the service set-up and registrations. SRB supplied the vehicles and the staff to operate the routes.

To make efficient use of resources, routes are operated between SRB's existing school runs and offer journeys to various towns where passengers can access health appointments, work, shopping and social opportunities.

The routes now in operation have been amalgamated to four but patronage numbers are steady and growing; a duplicate vehicle now operates on one of the routes. The Council and bus operators continue to review the service operation to identify future opportunities for service improvement and potential expansion of this operating model.

BSIP Phase 1 and 2 revenue funding has also been utilised to stabilise the network and secure socially necessary services between and to key towns. This revenue funding was absolutely critical to maintaining the bus network on which growing numbers of Cornwall's residents rely. Enhancements were funded on services between Newquay and Truro where there are higher proportions of young people making use of the night-time economy. The requirement for evening services in Newquay is further corroborated by a new partnership between the Council, Devon & Cornwall Police and First Bus which will provide a late-night bus service, funded by these partners (Including BSIP), over the summer and Christmas periods. Specifically targeted and ensuring the safety of residents and visitors to the area, the provision of the Newquay Night Bus aims to reduce antisocial behaviour and violence against women and girls.

Looking forward

Cornwall Council continues to reinforce its commitment to the public transport network by spending c.£43.3m a year providing public transport, school transport and the Truro Park & Ride. However, while absolutely necessary, this still presents an immense financial challenge for a rural setting. Cornwall keeps bucking the national trend and our priority is to keep the current network stable, enhance its quality and provide services that are a lifeline to local communities.

Recognising barriers to the growth of public transport in Cornwall due to its rurality, population density and demographics, the requirement for people to use the car for specific journeys will remain. However, as seen in the One Ticket section, growth in the proportion of passengers making longer journeys by bus is particularly encouraging and would suggest that, if delivered with the right conditions (frequency, connectivity, affordability), the connectivity needs of a growing number of passengers are being met.

The results of the Your Bus Journey survey 2023 demonstrates many positive results for Cornwall but also offered insight on the bus passengers' views on areas for improvement. A total of 74% of bus passengers in Cornwall are satisfied with connections with other forms of public transport (e.g. trains), in line with the overall level of satisfaction for rural areas (73%) but below the England average (76%).

Cornwall is at the centre of a revolution in the way that people move around, with huge investments in public transport with ground breaking initiatives such as the successful bid for a £50 million grant from the Government's Levelling Up Fund towards the £56.8 million Mid-Cornwall Metro (MCM) initiative. The project will help transform transport links in Cornwall. Residents will be able to better connect to employment, education (including higher education and university), and key services. Working with delivery partners GWR and Network Rail, the new coast-to-coast rail service will create a sustainable transport corridor through central Cornwall. It will improve the current links between four of Cornwall's largest towns: Newquay, St Austell, Truro, and Falmouth/ Penryn.

> "Cornwall is at the centre of a revolution in the way that people move around, with huge investments in public transport"

MCM will also provide further opportunities for public transport to be harnessed in a rural setting by increasing options for seamless travel and for bus travel to provide additional links between main and branchlines and our rural communities. When opportunities arise, our aim is to continue to work with operators to identify opportunities for the growth of existing services via introduction of increased frequencies, evening and Sunday provision and services where there is evidence of increasing demand (such as new housing developments and student accommodation).



One Standard

BSIP 2021 presented the evidence base around the standard of Cornwall's network. This section gives an overview of the standard of the bus network in relation to recent interventions.

Cornwall's aspiration is that buses will be simple and easy to use and have a consistent standard of service and infrastructure across the county. This section gives an overview of the impact of traffic on bus operations, local bus reliability, the fleet and wider infrastructure provision .



Bus Operations

Traffic Levels

Traffic levels in Cornwall increased by over 43% between 2000 and 2019. Lockdown had a considerable impact on traffic levels during 2020 but had returned, by 2023, to just 2% under pre-lockdown levels. The rise of car use creates increasing strain on the rural road network and key arteries in the county; with the addition of seasonal holiday traffic further exacerbating the situation, impacting both bus journey times and reliability. During the peak summer months, Cornwall experiences, on average, a 12% increase in traffic levels due to the impact of tourism and visitors to the county. Such levels create difficulties across the network and, most notably, in popular tourist locations.

High car use and increased traffic are key factors that contribute to poor network reliability. Bus reliability and punctuality are key concerns for operators and Cornwall was awarded BSIP funding to help address specific corridors and introduce bus priority measures.

Reliability

Service reliability remains a key issue for Cornwall Council and the bus operators to continue to address. BSIP 2021 detailed the factors impacting reliability in Cornwall (variations in congestion, streetworks and road traffic collisions) and these remain, the impact of streetworks playing a very significant role in the reliability of services over the last two years. Long term works to dual the A30 (due to complete this year) have severely impacted the highways network and bus operations, causing congestion, road closures and diversions. Cornwall's bus network reliability is now at 71% for 23/24 and, whilst this is an improvement on 22/23 (67%), this must improve if it is to instil confidence back into bus users and potential passengers. In the Your Bus Journey survey only 58% of passengers considered bus reliability in Cornwall good. Although slightly higher than the national average (56%), this provides significant evidence that addressing reliability is a core priority for the Council and its operators.

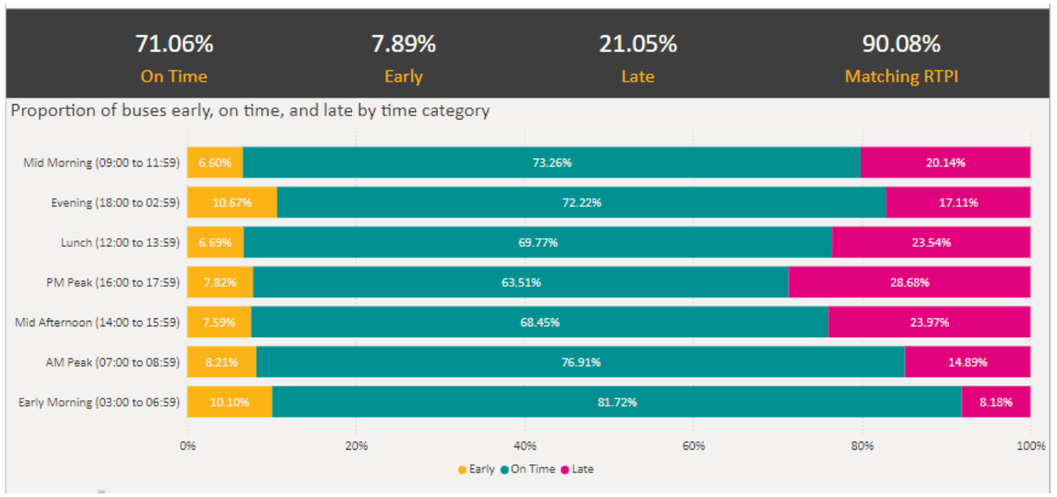


Fig 11: Local bus service reliabilty 2023/2024

Bus Priority

Cornwall's BSIP funding for bus priority improvements on busy bus corridors was aimed at improving journey time reliability, bus operations and efficiency. Work is underway to deliver capital improvements on the A390 in Truro, Falmouth-Penryn corridor and in Camborne- Pool-Redruth. These improvements are being delivered using a sustainable corridor approach, utilising funding from active travel where available to deliver coordinated interventions that jointly benefit bus users, cyclists and pedestrians. This will involve sections of bus and cycle lanes, easier access to bus stops for pedestrians, crossing points and traffic signal priority to ensure that buses are given priority at key junctions.

With the successful bid for BSIP, a targeted approach for infrastructure improvements has been implemented on key corridors and at strategic sites in Penzance and Liskeard, ensuring that the BSIP is able to improve transport infrastructure from the east to the far west of the county. A combination of junction changes and lining restrictions at Penzance Bus Station aim to improve access to the bus station for services and priority from the site for departing vehicles. In addition, improved footway connectivity plans are to be incorporated facilitating better access for customers between the town and the rail and bus station.

Large-scale bus priority schemes in a rural setting can be a challenge due to spatial limitations and the limited frequencies of services that may benefit. More localised issues stemming from inconsiderate parking blocking access to residential areas often cause severe delays to services, negatively impacting the performance of the network. The Council's Transport and Highways teams work closely to address these issues.

One such scheme involving a revision to road layout, addressing parking and access, received positive feedback from the local bus operator in the week following its inception:

> "**.....I am pleased to say we are already seeing a positive impact.** Drivers are reporting a much safer passage around the estate, especially with the junction and road widening in the worst places. .....Now we're looking forward to the next huge improvement, which will be the new parking restrictions."

Infrastructure & Technology

The Council is maximising wider funding and linking with other development opportunities, as exemplified in the Liskeard Cattle Market. This site, with a BSIP-funded new bus interchange at its heart, will receive a complete uplift, with new working spaces aimed at attracting business to the area, a new council building and combined GP surgery. BSIP funding will directly improve access to this new economic space.

Investment in Cornwall's roadside infrastructure is seen as a priority for the Transport for Cornwall partnership. Establishing a strong Transport for Cornwall presence and a high standard of bus stops and interchanges with appropriate facilities – shelters, flags, timetable information, RTPI – is considered a fundamental step in attracting customers and improving the appeal of bus travel.

Cornwall Council currently owns 4 bus stations which are leased to operators. An additional 3 bus stations are owned and operated directly by Cornwall's bus operators. There are currently c.6000 bus stops, of which c.3000 have some form of infrastructure. A rolling programme of improvement, undertaken on a route-by-route basis has taken place in recent years. Whilst all stops are correctly branded, there are many stops with mixed provision of facilities – some simply have a pole and flag, with others benefitting from passenger waiting shelters with RTPI. The remaining c.3000 bus stops, in rural areas are generally classed as hail and ride locations and many of these have little or no infrastructure.

The continued investment in the RTPI system over the past few years is a key feature in helping to enhance the bus product to customers by enabling live bus journey information to be made available. The electronic RTPI signs have the ability to display the bus times, destinations and service numbers of successive buses which are due to arrive at the stop. The Council continues to progress the roll-out of further RTPI at key stops across Cornwall. This is considered using the Section 278 and Section 106 funds and the Council's capital budget.

Shared Operator Facilities

The redevelopment of Longrock Depot, also funded by BSIP, is set be an innovative approach to partnership working in Cornwall. The site is currently occupied by two of Cornwall's largest operators, along with the Council, but the facilities are insufficient to support a modern bus fleet that is focused on partnership working. This new shared operator facility will benefit from rationalised routes of access to the site, removal of internal boundary walls, provision of new shared bus operator facilities (fuelling, bus wash, training and staff welfare) and prepare the site for future potential development related to improving the transport depot for bus operators e.g. electric charging depot infrastructure.

Technology continues to be an enabler for addressing reliability issues, with strong partnership working between the internal teams in Cornwall Council and bus operators for testing traffic signal priorities for buses. Regular consultation and engagement with operators takes place and helps to identify pinchpoints on the network and deliver targeted interventions.

Bus Fleet

Following investment in the fleet in recent years, Cornwall's local bus network is operated by over 190 lower emission buses. This has resulted in the average age of Cornwall's local bus fleet being 7 years old, with the supported fleet average age sitting at just 4 years old – a significant achievement for a rural county.

An Ultra-Low Emission Bus (ULEB) Strategy that identifies a pathway to introduce ULEBs to the local bus network in order to address Cornwall's carbon neutral goal has been developed. This fed into the Zero Emission Bus Regional Areas 2 (ZEBRA 2) bid that Cornwall, and a joint bid with Plymouth City Council, were successfully awarded funding for earlier this year. The ULEB Strategy also identifies future opportunities for the roll out of alternative fuel vehicles at key locations optimal to network operations.

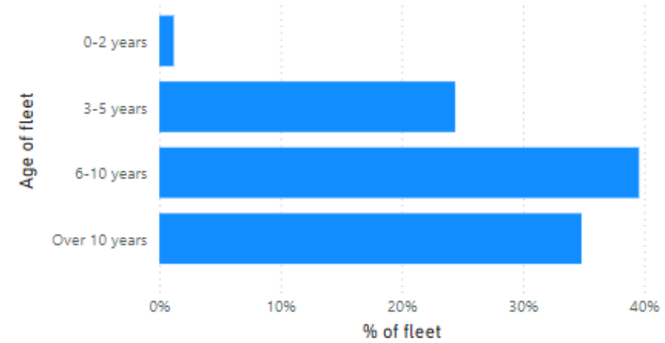


Fig 12: Age of local bus fleet

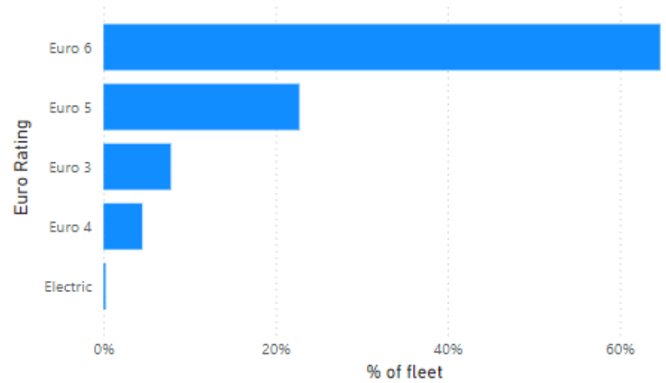


Fig 13: Euro Emission Rating of the Local Bus Fleet

*Electric entry above is a 7 seat vehicle

Looking forward

The expansion of Traffic Signal Priority (TSP) schemes that give bus services priority at key locations is central to Cornwall's bus priority plans and a countywide programme for TSP is an aspiration.

Where the introduction of bus lanes is not possible due to reduced road space, technology will be the chosen solution to allow late-running buses to flow. The aim is to ensure that opportunities for buses to be delayed are reduced, and that journeys made by buses are more comparable in time with car journeys, if not quicker in certain areas. Continued close working with highways and parking teams to address concerns over efficient use of road space will be prioritised.

Road works continue to provide a significant challenge, especially in residential areas with limited road space to be negotiated. There are already strong links with utilities companies, Highways England, internal teams and other parties, and the streetworks permit system in place is in accordance with the legislation. However, there is an opportunity in 2 years' time when the road classifications for embargoes are updated to reconsider how bus routes fit within the spatial planning for street and road works. From a policy point of view, the Council will review internal protocols to create awareness of the Local Transport Plan and the modal hierarchy and how this needs to be adopted by all. If road works typically maintain access for pedestrians, the Council aims to ensure that this can incorporate cycle journeys and buses. There will be continued investment in systems and data sources to demonstrate and address the impact of road works on bus service reliability.

As service reliability is such a key concern, highlighted by performance data and through the customer research, the Council and operators consider this a key priority to address and improve going forward. This will be the focal point of regular operator meetings with action planning and monitoring remaining in place to track improvements.

The enhancement of Cornwall's bus infrastructure is seen as a targeted intervention to support modal shift and make it easier and safer to reach bus stops by walking and cycling, including for those with impairments. As work continues towards achieving the aspiration for One Standard, the Partnership wants to ensure that the customer experience is further enhanced and has an ambition to upgrade infrastructure and embed the latest technology (RTPI & electronic bus timetable information at stops) for the benefit of passengers. There is a strong desire to standardise the offer at bus stations in terms of facilities, waiting areas and shelters - making them fit for purpose and our future network demands. Bringing all bus stops up to a basic standard and delivering a main stop in each village that has a shelter and RTPI is vitally important to supporting the connectivity of our communities and an investment that needs to be made to meet the needs of passengers. Further, the Partnership seeks to work with partners and improve accessible information for people with impairments to ensure equity of access to the bus network.



Transport Strategies for specific towns are being progressed and the Council and operators will work with local communities to ensure that consideration for public transport is at the core of future plans. Further, that bus stations, stops and shelters are fit for purpose, at the right locations, and provide the facilities required to improve the customer experience and bring more people to think 'bus first' when planning their journeys. This will also be picked up through ongoing work with schools to ensure that a behaviour change programme is in place to reduce traffic and congestion at peak times while growing patronage on the bus network; the use of mobility hubs and interchanges as school transport hubs is also an ambition.

With Longrock Depot being a starting point, the Cornwall Council is now embarking on a project to review depot facilities utilised by the Council and its strategic partners (such as Highways, Waste, transport operators and public car parks) within Cornwall so that locations can be optimised for shared facilities in the future with regard to energy usage, carbon impact and fleet optimisation. The aim is to ensure that the right depots are available at the right locations with the facilities that enable opportunities for co-location and efficiencies.

Cornwall's bus operators have supported the Council's development of its ULEB Strategy and pledged not to purchase new diesel vehicles from December 2022 with aim of having a full zero emission bus (ZEB) fleet by 2035. The ZEBs will make a substantial contribution to kickstarting the decarbonisation of the public service fleet in the County and the delivery of the Council's priority outcomes.

Following the award of ZEBRA 2 funding earlier this year, Cornwall's first zero emission buses will be introduced to Cornwall's fleet in 2025. These projects will introduce 8 x and charging infrastructure to the Truro Park & Ride and Falmouth Town Service. In partnership with Plymouth City Council, Cornwall was also successful in a joint bid to electrify Go Ahead's Plymouth (Milehouse) depot. This will see 6 x ZEBs entering service in south east Cornwall.

The arrival of these vehicles will provide much-needed local experience of electric bus operations for Cornwall's operators, particularly the smaller operators who do not have the same support that the national group operators have. However, the TfC partnership approach will ensure that this experience and expertise is available to all as a learning opportunity.

> "Cornwall's first **zero emission buses** will be introduced to Cornwall's fleet in 2025."



One Timetable and One Brand

BSIP 2021 gave a detailed overview of the information available and the vision for the development of a single brand. This section provides an update in relation to recent interventions in this area.

Transport for Cornwall brand

Cornwall's bus network is unique; the mix of commercial routes and routes that require support from the Council in order to be financially viable and continue to deliver connectivity in a rural area are seen quite differently by the public. The Transport for Cornwall (TfC) partnership is developing a brand strategy to position TfC as a connector of communities, people and places – a brand that represents a Cornwall with public transport at its heart.

With the introduction of interoperability and 'Any Ticket, Any Bus' in January 2022, it became a priority to ensure that passengers in Cornwall would understand this as a unified offer, available across Cornwall's operators. With the "making" of the Enhanced Partnership in Apr 2022, an extensive piece of work has been undertaken to develop the standard required for on-bus branding and integrated roadside information, bus timetable booklet, network guides and maps - allowing the public to understand that Transport for Cornwall provides all the information needed about using the bus network in Cornwall, all in one place.

Availability of information

Operators currently have free apps available for download providing customers with the ability to plan journeys, access real time information and use live tracking to track buses. These apps also allow customers to purchase period pass tickets.

With the introduction of the suite of integrated information, public transport has become easier to understand and use. Building on the very popular integrated timetable booklet and the countywide map, progress has been made to integrate roadside information so that customers have one coordinated display, along with a QR code that links to the existing Transport for Cornwall microsite to provide further information.

Marketing

Recognising the importance of portraying public transport positively and in a way that these messages are visible and relatable is the first step to attracting attention and having people 'tune-in' to public transport. Engaging marketing and promotional campaigns are a key ingredient in the delivering the benefits of public transport to a wider audience.

To this end, on behalf of Transport for Cornwall, Cornwall Council has engaged a marketing agency to carry out marketing, communications and engagement activities going forward. The Council and operators agree the annual marketing plan, target audiences and behaviour change strategies to promote wider awareness of the bus network in a way that will resonate with its markets; this is essential to be able to reach the various sectors (such as residents, commuters, tourists).

A huge step for TfC, this work is included within a Memorandum of Understanding between the Council and the two largest operators who have each committed funding and pooled resources to deliver this integrated approach to information provision and simplifying the offer for the customer. This innovative approach is formalised further through a specific EP Scheme for Marketing which is in the process of being adopted.

Looking forward

Following the introduction of the Transport for Cornwall brand, work is underway to make sure that the public can connect with the brand and understand more about what TfC can do to help them in their everyday lives. An evidence-led approach to delivering behaviour change is a key factor in driving real, long-term changes in behaviour.

The use of the Transport for Cornwall brand has evolved over recent years, the visual identity has been steadily rolled out across bus interchanges, fare and timetable information, marketing, core service announcements (e.g. route updates) and vehicles. TfC branded fares and general bus promotions have taken place at significant scale since the start of the Bus Fares Pilot in April 2022 and while recent focus group work has revealed that recognition of the TfC brand is strong, people's understanding of what Transport for Cornwall is/does and its value to those who visit, work and live in Cornwall needs further work. Therefore, the forthcoming brand strategy deployment over Summer 2024 aims to boost this and place TfC and its brand values firmly in the public domain, reinforcing its position and the benefits it provides to the community.

Also over the Summer, the Transport for Cornwall combined app and website will launch, promoted by a product launch campaign encouraging people to download the app and receive full bus journey planning information and ticket retail in one place. Starting with the two main operators, the app has the ambition to be the single point for information for buses, Beryl bikes, rail and other modes of transport.

The roadside information will continue to evolve as processes are refined between operators to improve the data exchange of timetable information. As the new TfC website/app is launched, the QR codes that currently feature on roadside information will link to live bus tracking available on the new TfC platform. While this information will be available online for access anywhere, these specific links will ensure that at all stops with physical infrastructure, customers have the ability to directly access live bus data – a further step forward in confidence building in the network.

The MoU and EP Scheme for Marketing will evolve based on feedback to the brand strategy and marketing campaigns planned for the year ahead. This is an exciting area of work that is able to respond to passenger growth and demand and, by working together, collaborate on joint communications that can drive real changes in travel behaviour.



Summary

This section draws together insights that inform the current state of the bus network. This insight is then used to inform future ambitions and actions in the following sections, such that they are targeted in the areas of greatest need and where they will have most impact. The following strengths and weaknesses analysis captures and summarises the main issues in line with local and national objectives.



Performance of Cornwall's current bus network against the ambitions of the National Bus Strategy and BSIP

National Bus Strategy ambitions

- Cheaper
- Easy ticketing

Cornwall BSIP

Workstream

- **One Ticket**

Ambitions

- Seamless travel
- Fares clear and simple, offering good value
- Ticketing easily understood and simple to use across the network
- More affordable travel for those who need it

Strengths

- ✔ Consistent range of tickets available that can be used across the network, regardless of operator
- ✔ Tap and cap payment available
- ✔ Discount good value fares as a result of Bus Fares Pilot and Government's £2 fare cap
- ✔ Consistent fares discounts for all under 19s
- ✔ Ticket 'bundles' offer further discounts compared to individually priced tickets
- ✔ Free travel for care leavers
- ✔ Data held for the delivery of the Bus Fares Pilot is gives a detailed insight into ticketing product and travel behaviour
- ✔ The proportion of fare-paying passengers has increased through the delivery of the Bus Fares Pilot and £2 Bus Fare Cap Grant, improving the sustainability of services

Weaknesses

- ✖ The best value period tickets require high upfront payment
- ✖ Lack of ticketing products aimed at group travel

Performance of Cornwall's current bus network against the ambitions of the National Bus Strategy and BSIP

National Bus Strategy ambitions

- More frequent
- More comprehensive
- Better integrated

Cornwall BSIP

Workstream

- **One Network**

- Network simple to understand and convenient
- Extensive network of directly routed services offering attractive levels of connectivity and availability
- Well-planned (co-ordinated) network that maximises travel opportunities and provides confidence to users
- Services that are increasingly commercially viable

Strengths

- ✔ Extensive network
- ✔ Existing Park & Ride provision
- ✔ For the type of area, relatively good levels of service (commercial and supported), including evenings and Sundays
- ✔ Strong support for bus by Cornwall Council
- ✔ Significant network of supported services
- ✔ Strong patronage compared with other rural areas and exceeding pre-pandemic levels
- ✔ A greater amount of data is shared by operators and held by the Council giving improved insight into operation and performance
- ✔ Large number of visitors provide potential demand
- ✔ Planned growth could increase demand for bus
- ✔ Potential to convert car journeys to bus in Truro and towns
- ✔ Strong partnership working with collective desire to achieve improvements
- ✔ Community transport responding to local needs

Weaknesses

- ✖ Dispersed settlement patterns and travel demands
- ✖ Lack of co-ordination between operators on certain corridors
- ✖ Public engagement indicates people want frequent services and direct buses to more destinations
- ✖ Lack of early morning and late evening buses
- ✖ Specific tourist-related services not always integrated into overall network



National Bus Strategy ambitions

- Faster and more reliable
- Better to ride
- More understandable
- Greener



Cornwall BSIP

Workstream

- **One Standard**

Ambitions

- Buses simple and easy to use, offering a consistent standard
- Positive experience of bus travel – high quality, convenient, pleasant, comfortable, reliable
- Efficient and effective bus operations, supporting wider policy objectives

Strengths

- ✔ Relatively new bus fleet
- ✔ High levels of user satisfaction
- ✔ Funding secured for introduction of zero emission buses

Weaknesses

- ✖ Congestion hotspots
- ✖ Worsening traffic situation with planned growth
- ✖ Reliability issues from congestion caused by visitor traffic and impact of large events
- ✖ Variable provision and quality of bus stop infrastructure
- ✖ Public engagement shows lack of confidence in using the bus

Cornwall BSIP

Workstream

- **One Timetable and**
- **One Brand**

Ambitions

- Bus viewed positively by all and as a desirable way to travel
- Bus network is stable, visible and widely understood
- Customers understand the Transport for Cornwall brand and what it represents

Strengths

- ✔ Transport for Cornwall (TfC) brand and marketing well established, including TfC website
- ✔ Joint council and operators group to oversee and direct information and marketing provision
- ✔ Comprehensive bus network map and timetable booklet available
- ✔ Real time information displays at over 300 stops
- ✔ 2300 TfC-branded bus stop flags and 2400 timetable cases at bus stops
- ✔ Coordinated service change dates
- ✔ Single Bus Passenger Charter covering whole network
- ✔ Work to commence on encouraging travel behaviour change and use of more sustainable modes

Weaknesses

- ✖ Uncoordinated route numbering



Section 3 | **Improvement programme - since BSIP 2021**

3

The following table details the improvements made in the last two years since the original BSIP submission and formation of the Enhanced Partnership, set against the One Public Transport System for Cornwall workstreams and ambitions (columns 1 & 2).

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress since October 21	Future actions
One Ticket	Seamless travel – so customers don't need to worry and can trust that they get best value. This means: • Fares that are clear and simple, widely known and offer good value • Ticketing products that are easily understood and simple to use across the entire public transport network • More affordable travel for those that need it	Interoperability - operators accept one another's tickets	Achieved interoperability January 22. Cited as a 'gamechanger' in our customer research, this has enabled over 1m interoperable journeys since inception.	Operators will continue interoperability as a BSIP 2024 commitment.
		Child fares extension to under 19s	Interoperability in January 2022 also saw operators adopt the same age range for child fares (under 19s) and level of discount given (50% adult). These fares are maintained in the current shadow fares that sit behind the Bus Fares Pilot.	Operators will continue child fare parameters as a BSIP 2024 commitment.
		Bus Fare Pilot (BFP)	Delivered from April 2022 – initial one third discount on fares. Marketable headline fares at launch led to noticeable product shift from sgl/rtn to multi-journey day tickets. Has been operating alongside the national £2 Bus Fares Cap Grant since January 23.	Continue to deliver good value fares discounts while BFP funding is in place.
		Tap & Cap	In July 2022 as part of the BFP, contactless Tap & Cap payments were introduced as a quick and easy way to pay for Adult Day & Weekly tickets.	Operators will continue Tap & Cap as a BSIP 2024 commitment, extending its roll out to appropriate products in line with the P&P Strategy (below).
One Ticket (cont.)		Care leavers' free travel	Achieved through the Enhanced Partnership and funded by Cornwall Council, free bus travel for care experienced young people under 25 yrs old was launched in June 2023. Nearly 5,000 journeys were made in the first 10 months of the scheme, providing vital social, employment and educational links for this cohort.	The Council and operators will continue the care leavers' free bus travel as a BSIP 2024 commitment.
		Volunteering 'time credit' exchange for free bus travel	Transport for Cornwall has become a Recognition Partner of the Tempo Time Credits charity to recognise and reward the valuable work that its volunteers undertake across the community. Volunteers can exchange volunteering time credits for bus tickets to assist access volunteering opportunities or enjoy at their leisure.	Operators will continue time credit exchange as a BSIP 2024 commitment.
		Active Travel Social Prescribing	Cornwall Council was awarded funding in 2024 to reduce health inequality and make active lifestyles more attractive and achievable. Bus operators have agreed to work in partnership to facilitate the 'prescribing' of free bus travel to enable access to active travel opportunities, supporting adults to change and embed sustainable travel into their lives.	Operators will continue participating in the social prescribing scheme as a BSIP 2024 commitment.
		Pay-As-You-Go (PAYG) ticketing on rail	In November 2023 PAYG smart ticketing was introduced in west Cornwall funded by Cornwall Council and delivered by GWR. This scheme allows passengers to tap on and off rail journeys with their smartcard and be charged the best value fare for the journey made.	With an allocation of funding from Cornwall's Mid-Cornwall Metro Levelling -Up Fund award, PAYG ticketing will be extended up to and including Plymouth in February 2025. It is hoped that this will provide the foundation for bus/rail multimodal ticketing in the future.

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress since October 21	Future actions
One Network	• An extensive network of punctual services, offering attractive levels of connectivity and availability. • A well-planned network that maximises travel opportunities and provides confidence to users. • Services that are increasingly commercially viable and offer a realistic alternative to the car for some journeys. • Services that seamlessly link with other modes, enabling better choice and more opportunities for travel.	Bus service adjustments / Network review and consolidation	The Council and operators have worked together to keep the network as stable as possible through a period of funding uncertainty in the wake of the pandemic. An evidence-led approach has been taken to keeping changes to a minimum and continuing to offer effective and much-needed transport links. Where possible, route adjustments have been made to offer better connections between bus-bus and bus-rail and as a way of addressing some reliability concerns.	Operators are committed to continuing to develop and maintain a connected and integrated network that offers reliability and confidence in travel. Reliability is seen as key to continued patronage growth and future focus will be on improving the current customer offer and experience, linking in with planned BSIP capital schemes to improve journey times and encourage modal shift.
		*Alternative delivery models for rural transport	New approach to delivering rural transport launched in April 2023 with new BSIP funded services operated by Saltash Red Bus (SRB). This partnership between SRB and Go Cornwall Bus (GCB) sees GCB provide support for service registration, planning and the supply of ticket machines while SRB provide the vehicles and drivers that facilitate vital links for extremely rural communities.	Long term financial sustainability is the challenge to this project as the vehicles operating have limited seating (16 seat minibuses) so growth is limited. Services have reduced and been amalgamated from seven at outset to four for 2024 based on uptake. Evidence would indicate that although these links are vital to isolated communities, usage and income is limited by the vehicle size and high level of ENCTS card use. And unlikely to ever be fully sustainable.

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress since October 21	Future actions
One Standard	• People choose to use the bus as the whole experience of bus travel is positive and of high quality – convenient, safe, pleasant, comfortable and reliable. • Bus operations are efficient and effective and support wider policy objectives (decarbonisation; economy; health and wellbeing). • Buses will be simple and easy to use, offering the same standard of service for residents across Cornwall supported by high quality infrastructure. • A zero emission fleet operating on Cornwall's network. Depot strategy including land for parking of vehicles. Alternative fuel vehicles require additional infrastructure requirements and land space.	Encouraging modal shift and integration across public transport	With GWR a key Transport for Cornwall partner, branded wayfinding signage between rail stations and bus stops to ease navigation at interchanges. On-board audio announcements directing rail passengers to onward bus connections and to www.transportforcornwall.co.uk for further information now make integration options easier for passengers.	Ongoing commitment to continue the roll-out of station and interchange wayfinding and improvements. This will include continued investment in upgrading stops (hardstanding, footways, dropped kerbs, bus shelters, etc.) making them more accessible, better connected with up-to-date information provision and branding.

*BSIP funded schemes are denoted with an asterisk.

Case Study:

Tempo Time Credits



Transport for Cornwall is a Recognition Partner of Tempo Time Credits – a charity that rewards registered volunteers for their community volunteering efforts. By allowing volunteers to exchange volunteering time credits for bus tickets, TfC is making a difference to those dedicating their time to help others.

Sue, Volunteer at St. Ives Community Orchard: "I'm a big fam of public transport. Our roads are so crowded in Cornwall and it is so much better for the environment. I have used Time Credits a few times for day tickets to go out for a trip somewhere nice. We have been to Mousehole and….Sennen Cove. We also used the tickets for my husband to go to hospital appointments."

Helen, Volunteer at Newquay Orchard: "I have used my Time Credits to save money on public transport……I have used the bus for days out with my partner……This was a fantastic experience that we might not have had the chance to enjoy without the Time Credits."

Workstream	Ambition	Description	Progress since October 21	Future actions
One Timetable and One Brand	• The bus is viewed positively by all and seen as a desirable way to travel. • The bus network is reliable, stable, visible and widely understood – with users and potential users able to plan all elements of their journey before they travel including services, fares and real-time information. • Information provision is consistent and easy to understand – customers know how to find out about buses. Customers understand the Transport for Cornwall brand and what it represents, and what they can expect through the Customer Charter.	*'Network' recognition via deployment of Transport for Cornwall (TfC) branding	Full TfC livery has been deployed on GCB's Council-supported services and TfC logos are displayed on commercial services operated by First South. All roadside infrastructure and information proudly features the TfC brand, along with marketing materials, to ensure that passengers understand what services, facilities and products are available to them as part of TfC.	Wider deployment will continue with new campaigns designed to 'position' the Transport for Cornwall brand – better explaining to the public our vision and goals and how TfC impacts and relates to their lives.
		Agreed timetable change dates	Included in the Enhanced Partnership Scheme is the agreement of set timetable change dates per year – this has promoted stability for passengers and provided the foundation for the delivery of joint service information (see below).	Operators will continue to agree future timetable change dates as a BSIP 2024 and EP commitment.
		*Coordinated roadside timetable information	Progress has been made to integrate roadside information across operators, providing customers with a coordinated uniform display.	The Council and operators will continue to work together to evolve the roadside information and provide the best possible information experience when using interchanges and waiting facilities.

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress since October 21	Future actions
One Timetable and One Brand (cont.)		*Memorandum of Understanding (MoU) in place to deliver consolidated information, all in one place	All service information is now integrated across TfC operators: timetable booklet, bus and rail service map, roadside information, real-time passenger information (RTPI) and a TfC microsite. This has provided the foundation for the establishment of the MoU with operators which commits funding and resource to deliver combined service information and marketing, communications and engagement activities on an annual basis.	The Council and operators will continue to use the MoU to jointly fund these activities. Further, a new Enhanced Partnership Scheme for Marketing will be in place in Summer 2024 that details the ongoing EP commitment to this important workstream.
		*Marketing, Communication and Engagement Contract	On behalf of the TfC partnership, Cornwall Council procured a marketing agency in August 2023 to undertake marketing, communication and engagement activities to better establish the TfC brand and undertake marketing and behavioural change campaigns to encourage people to try the bus.	TfC brand strategy work and behavioural change campaigns are planned to launch in Summer 2024. Seasonal and targeted campaigns are also planned throughout the year ahead.

*BSIP funded schemes are denoted with an asterisk.



Workstream	Ambition	Description	Progress since October 21	Future actions
Customer Focus	Ensuring that the customer experience is at the heart of the TfC delivery	Research to better understand our customers and potential markets	Cornwall's programme of focus group activity continued in 2022 and 2023 with research undertaken to understand the impact of the BFP and public transport improvements. The groups conducted in 2023 were informed by the DfT's Segmentation Tool and sought insight into people's use of and attitudes towards the bus as well as specific interventions delivered over the last two years. The outputs of these groups have supported the direction of the Product & Pricing Strategy, TfC brand strategy work and informed the development of the BSIP 2024.	Cornwall is committed to ensuring that both user and non-user research is undertaken to inform delivery across public transport. It is widely recognised that passengers in rural areas have specific transport needs that are not always reflected in national research, making a commitment to ongoing local research vital in planning and delivering our network and services.
		*Participation in Transport Focus 'Your Bus Journey' survey	Cornwall values the input of Transport Focus to its Enhanced Partnership Steering Group and is supported by the valuable insight provided to champion the customer in the delivery of the network. Through the Transport for Cornwall Partnership, the Council and bus operators committed to jointly fund Cornwall's participation in the Your Bus Journey survey in 2023 in order to monitor the satisfaction of passengers and, through benchmarking, understand this performance in the context of the national picture.	Continued jointly funded participation in the Your Bus Journey survey and use of the results to inform the evolving Bus Passenger Charter and focus for future priorities.

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress since October 21	Future actions
Customer Focus (cont.)		Working with Sustrans to promote active travel and public transport	The Council has a contract in place with Sustrans to undertake active travel and public transport promotion and this has led to the delivery of Junior Life Skills training (joint service initiative involving training on using the bus) guided walks using the bus at either end, workplace sustainable transport promotion and coordinated marketing activities with the TfC event delivery team.	Continuation of the partnership work to deliver combined active travel and public transport promotion to the public via workplaces, schools and public events.
		Independent Travel Training (ITT)	The Council has been working closely with schools to establish a new ITT programme. The aim of which is to establish ITT as a core part of the school curriculum, aligning to the outcomes of the young person's Education Health & Care Plan – helping to prepare students to travel independently on public transport as they progress to further education and into the workplace.	Roll-out of the programme will be expanded and embedded at more schools, increasing the number of students benefitting from the training. Already being delivered as part of the Council's own offer but we would like to secure funding for delivering an innovative and exciting learning opportunity to small cohorts of students. This would be focused on the planning and experiencing a journey via public transport under the guidance of school staff (via a "train the trainer" approach. Students will have an opportunity to interact with Members of the Transport Coordination Team and the Local Bus Operators, (including visits to the network control rooms) to build confidence and knowledge of the public transport network, in a view to encourage behaviour change .

*BSIP funded schemes are denoted with an asterisk.

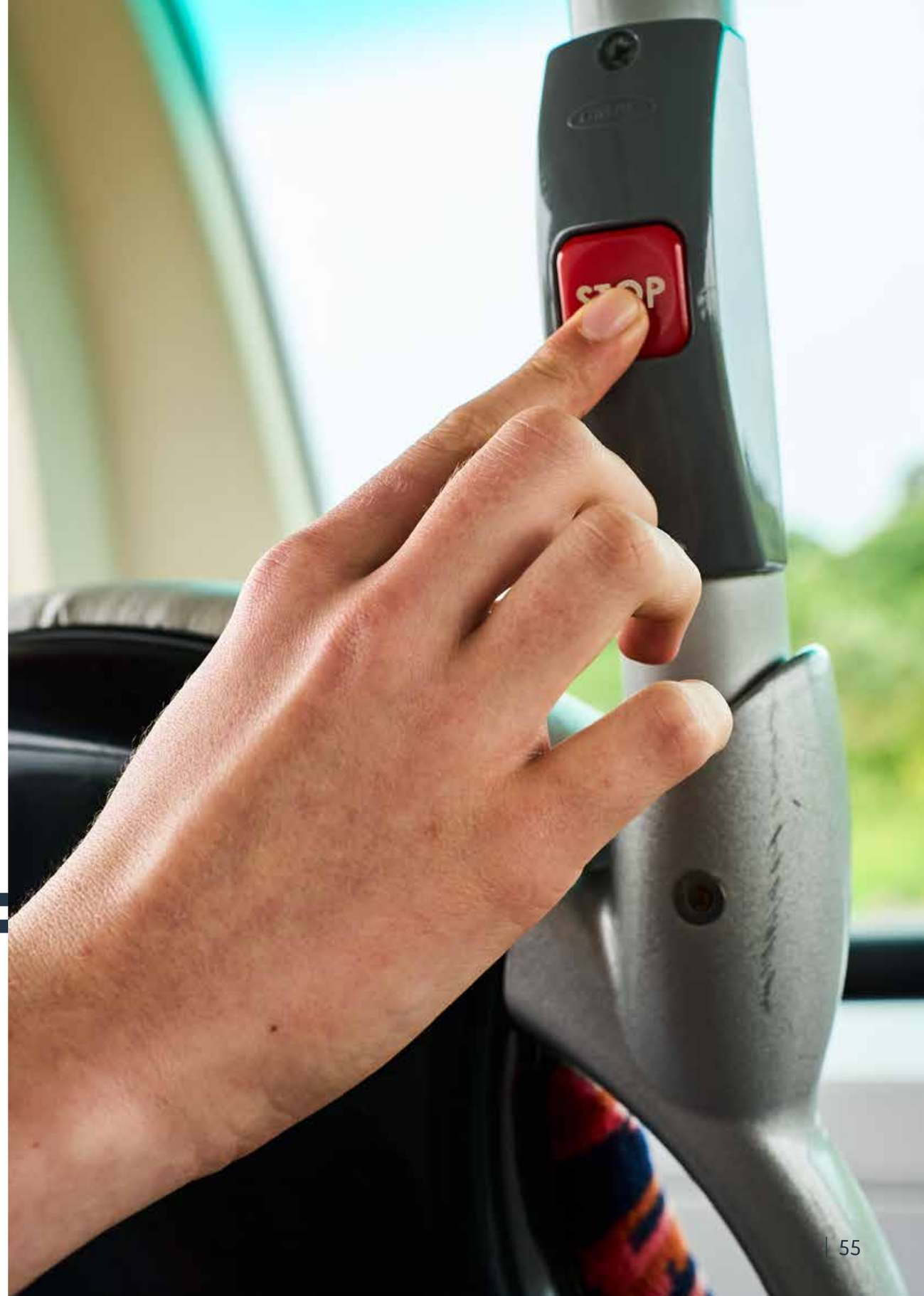
Case Study:

Independent travel training

Working together, the Careers Hub and Transport Coordination Service help organise trial trips on the public transport network, focusing on journeys to further education providers, transport hubs and potential employers. Transport for Cornwall plays an active part in the experience with Go Cornwall Bus providing students with a tour of Truro Bus Station and their Network Control facility where the bus network is managed. The aim of this project has been to establish independent travel training as a core part of the school curriculum that aligns with the agreed outcomes of the young person's Education Health & Care Plan to help prepare students to travel independently on public transport as they progress to further education and into the workplace.

So far, the programme has been established across Cornwall's Special Partnership Trust main sites and as well as for some students with SEND at mainstream school settings. The evidence so far shows that the programme has been very well received by students. Testimony from school staff involved in the programme has also been very positive, showing the benefits of helping facilitate a programme that empowers the trusted education professionals who work with students on a daily basis to deliver the training and support with the oversight and direction required from the Careers Hub Team.

It is our priority that this programme will continue to be rolled out and embedded at more schools so that increasing numbers of students will benefit. The Transport Coordination Service will monitor feedback and outcomes to observe where participation in the scheme helps students to move to more independent forms of travel when engaging in further education.





Section 4 | **Improvements programme 2024 - 2025**

4

The following table details the delivery focus for 2024/25. As this work relates to the original BSIP (2021), these are set against Cornwall's One Public Transport System for Cornwall workstreams and ambitions (Columns 1 & 2).

*BSIP funded schemes are denoted with an asterisk.

Workstream	Ambition	Description	Progress for 2024-25
One Ticket	Seamless travel – so customers don't need to worry and can trust that they get best value. This means: • Fares that are clear and simple, widely known and offer good value • Ticketing products that are easily understood and simple to use across the entire public transport network • More affordable travel for those that need it	***Young Person's (19-25 years) Discounted Bus Travel scheme** - Acknowledging that sustainable travel behaviour is a habit formed from a young age, the young person's discount will provide discounted bus travel on period pass products, giving better value travel to young people and locking in loyalty to bus for longer. Options have been identified for the scheme implementation which consider the commercial retention of the scheme once the BSIP funding has ceased.	• Scheme launch in Summer 2024. • Countywide multimedia promotion. • New TfC app will provide age verification. • Scheme to benefit from launch of TfC web/app.
		Completion and early implementation of the Product & Pricing Strategy – A Product & Pricing (P&P) Strategy is being developed to outline the approach that the Council and operators should take to support a sustainable exit from the Bus Fares Pilot (BFP). It is imperative that the exit is considered in such a way as to protect the patronage growth achieved since 2022.	• Agree the P&P Strategy outcomes with operators. • Commence implementation measures ahead of the end of the BFP funding in order to protect passengers and operators from the impact of any 'cliff-edge'.
One Network	• An extensive network of punctual services, offering attractive levels of connectivity and availability. • A well-planned network that maximises travel opportunities and provides confidence to users. • Services that are increasingly commercially viable and offer a realistic alternative to the car for some journeys. • Services that seamlessly link with other modes, enabling better choice and more opportunities for travel. • Services that meet the needs of the local community, acknowledging the vital role that the public transport network plays in a rural area	***Stabilising the existing network and to continue to promote community connectivity and enable accessibility and social inclusion** - Almost half of Cornwall's passengers rely on the bus network to access employment, education, health services and shopping as they have no other transport options. It is therefore vital that the existing network is protected to give the public confidence in the role it has in their daily lives.	The key priority is to ensure that the current network is stable and protected from the requirement to make service reductions.
		***Network Development –** Whilst protecting the existing network remains the top priority in relation to the bus network, where there are opportunities to support service enhancements, these will be considered on an evidence-led basis where growth is most achievable.	Currently funded service enhancements between Newquay and Truro and support for the Saltash Red Bus services which are a community-led initiative will continue this year.
		Improved collaboration with Cornwall Council Highways and Street Works teams regarding the impact of road closures - Road closures caused over 700 diversions to Cornwall's bus routes in 2023. While many of road closures are necessary works to improve the highways and to carry out emergency works, the timing and scheduling of works in a way that is considerate of bus movements as a priority has been embedded across the scheduling teams. Linked to the stabilisation of the existing network, it is imperative that the impacts of network disruptions are minimised and well-managed in order that customers can continue to receive a reliable service on which they rely.	Introduction of new software that will manage the publication of road closure notices to streamline the existing manual processes, enabling officers and bus operators to see consolidated works and plan ahead. (The outcome of an internal bid for funding for this software is awaited.)

Workstream	Ambition	Description	Progress for 2024-25
One Standard	• People choose to use the bus as the whole experience of bus travel is positive and of high quality – convenient, safe, pleasant, comfortable and reliable. • Bus operations are efficient and effective and support wider policy objectives (decarbonisation; economy; health and wellbeing). • Buses will be simple and easy to use, offering the same standard of service for residents across Cornwall supported by high quality infrastructure. • A zero emission fleet operating on Cornwall's network. • Depot strategy including land for parking of vehicles. Alternative fuel vehicles require additional infrastructure requirements and land space.	*Bus Priority works: • Truro A390 Corridor – Bus priority works are underway that will address specific pinchpoints on Cornwall's busiest bus corridor. Where relevant, Traffic Signal Priority (TSP) is being deployed to identified junctions to give buses a clearer path into and out of the city. Capital works to improve bus advancement along the corridor are also underway – these schemes will provide greater journey time reliability for passengers. Works to improve access to bus stops for pedestrians and cyclists and are also being progressed. • Falmouth-Penryn Corridor – A jointly funded initiative using BSIP and Active Travel England funding, works on this corridor will deliver a new section of bus lane along with junction revisions to improve bus, cycle and walking access along the corridor between the two towns. • Camborne A3047 Corridor - A series of interventions has been drawn up for this corridor which aims to improve pedestrian access and bus priority including the roll out of TSP at key locations.	Completion of scheme delivery and 'go live'.
		*Targeted infrastructure – This work package is developing pipeline bus priority schemes in Redruth, Camborne, Newquay, Penzance, Playing Place and St Austell. Where 'quick wins' (Traffic Signal Priority, revision of road markings/layout, etc.) have been identified and funding allows, interventions are being progressed to improve bus priority in these areas.	• Completion of scheme development and feasibility work. • Delivery of 'quick wins'.
		*Shared operator facilities - Redevelopment of an existing site at Longrock, nr Penzance where operators and the Council currently occupy separate areas. This scheme will bring operator sites together and provide shared training facilities, staff welfare, bus wash and re-fuelling facilities. The site will also be future proofed for electrification through the design of an electric vehicle layout plan.	• Completion of scheme delivery and 'go live'.

Workstream	Ambition	Description	Progress for 2024-25
One Standard (cont.)		***Connections & interchange –** A Connections and Interchange Strategy has been drafted, identifying opportunities to improve the connectivity of public transport across Cornwall. This will help people access public transport and interchange more easily between services. Specific work to deliver a new transport hub at Liskeard is being progressed as part of a multi-service development at the former cattle market site. This will provide a much-needed interchange for passengers with bus waiting and layover facilities	Completion of scheme delivery and 'go live'.
		Zero emission buses – Cornwall Council was successful with its ZEBRA 2 bid to introduce 8 x zero emission buses (ZEB) and charging infrastructure to the Truro Park & Ride and Falmouth Town Service. In partnership with Plymouth City Council, Cornwall was also successful in a joint bid to electrify Go Ahead's Plymouth (Milehouse) depot. This will see 6 x ZEBs entering service in south east Cornwall.	• Commencement of procurement activities for the ZEBs and required charging infrastructure. • Working with Plymouth City Council and Go Ahead to progress the joint scheme.
One Timetable and One Brand	• The bus is viewed positively by all and seen as a desirable way to travel. • The bus network is reliable, stable, visible and widely understood – with users and potential users able to plan all elements of their journey before they travel including services, fares and real-time information. • Information provision is consistent and easy to understand – customers know how to find out about buses. • Customers understand the Transport for Cornwall brand and what it represents, and what they can expect through the Customer Charter.	*Transport for Cornwall Website and App - Work is underway to launch a Transport for Cornwall (TfC) website/ app in Summer 2024. Bringing together bus journey planning and real time bus information for the first time and providing a single platform for interoperable ticketing retail, this is a key development for the TfC Partnership.	• Website/app launch in Summer 2024. • Accompanying marketing and promotional activities.

Workstream	Ambition	Description	Progress for 2024-25
One Timetable and One Brand (cont.)		**Promotion/marketing and behaviour change campaign work** - Marketing contract to improve public perceptions and make sure public transport is presented as a positive choice. Specifically targeting those with the greatest propensity to change their travel habits, behaviour change campaigns are being carefully planned and evidence-led. Overall brand work to 'position' the TfC brand in the public's view. This needs to create and maintain positive relationship with TfC, even for non-bus users. Short term, immediate targets are residents in areas where good frequency and connectivity levels make off-peak travel attractive.	• Campaign execution in line with agreed marketing plan • Communications and engagement work to build the TfC profile and translate the brand to the public
		***Improvement of roadside information and access** - Upgrading existing stops to improve access and information is critical to attracting more people to bus. The recent Your Bus journey saw Cornwall achieve a 76% passenger satisfaction rating with the bus stop and 72% satisfaction with the information provided at bus stops. While these compare favourably with the rural and England average scores, the importance of getting these basic elements right in order to attract more people to bus cannot be overlooked.	• Continued roll-out of upgrades to roadside information and improvements of access to stops.
Customer Focus	• Ensuring that the customer experience is at the heart of the TfC delivery	***Bus frontline staff training - 'Delight the Customer/TfC Ambassador'** – Frontline staff play a significant role in the delivery of the commitments made to passengers in the Bus Passenger Charter- they can be the difference between a good or a satisfactory journey experience. This accredited training will ensure that frontline staff have an understanding of how to 'Delight the Customer' and positively represent their part in the Transport for Cornwall Partnership.	• Gain course accreditation • Deliver training to all frontline staff

Bus driver recruitment and retention

Significant driver shortages have been experienced across the industry in recent years with operators finding it difficult to recruit and retain the staff required to deliver efficient bus operations. Huge efforts were taken in Cornwall by national operators to attract and train drivers and, while the situation was particularly challenging due to Cornwall's economy post-pandemic, the situation is currently much more positive with Cornwall's three group operators reporting that they are fully staffed for drivers. One operator is reporting a waiting list of applications in some areas.

Operators cite that this success has been due to significant investment in the employee proposition with commitments to salary, workplace culture and workable rostering, all improving the appeal of a becoming a driver.

Into 2024/25 Cornwall's operators will seek to maintain this position, proactively recruiting and monitoring retention trends. One operator has an ongoing campaign to increase the number of female drivers through the introduction of women-only training courses and open days.





5

Cornwall Council and its operators are committed to maintaining the current network and delivering this to a consistently reliable standard to meet customer needs and expectations. Securing the ongoing revenue funding required to maintain the existing network continues to be Cornwall's main priority. From here, investment in the incremental development of the network can be sustainably implemented and led by evidence of growth in demand and patronage.

Building on the improvements delivered through the strong partnership that has underpinned the first BSIP and Bus Fares Pilot, Cornwall's Enhanced Partnership is focused on ensuring that the future delivery of the network continues to maintain the passengers it has worked hard to attract and grow the patronage base further. Achieving a continuously high standard of delivery will be the operational focus going forward so as to reinforce the foundations for future growth.

Future capital spend will, in the main, be directed at improving the customer experience – upgrading roadside waiting infrastructure and interchanges, investing in the wider roll-out of targeted bus priority measures, real-time passenger information and the progression of multimodal ticketing.



National Bus Strategy Category

→ **Lower and simpler fares**

Title of scheme or proposal	Description
→ **Continuation of Bus Fares Pilot**	• The Bus Fares Pilot will continue to provide discounted travel across the network while existing Government funding is in place until March 2026. While this is not a BSIP-funded priority, the continued delivery of affordable fares that increase the attractiveness of the bus to new and existing users is critical to growing patronage, growing the network and helping to decarbonise transport.
→ **Young Person's (19-25 years) Discounted Bus Travel scheme**	• Young people are the bus users of the future and Cornwall recognises the importance of providing them with a positive and fulfilling bus experience in order to lock-in this positive travel behaviour, normalising bus use in everyday lives. It is important for Cornwall to be able to support the Young Person's Discounted Bus Travel scheme (commencing 2024) to a commercially viable product in the future.
→ **Targeted fares for those most in need**	• Given the high deprivation levels in Cornwall, opportunities will be explored to create targeted fares products for those most in need, enabling them more affordable access to public transport. The exploration of a scheme that may make bus travel more affordable for job seekers, for example, would seek to facilitate improved access to employment while embedding modal shift at a time where we understand people are more receptive to change.
→ **Concessionary Fares - maintaining discretionary scheme elements**	• Cornwall is committed to encouraging growth in concessionary travel, recognising how passholders use their passes for social activities, important in respect of people's health and wellbeing, access to healthcare, shopping and employment. Cornwall Council wishes to continue to offer a 24/7 scheme, above the statutory requirement, cognisant of the lifeline that ENCTS provides.

National Bus Strategy Category

→ **Ticketing**

Title of scheme or proposal

→ **Bus/rail ticketing**

→ **Devon and Cornwall bus ticket**

→ **Future ticketing measures**

Description

- Cornwall's aspiration for multioperator multimodal contactless tap on, tap off (TOTO) ticketing remains strong and much progress has been made towards this on both bus and rail. The Bus Fares Pilot introduced the TOTO technology on bus to facilitate contactless Tap & Cap in 2022. The delivery of Pay-As-You-Go smart ticketing on rail in west Cornwall in November 2023 (and the current expansion to the rest of the county, including Plymouth, by February 2025) will mean that Cornwall is in a strong position to develop an account-based bus/rail ticketing scheme. Preliminary discussions have been held with operators and scoping is underway.
- Recognising that many passengers have a requirement to travel across our borders for work, education, healthcare and leisure, there is a cross-border desire to develop a Devon & Cornwall Bus Ticket. This is likely to form part of a wider approach to multioperator ticketing in the south west being explored by the Sub-National Transport Body.
- Following the delivery of the Bus Fares Pilot (BFP) between 2022-2026, Cornwall is seeking the opportunity to ensure that fares and ticketing remain sustainable for operators and attractive to the public. A Product & Pricing Strategy is in development that will identify the ticketing reform required to exit the BFP and the products that are most likely to encourage further network growth and behaviour change.

National Bus Strategy Category

→ **Service level and network coverage**

Title of scheme or proposal

→ **Protecting and stabilising the existing network**

→ **Network development**

Description

- Through the use of BSIP Phase 1 and Phase 2 funding, Cornwall was able to maintain and develop its network, delivering patronage growth. Cornwall's highest priority is the ongoing protection of this network that has been so well protected with BSIP funding and is vital for its rural communities where public transport facilitates much-needed and relied-upon access to employment, education, healthcare and shopping.
- An evidence-led approach will build on the existing bus network, increasing frequencies and extending service operation through the evenings and weekends where newly initiated demand suggests growth is possible, and will consider housing and employment development needs from the emerging Local Plan - a specific focus will be applied to improving frequencies in Travel to Work Areas and relieving seasonal demand through pop-up Park & Rides. Longer-term network transformation will build from here, underpinned by the commitments and measures within the EP to deliver a future network that attracts and enables modal shift in the drive to decarbonise transport.



National Bus Strategy Category

→ **Accessibility and inclusion**

Title of scheme or proposal	Description
→ **Inclusive provision**	• To ensure Cornwall's public transport network is available to all, a programme of infrastructure upgrades to existing rural roadside waiting facilities ensuring connectivity to the bus stop is prioritised - kerb adjustments, crossing facilities, hard standing/footway at the bus stop, shelters, etc. Improvements will also be made to signage and wayfinding. Opportunities will be explored to provide assistance to help operators meet the new audio/visual announcement requirements on-bus from October 2026 and seek to include expected arrival times for route terminus points. The safety and comfort of all passengers is paramount, ensuring that they are well-informed during journeys will help to reinforce this.
→ **Independent Travel Training (ITT) offer and modal shift**	• Cornwall aspires to extend the existing ITT offer for students - planning and experiencing a journey via public transport under the guidance of school staff (via a "train the trainer" approach). Students will have the opportunity to visit the network control rooms to build confidence and knowledge of the public transport network, with a view to encouraging long-term behaviour change.

National Bus Strategy objective

→ **Waiting and interchange facilities**

Title of scheme or proposal	Description
→ **Bus stop improvement programme**	• A rolling programme of improvements will be undertaken in conjunction with our active travel workstreams on core and supporting routes - including bus shelter replacement, accessibility and walking links to stops and improved information provision at all bus stops and key interchange points. Bringing all bus stops up to a basic standard with a pole, flag and hardstanding and a main stop in each village with a shelter and RTPI are vital investments to support the network.
→ **Mobility hubs & station upgrades**	• Using the outcomes of the Connections & Interchange Strategy, mobility hubs will be established in line with our active travel strategy and school transport workstreams in key strategic locations. Further, bus station upgrades and capacity works will be carried out at our key bus stations - Newquay, Penzance and Truro.

National Bus Strategy Category

→ **Bus priority**

Title of scheme or proposal	Description
→ **Bus priority measures**	• A principle of continuous improvement in network management and provision of targeted measures that provide reliability and journey time improvements. Opportunities for bus priority will be explored on approaches to key towns where bus access/egress is hindered by congestion, junction capacity, signal sequencing, etc. and where the impacts of seasonal traffic are particularly significant. The Targeted Infrastructure workstream in the BSIP 2021 has identified schemes to implement in Newquay, Camborne and St Austell.
→ **Traffic signal priority**	• A rolling programme to deliver signal upgrades at identified sites and to include consideration of bus priority future site renewals/upgrades and wider transport/highway delivery.
→ **Other targeted measures**	• The penetration of bus into estates and communities is critical to the reliability of the service and ensuring equality of access. Targeted bus priority interventions are required at network pinchpoints, often due to obstructive parking and/or insufficient highway layout. A review of these concerns and delivery of solutions will provide confidence in the network, helping to restore and maintain journey time reliability.
→ **Roadworks coordination and management**	• Cornwall operates a permit system which helps to manage roadworks and their impact on bus service disruption. The introduction of new software has been identified as a solution to manage the publication of road closure notices, streamlining the existing manual processes, enabling officers and bus operators to see consolidated works for forward planning. This will be a significant boost to ensuring buses are considered foremost in disruption management.
→ **Tree and hedge cutting**	• Bus damage from tree strikes incur significant maintenance requirements and negatively impact operations. This will be further supported by the deployment of protective bars and exploration of technology to mitigate tree strikes on our most affected routes, pinpointing strikes and ensuring these can be swiftly dealt with.

National Bus Strategy Category

→ **Longer term network transformation**

Title of scheme or proposal	Description
→ **Strategic depot**	• The Council is investigating the development of a multi-operator flexible depot space, enabling operators to co-locate with other fleet-operating organisations. Operational and cost efficiencies through shared maintenance, charging facilities, commercialisation will be explored, alongside costings. The BSIP 2021 scheme for shared operator facilities at Longrock is the first of its kind in Cornwall.

National Bus Strategy Category

→ **Bus information and network identity**

Title of scheme or proposal	Description
→ **Targeted marketing activity**	• Marketing & promotional activity and positive communications are integral to influencing public perception, adoption of brands and ultimately, in relation to public transport, encouraging modal switch. Ongoing and targeted marketing activity will continue to encourage sustainable behaviour change within target audiences - this follows the successful engagement of a marketing agency to 2025.
→ **Further development of website and app**	• Customer Information Revolution: Following on from the release of the Transport for Cornwall app/website, the future development of this platform towards a Mobility-as-a-Service (MaaS) platform will be actively explored, enabling wider functionality in terms of multimodal journey planning for public transport, cycle, e-Bike, walking, etc. plus the facility to pay for access to these modes via the app.

National Bus Strategy Category

→ **Bus fleet**

Title of scheme or proposal	Description
→ **Zero emission buses (ZEB)**	• Building on Cornwall's ZEBRA 2 successful bid to electrify the Truro Park & Ride and Falmouth Town Service with 8x ZEBs, and the joint-award with Plymouth City Council for 6x ZEBs in SE Cornwall, Cornwall aims to continue the roll-out of charging infrastructure and ZEBs to facilitate the wider introduction of ZEBs across the network, starting with key depot locations identified in the ULEB Strategy. • The progression of these packages supports Cornwall's bus operators' pledges not to purchase new diesel vehicles after December 2022 and their aim to have a full ZEB fleet by 2035. The ZEBs will make a substantial contribution to kickstarting the decarbonisation of the public service fleet in the County and the delivery of the Council's priority outcomes.

National Bus Strategy Category

→ **Bus passenger experience**

Title of scheme or proposal	Description
→ **Monitoring and evaluation of scheme delivery and impact on bus patronage**	• Cornwall is able to access a growing number of datasets from operators that combines to provide valuable insight on the impact of interventions on the performance of the network and, ultimately, the impact on patronage and satisfaction. Ongoing research will continue to provide such insights in order to shape future direction.
→ **Modernising school transport**	• Programme of moving the issuing and accessing of bus passes for 14,000 scholars to an app-based solution. This will ensure that greater accuracy on usage, demand and capacity required on buses is available. This will provide an improved experience for students.
→ **Evolution of the Bus Passenger Charter**	• Future work with Transport Focus and stakeholders to evolve the existing Bus Passenger Charter to reflect the ongoing commitments of operators and the Council in the Enhanced Partnership Schemes.

National Bus Strategy Category

→ **Other**

Title of scheme or proposal	Description
→ **Capacity building within team (training within team)**	• It is Cornwall's priority to invest in and retain talent in the team, to address recruitment challenges. A programme of professional development opportunities (via formal training or on the job opportunities) will be implemented over 4 years to ensure that staff are skilled and trained to perform the duties and continue to respond to ever changing demands (decarbonisation, electrification) and allow for succession planning.
→ **External support (ongoing support)**	• Ensure specialist technical support is secured to support the delivery of strategic projects.
→ **Promoting sustainable tourism**	• Wider partnership work with local tourism associations will be progressed to encourage sustainable tourism to and within Cornwall and the benefits of using sustainable transport modes to enjoy Cornwall at leisure.





6

These targets have been set to best reflect the aims and objectives of the BSIP. The indicators, baseline data, and targets will be reviewed as part of the ongoing EP reviews.

Performance against targets and annual updates will be published online in accordance with the emerging guidance on the required BSIP Monitoring Reports to be released by DfT later in 2024.



Performance Indicators

Indicator	Specifics	Actual					Target	Target	Measure
		2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2028/29	
Passenger growth (including Park & Ride passengers)	Overall growth	11.4m	3.8m	7.7m	12m	12.9m ↑	13.1m	13.9m	Operator data by route
Reliability	Overall reliability	86%	88%	73%	67%	71% ↑	80%	95%	Up to 2022/23 - DfT dataset for non-frequent bus services running to time (Bus0902) 2023/24 onwards – Cornwall's Cloud Amber data

Passenger Indicators

Indicator	Specifics	Actual			Target	Target	Measure
		2019	2020-2022 (survey not carried out)	2023	2024/25	2028/29	
Passenger satisfaction	Overall satisfaction	93%	n/a	85% ↓	90%	95%	Transport Focus YBJ satisfaction survey
Passenger satisfaction	Value for money	57%	n/a	75% ↑	77%	79%	Transport Focus YBJ satisfaction survey
Passenger satisfaction	Punctuality	83%	n/a	75% ↓	80%	85%	Transport Focus YBJ satisfaction survey
Passenger satisfaction	Information (on-board)	70%	n/a	66% ↓ (where on-board info was present)	70%	75%	Transport Focus YBJ satisfaction survey
Passenger satisfaction	Information (off-bus)	82%	n/a	72% ↓	80%	85%	Transport Focus YBJ satisfaction survey
Passenger satisfaction	Infrastructure – The bus stop	83%	n/a	76% ↓	80%	84%	Transport Focus YBJ satisfaction survey
Awareness	Awareness of Transport for Cornwall brand	n/a	n/a	57%	68%	75%	Transport Focus YBJ satisfaction survey



Performance Indicators

Indicator: Passenger Growth

Methodology and commentary: Measured by reviewing operator patronage data on a route-by-route basis. It is important that these targets are reviewed and refined periodically and informed by the introduction of interventions and changes likely to impact patronage. Patronage will also be monitored on a granular level – by area; corridor; service; ticket type; demographic - to understand the impact of the different specific BSIP & BFP measures, which will be used to inform the development of the BSIP in future years.

Indicator: Reliability

Methodology and commentary: Until 2022/23 reliability was measured using the DfT Bus Reliability and Punctuality dataset for non-frequent bus services running to time. However, the use of the Council's Cloud Amber data provides data on a more granular basis and so this indicator will now be measured using the same data that is used to inform the regular performance reviews with operators. With the emphasis placed on achieving consistent reliability in this BSIP by operators and the Council, targets have been set to reflect this future focus.

Passenger Indicators

Indicator: Passenger Satisfaction (Various)

Methodology and commentary: Derived from Transport Focus' annual Your Bus Journey surveys, satisfaction scores being monitored in Cornwall's BSIP directly reflect the desire to monitor the impact on passenger satisfaction relating to the area of intervention – Value for Money, Reliability, Infrastructure, etc. as well as Overall Journey Satisfaction. The 2019 Transport Focus survey has been used as the baseline, however the methodology for undertaking this survey changed in 2023 and so scores are now reset. The use of this survey to monitor passenger satisfaction represents the latest independent and representative surveys undertaken – it also allows national benchmarking.

Indicator: Awareness of Transport for Cornwall Brand

Methodology and commentary: Also from the Your Bus Journey survey, the Transport for Cornwall partnership has requested additional questions in its survey to monitor the awareness levels across passengers of the Transport for Cornwall brand. It is important to track the penetration of the brand as awareness of TfC and the benefits it can provide to people's daily lives is vital in changing travel behaviour.

Appendix 1

Bus Passenger Charter

A pledge to provide the best possible bus services in Cornwall

Issued in **August 2022**

This charter sets out what can be expected when using all local bus services that operate across Cornwall. These include the services provided by the following bus operators:

Cornwall by Kernow (First)
Go Cornwall Bus
Hopley's Coaches
OTS
Plymouth Citybus
Roselyn Coaches
Royal Buses
St Ives Bus Company
Stagecoach
Travel Cornwall
Yeo's Contracts

It also covers elements of service provision that are the responsibility of Cornwall Council, which is the local transport authority, including bus stops. Cornwall Council works to co-ordinate and improve public transport and financially supports about half of the bus services operating in the county.

This charter can be made available in other formats, if you would like this information in another format or language please contact: **transport@cornwall.gov.uk**

Transport for Cornwall
Karyans rag Kernow

transportforcornwall.co.uk

Connecting Cornwall's Communities | CORNWALL COUNCIL one and all • onen hag oll

Our pledge to you

What you can expect from bus services in Cornwall:

Services and information

- A network of regular bus services designed to connect people to places according to demand
- A single source of information detailing all you need to know about bus services in Cornwall (including maps, routes, timetables and fares) – please visit **www.transportforcornwall.co.uk**
- A place to wait for the bus that is in a suitable location, with shelter at busier stops. Got an issue with a bus stop or shelter? You can let the council know by contacting **transport@cornwall.gov.uk**
- Up-to-date information at every bus stop equipped with an information display, including details about bus times and fares. If there is no information display, then there will be something to signpost you to this information either via a website link or QR code
- Real Time Information will be displayed at key stops, and is available for all stops on bus operators' travel apps and Traveline

Reliability

- A reliable bus service - that means buses normally running no more than one minute early or five minutes late
- You will be kept informed by the driver and/or via social media if your bus is seriously delayed and why
- Sometimes there are exceptional circumstances that mean buses can't operate as advertised – wherever possible we will keep you informed and let you know about planned changes ahead of time

On the Bus

- A range of value for money tickets that can be used on any bus in Cornwall, with a range of payment methods including cash
- CCTV on most buses for your safety and security
- A space large enough to take one wheelchair or two buggies, on every bus
- A clean bus, both inside and out, at the start of its service (but be patient with us, sometimes it's hard to keep a bus clean – especially when it's raining a lot)
- A smart, friendly and helpful driver
- A pleasant and comfortable journey experience, with a smooth ride

Improving the bus services in Cornwall

- Readily available information about the progress we are making to improve bus services
- You will be able to view information about the performance of bus services against our targets here www.cornwall.gov.uk/transport-parking-and-streets/public-transport/cornwall-s-transport-services/enhanced-partnership-and-bus-service-improvement-plan/. It will be updated every 6 months
- We'll keep you informed of any significant future changes to services and give you an opportunity to comment at **www.cornwall.gov.uk/transport-parking-and-streets/public-transport/cornwall-s-transport-services/buses-in-cornwall**
- You can send us suggestions and comments about bus services and ways that they can be improved by either contacting an operator through the sites listed below, or the council at **transport@cornwall.gov.uk**
- You'll always have any complaint fully investigated and a response provided within 10 working days, with the opportunity to feedback on how well you consider your complaint has been dealt with
- This charter will be updated each year, taking on board your thoughts and comments

The small print

This Charter does not affect your statutory rights. Passengers are carried by each bus operator in accordance with its own conditions of carriage, available from the websites listed below.

Complaints and comments

If your journey has not met your expectations, please let the operator know – they actively welcome comments and suggestions, as well as complaints. Details of how to comment or complain can be found via the operators' websites detailed opposite:

Cornwall by Kernow (First)
www.firstbus.co.uk/cornwall

Go Cornwall Bus
www.gocornwallbus.co.uk

Stagecoach
www.stagecoachbus.com

Hopley's Coaches
www.hopleyscoaches.com

OTS
www.otsfalmouth.co.uk

Travel Cornwall
www.travelcornwall.uk.com

Operators will respond to all complaints within 10 days.

If you are not satisfied with how an operator has dealt with your complaint,please contact Cornwall Council at **transport@cornwall.gov.uk**

jn 52525 04/23

Transport for Cornwall
Karyans rag Kernow

transportforcornwall.co.uk

Connecting Cornwall's Communities

CORNWALL COUNCIL
one and all · onen hag oll

Buses in Cornwall will provide an **excellent connection** between **people, communities, businesses** and **services**



Contact us

For advice and guidance please email the Transport Coordination Service:

transport@cornwall.gov.uk

Or call us on:

0300 1234 222

If you would like this information in another format or language please contact:

Cornwall Council, County Hall, Treyew Road, Truro, TR1 3AY

e: equality@cornwall.gov.uk t: 0300 1234 100

Transport for Cornwall
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Cornwall Council – one and all • onen hag oll
Go Cornwall bus
Kernow
Stagecoach
Hopley's Coaches
OTS
GWR Great Western Railway
TRAVELCORNWALL
transportfocus
Cornwall Chamber of Commerce

Cornwall recycles
Kernow a wra eylgylghya

June 2024 JN54695

Why are more people in Cornwall choosing the bus?

08 February 2024

How can the industry entice people back onto the bus? We saw from the £2 fare cap that value for money is a key factor to help get bus passengers back on board.

Cornwall was one of the few authorities where the number of people using the bus was rising prior to Covid, and while it took a hit during the pandemic it is now almost back to pre-Covid levels.

Cornwall participated actively over many years in our *Bus Passenger Survey.* Although bus passenger satisfaction scored well above the national average, passenger satisfaction with value for money remained stubbornly low – in 2019 performance was amongst the lowest of all the areas we surveyed at 57 per cent. Cornwall's determination to get to the bottom of this led it to propose a bus fares pilot, which the Department for Transport agreed to fund. The pilot aimed to simplify and lower fares.

In 2022, fares were lowered by an average of 36 per cent – day tickets were reduced from £9 to £5, weeklies were cut down to £20 from £28 and 'Tap & Cap' was introduced. To make travelling simpler, passengers can now also use their ticket across different operators. Passenger satisfaction with value for money, measured by our new *Your Bus Journey* survey was 80 per cent in June 2023.

Of course, the ultimate measure of success is more people using buses. Since its start in April 2022, over 20 per cent more Bus Fares Pilot passengers, as part of the Bus Fares Pilot, travelled in the first six months of 2023/24 than the same period of 2022/23.

Transport Focus has been working with Cornwall Council and the main bus operators, in particular First Kernow and Go Cornwall, for many years. Nowhere has our message about the importance of using passenger research to drive improvements been embraced more. Their latest round of research involved 18 focus groups of users and non-users between July and October last year. The findings covered issues such as journey planning, barriers to bus use and awareness of ticket products and pricing and will be studied carefully to see where improvements can be made.

A push from Transport Focus helped Cornwall to be one of the first areas to start to develop a Bus Passenger Charter that clearly sets out what passengers can expect from operators delivering services across their area. We helped them to write it, insisting that it needed solid commitments which reflected the things that matter most to passengers. They will look to strengthen commitments in subsequent reviews, with the first review about to take place.

At a recent session, we talked the Council and bus operators through the interim results of the 2023 ***Your Bus Journey* survey**. We recommended that the partnership digs deep into their headline performance figures, asking questions to enable them to pinpoint where action appears to be working and where further action is needed. We are pleased that the Council has agreed to set up a working group to investigate and we have been invited to lead an initial session. This is exactly how *Your Bus Journey* is designed to work.

The challenge now is to maintain this improvement, Transport Focus will continue to support Cornwall's efforts to sustain and build upon these developments for years to come.

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Blog

How Cornwall is winning the bus game

10 April 2024 | Guest blogger | Buses

This guest blog was written for us by Cllr Richard Williams-Pears who holds the transport portfolio at Cornwall Council.



Cornwall has continued to invest in its public transport network and through this investment has maintained a largely stable local bus network. This is in direct contrast to many other rural local authorities and something that we are particularly proud of.

Working in partnership with operators under the brand *Transport for Cornwall* we have introduced a high quality, customer focused public transport network for our residents and visitors, with the aim of attracting and growing patronage to make the whole network more financially sustainable. As such we are currently delivering our £17.2 million 'Bus Service Improvement Plan' alongside the Department for Transport funded £23.5 million Bus Fares Pilot.

Cornwall was awarded £23.5 million to operate a four-year reduced fares scheme to understand if and how reduced fares could encourage patronage growth. The **'Bus Fares Pilot' scheme** was launched in Spring 2022 following the successful introduction of ticket interoperability and "Any Ticket, Any Bus" in January 2022. A simplified fares structure was key to the launch of the reduced fares scheme and so new fare bands, town zones and countywide products were introduced across all operators offering fare reductions of up to 36 per cent, meaning that there was no better time to bus in Cornwall.

This committed investment in public transport, is delivering a shift in travel behaviour with more people using buses. Overall patronage on buses has recovered since the Covid-19 pandemic and we are now seeing greater numbers using our services. One very promising evolving picture is that

Cornwall now has a greater proportion of adult fare paying passengers using the services, these drive revenue and help to make the network more sustainable.

Alongside the Government's £2 Fare Cap scheme, the customer offers around fares in Cornwall have achieved a dramatic improvement in passenger satisfaction with value for money score – achieving 75 per cent compared to the English average of 67 per cent in **Transport Focus' Your Bus Journey 2023 survey**. Understanding what our customers (and potential new users) think about the bus network is critical in shaping our direction and reinforcing our focus on delivering for the customer. Since 2017, we have been undertaking focus groups and market testing to gauge insight and opinion on our network and potential schemes – this work has proved invaluable in targeting our delivery and addressing the barriers to public transport use. During 2023 we undertook an extensive range of focus groups to better understand both user and non-user views around the progress made on improving public transport provision.

This research highlighted:

- Just under half of respondents were using buses more frequently than the previous year
- The uplift in bus use can be attributed to a number of factors as follows; a reduction in bus fares, increased cost of living, performance issues with trains, changes in personal circumstances.
- Two-fifths of respondents said they had made more bus journeys in Cornwall as a result of the reduction in bus fares.

While we are seeing patronage growth and positive responses to the fares offer, we recognise that we need to improve service reliability if customers are to have confidence in the network as a whole – this is the strongest feedback that we have received across all forums. In response to this, for Spring 2024 we have undertaken extensive work with our two main operators, Cornwall by Kernow and Go Cornwall Bus, to identify ongoing reliability issues and introduce timetable 'tweaks' to address these.

With the major A30 works that have caused nearly three years of diversion and congestion challenges to bus services anticipated to be completed by Summer 2024, it is hoped that a considerable improvement will be seen to punctuality.

Giving customers better access to information is also key to instilling confidence and keeping them informed in times of disruption. In response to customer feedback, a new integrated app/website is currently being developed to bring bus information and ticket retail onto a single platform. Further improvements will be made to enhance information provision on top of the existing joint map and timetable and roadside information that we have worked hard to introduce.

The Transport for Cornwall partnership is about to embark on a marketing and behavioural change programme over 2024/25 to raise awareness of the bus improvements and to persuade more people to try the bus for some of the journeys they make.

This is a positive time for public transport in Cornwall. The Government's recent ZEBRA 2 announcement will see electric buses in Cornwall for the first time from 2025 and we are excited for the opportunities this brings. On rail, we are also seeing further investment ahead in the £56 million Mid-Cornwall Metro programme and wider roll out of pay-as-you-go smart ticketing on rail across Cornwall. A fully integrated public transport network continues to be our aspiration and we have made headway with bus-rail timetabling, on-board announcements on trains for connecting bus services and wayfinding at stations. Multimodal ticketing across bus and rail remains a challenge but one that we are keen to progress.

As a rural authority, Cornwall has worked hard, in partnership with its transport operators and other stakeholders, to deliver a step change in public transport provision. Our delivery to date, acknowledged by feedback from both customers and non-users show that good rural bus services delivered as part of a holistic network can attract patronage to help the network become more sustainable. The biggest challenge we face is continuing to fund this in the long term and securing future investment to meet our current commitments and retain and improve the quality of the network.

For more information on *Transport for Cornwall* visit: **transportforcornwall.co.uk**

Header image: Wiki commons



Fowlmere Parish Council creates bespoke bus information to boost bus usage

News / 16 October 2025

Over the past few years, Fowlmere Parish Council has worked with Cambridgeshire and Peterborough Combined Authority and local bus operator A2B Bus & Coach Ltd to ensure village residents have the lifeline bus services they need to access college, work, medical services, shopping centres and leisure activities. Fowlmere village, which isn't served directly by a railway line, is located in rural South Cambridgeshire about 9 miles from Cambridge and, like the majority of villages, towns and cities outside London, has experienced a decline in bus services over the past twenty years. Three bus services currently run through the village, one of which (the 26) is run almost commercially[1] by A2B, and the other two of which (the 17 and the 7A) are operated by A2B and fully subsidised by the Combined Authority.

Aware that the more passengers use the bus, the better a village's bus services are likely to be, members of Fowlmere Parish Council had been considering advertising the village's bus services to residents for some time in an attempt to boost passenger numbers. In the end, the trigger for action was major changes in the timetables for routes 26 and 17, Fowlmere's two main bus services. Following two years of negotiation by District Councillor James Hobro and County Councillor Peter McDonald with the Combined Authority and A2B, services on the 26 and 17 were

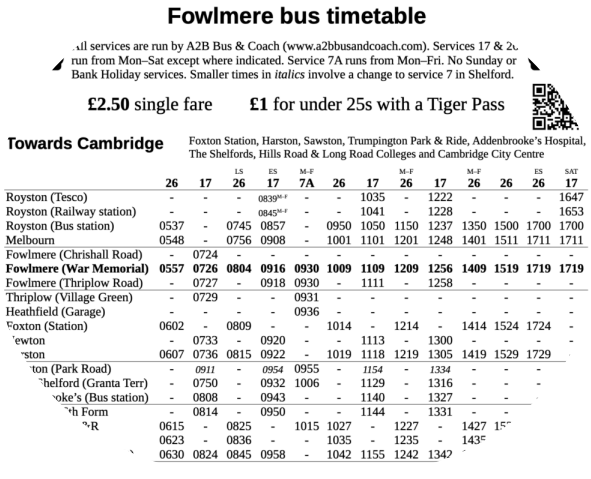
interleaved to give the village an approximately hourly service. This made the village's buses much more attractive for passengers (departures had previously been unevenly spaced throughout the day) and the Parish Council wanted to publicise the improved services. The Parish Council also designed its publicity campaign around the premise that many residents did not use the bus regularly, so were unaware that many key destinations are easily reachable by bus and that tickets are low cost.

Creating a local timetable

The first step was to produce a bespoke, one-page bus timetable for the village. This timetable shows the times for services on all three bus routes that go through the village on one handy sheet, bringing together information that is presented separately elsewhere, including times for some connecting services. Displayed this way, it's clear that the village has an approximately hourly bus service in both directions, which is much more frequent than the timetables for the separate services might suggest.

To make the timetable easy to interpret, the times of services from the village's central bus stop are printed in bold. The sheet then lists the times services arrive at selected destinations only, uses lines to group nearby destinations together and employs a key rather than separate tables to indicate the differences between weekday and weekend services. These features make the sheet much easier to read than a standard timetable and ensure the data fits on one page.

Information about bus fares is provided at the top of the sheet (people are more likely to use a service if they are sure in advance how much it will cost) together with a QR code to the application form for the Tiger Pass (£1 Bus fares for U25s). You can compare Fowlmere Parish Council's bespoke timetable with the bus operator's timetables for routes 17/26 below, as well as the timetable for route 7A.



Fowlmere bus timetable

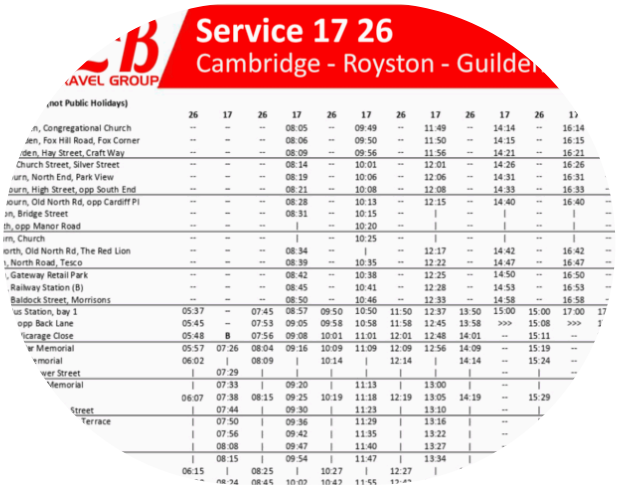
All services are run by A2B Bus & Coach (www.a2bbusandcoach.com). Services 17 & 26 run from Mon–Sat except where indicated. Service 7A runs from Mon–Fri. No Sunday or Bank Holiday services. Smaller times in *italics* involve a change to service 7 in Shelford.

£2.50 single fare **£1** for under 25s with a Tiger Pass

Towards Cambridge Foxton Station, Harston, Sawston, Trumpington Park & Ride, Addenbrooke's Hospital, The Shelfords, Hills Road & Long Road Colleges and Cambridge City Centre

	26	17	26	17	7A	26	17	26	17	26	26	26	17
			LS	ES	M-F			M-F		M-F		ES	SAT
Royston (Tesco)	-	-	-	0839M-F	-	-	1035	-	1222	-	-	-	1647
Royston (Railway station)	-	-	-	0845M-F	-	-	1041	-	1228	-	-	-	1653
Royston (Bus station)	0537	-	0745	0857	-	0950	1050	1150	1237	1350	1500	1700	1700
Melbourn	0548	-	0756	0908	-	1001	1101	1201	1248	1401	1511	1711	1711
Fowlmere (Chrishall Road)	-	0724	-	-	-	-	-	-	-	-	-	-	-
Fowlmere (War Memorial)	**0557**	**0726**	**0804**	**0916**	**0930**	**1009**	**1109**	**1209**	**1256**	**1409**	**1519**	**1719**	**1719**
Fowlmere (Thriplow Road)	-	0727	-	0918	0930	-	1111	-	1258	-	-	-	-
Thriplow (Village Green)	-	0729	-	-	0931	-	-	-	-	-	-	-	-
Heathfield (Garage)	-	-	-	-	0936	-	-	-	-	-	-	-	-
Foxton (Station)	0602	-	0809	-	-	1014	-	1214	-	1414	1524	1724	-
ewton	-	0733	-	0920	-	-	1113	-	1300	-	-	-	-
ston	0607	0736	0815	0922	-	1019	1118	1219	1305	1419	1529	1729	
ton (Park Road)	-	*0911*	-	*0954*	0955	-	*1154*	-	*1334*	-	-	-	
helford (Granta Terr)	-	0750	-	0932	1006	-	1129	-	1316	-	-	-	
oke's (Bus station)	-	0808	-	0943	-	-	1140	-	1327	-	-		
h Form	-	0814	-	0950	-	-	1144	-	1331	-	-		
R	0615	-	0825	-	1015	1027	-	1227	-	1427	15		
	0623	-	0836	-	-	1035	-	1235	-	143			
	0630	0824	0845	0958	-	1042	1155	1242	1342				

An extract from the Fowlmere Parish Council's bus timetable



Service 17 26

Cambridge - Royston - Guilde

AVEL GROUP

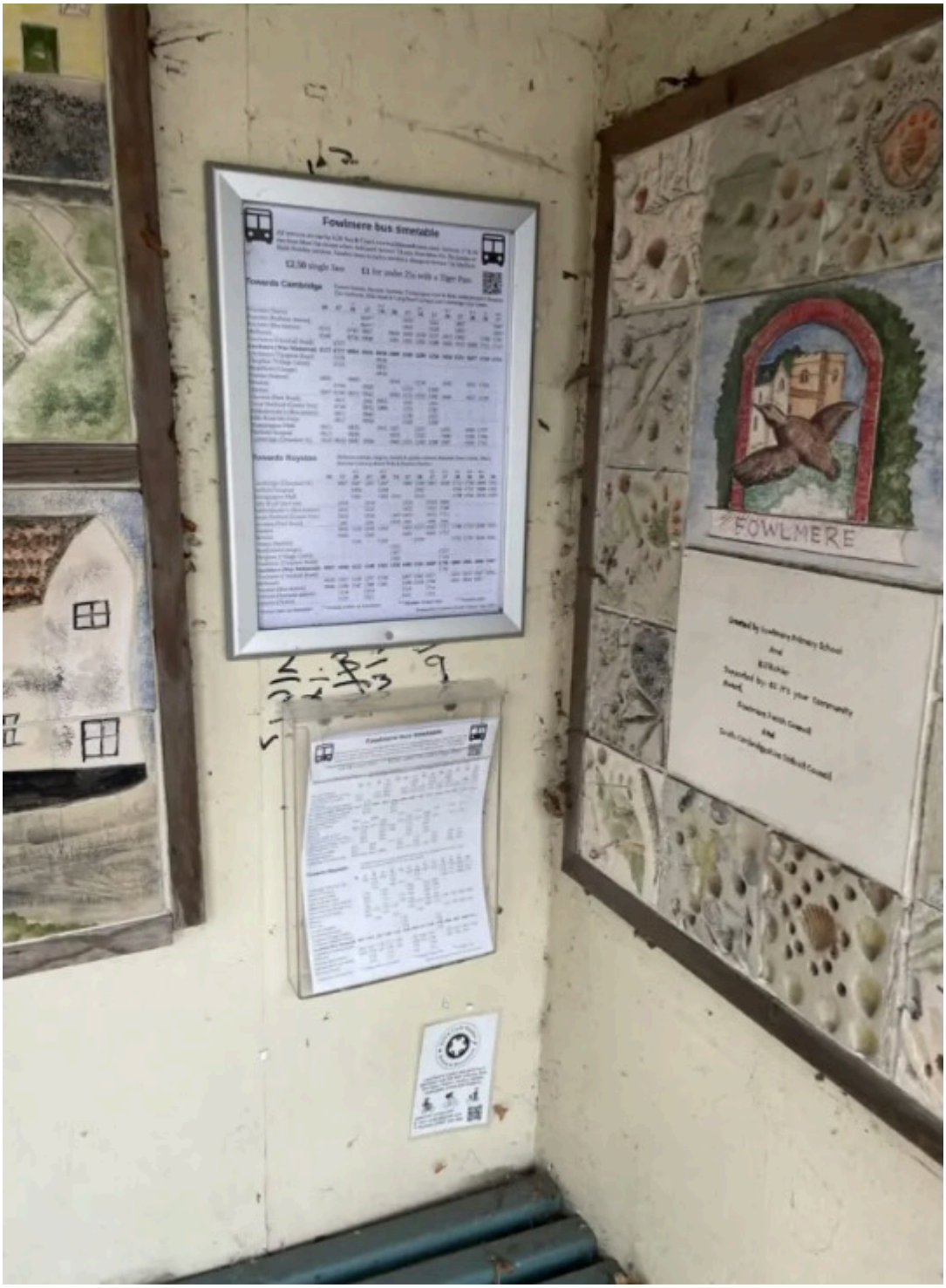
,not Public Holidays)	26	17	26	17	26	17	26	17	26	17	26	1
n, Congregational Church	--	--	--	08:05	--	09:49	--	11:49	--	14:14	--	16:14
den, Fox Hill Road, Fox Corner	--	--	--	08:06	--	09:50	--	11:50	--	14:15	--	16:15
den, Hay Street, Craft Way	--	--	--	08:09	--	09:56	--	11:56	--	14:21	--	16:21
Church Street, Silver Street	--	--	--	08:14	--	10:01	--	12:01	--	14:26	--	16:26
urn, North End, Park View	--	--	--	08:19	--	10:06	--	12:06	--	14:31	--	16:31
ourn, High Street, opp South End	--	--	--	08:21	--	10:08	--	12:08	--	14:33	--	16:33
ourn, Old North Rd, opp Cardiff Pl	--	--	--	08:28	--	10:13	--	12:15	--	14:40	--	16:40
n, Bridge Street	--	--	--	08:31	--	10:15	--	|	--	|	--	|
h, opp Manor Road	--	--	--	|	--	10:20	--	|	--	|	--	|
rn, Church	--	--	--	|	--	10:25	--	|	--	|	--	|
orth, Old North Rd, The Red Lion	--	--	--	08:34	--	|	--	12:17	--	14:42	--	16:42
, North Road, Tesco	--	--	--	08:39	--	10:35	--	12:22	--	14:47	--	16:47
, Gateway Retail Park	--	--	--	08:42	--	10:38	--	12:25	--	14:50	--	16:50
Railway Station (B)	--	--	--	08:45	--	10:41	--	12:28	--	14:53	--	16:53
Baldock Street, Morrisons	--	--	--	08:50	--	10:46	--	12:33	--	14:58	--	16:58
us Station, bay 1	05:37	--	07:45	08:57	09:50	10:50	11:50	12:37	13:50	15:00	15:00	17:00
opp Back Lane	05:45	--	07:53	09:05	09:58	10:58	11:58	12:45	13:58	>>>	15:08	>>>
icarage Close	05:48	B	07:56	09:08	10:01	11:01	12:01	12:48	14:01	--	15:11	--
r Memorial	05:57	07:26	08:04	09:16	10:09	11:09	12:09	12:56	14:09	--	15:19	--
morial	06:02	|	08:09	|	10:14	|	12:14	|	14:14	--	15:24	--
ver Street	|	07:29	|	|	|	|	|	|	|	--	|	--
Memorial	|	07:33	|	09:20	|	11:13	|	13:00	|	--	|	
	06:07	07:38	08:15	09:25	10:19	11:18	12:19	13:05	14:19	--	15:29	
Street	|	07:44	|	09:30	|	11:23	|	13:10	|	--	|	
Terrace	|	07:50	|	09:36	|	11:29	|	13:16	|	--		
	|	07:56	|	09:42	|	11:35	|	13:22	|	--		
	|	08:08	|	09:47	|	11:40	|	13:27	|			
	|	08:15	|	09:54	|	11:47	|	13:34	|			
	06:15	|	08:25	|	10:27	|	12:27	|			

An extract from bus operator A2B's timetable for routes 17 and 26

Publicising the local timetable

The Parish Council put a printed A3 copy of the consolidated timetable in a waterproof frame in all three bus stops in Fowlmere (where neither the bus operator nor the Combined Authority had

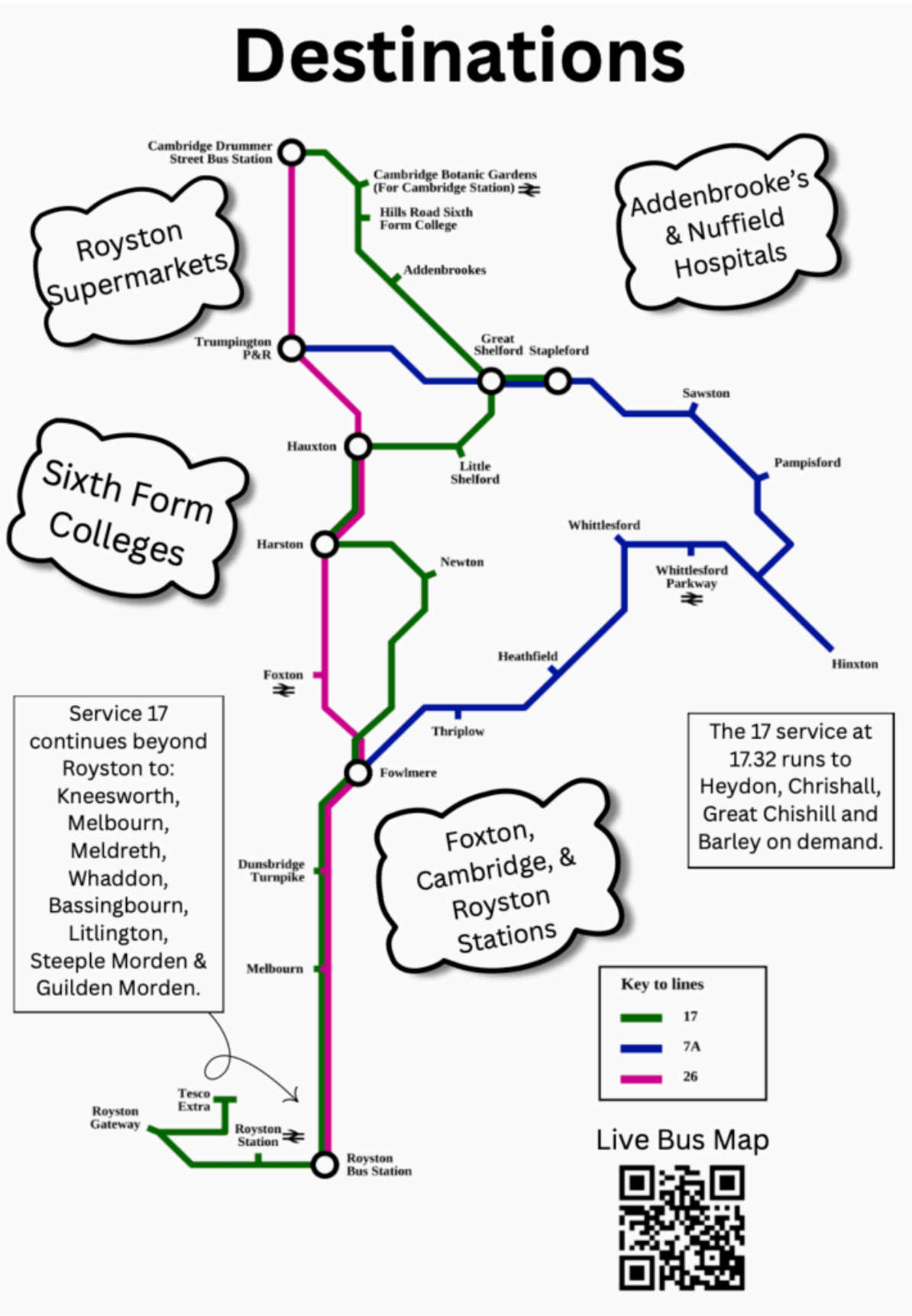
previously ensured that up-to-date printed timetables were on display at all times[2]). It then distributed a printed A4 copy to every address in the village (the Parish Council hoped that the single-page format and attractive layout would encourage residents to pin the timetables up in their kitchens and businesses to display them), and installed timetable dispensers at bus stops so that people could pick up a fresh copy if needed. Lastly, the group put the timetable on its own website and also arranged for it to be printed in a local magazine. The Parish Council ensures that all these timetables are kept up-to-date, including the regular one that goes out in the village magazine.



Fowlmere Parish Council's timetable and timetable dispenser at the bus stop at Fowlmere War Memorial bus stop.

Next steps

This autumn as the next step in its campaign, the Parish Council has produced a schematic 'tube-style' map of destinations that can be reached by bus from Fowlmere. This will be printed on the reverse side of September's updated bus timetable, and delivered to all homes in Fowlmere, and displayed in the village's three bus stops[3]. The map highlights the major destinations that can be reached from the village by bus, as well as intersections with the railway network. The text on the opposite page contains information about fares and reminds readers of the Parish Council's ongoing efforts to improve local bus services.



Fowlmere Parish Council's schematic bus map

Impacts

Members of the Parish Council's working group Fowlmere Sustainable Travel have some evidence that bus usage has increased in the village, however they have not yet received the ticketing data they have requested from A2B to confirm this. There is good reason to think passenger numbers might have increased though: around half of respondents to a recent survey organised by bus advocacy organisation Campaign for Better Transport said that having better information at bus stops including printed timetables would make them more likely to use the bus.

Increasing patronage may be critical, as the subsidised services that run through Fowlmere have already been reshaped in previous years as part of efforts to make the routes the Combined Authority invests in more cost-effective. The Combined Authority reviews the cost of the services it supports annually and local politicians may decide they cannot continue subsidising services in the future unless passenger numbers increase. An initial discussion is scheduled to take place about all services the Combined Authority subsidises at November's Combined Authority Transport Committee meeting.

We are keen to hear more about other groups' efforts to improve bus information in their local areas. Please get in touch if you would like to tell us about your experiences.

1. The 26 was previously fully subsidised by the Combined Authority. A2B has since taken on this service commercially, but it is still partly subsidised by the Combined Authority. ↩
2. A recent survey by Campaign for Better Transport found that only just over 3 in 10 bus stops in England, Scotland and Wales have an up-to-date timetable on display. ↩
3. According to Campaign for Better Transport's recent survey, only 16% of bus stops in England, Wales and Scotland have up-to-date maps of routes in the area. ↩

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Waiting time perceptions at transit stops and stations: Effects of basic amenities, gender, and security

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ABSTRACT

Waiting time in transit travel is often perceived negatively and high-amenity stops and stations are becoming increasingly popular as strategies for mitigating transit riders' aversion to waiting. However, beyond recent evidence that realtime transit arrival information reduces perceived waiting time, there is limited empirical evidence as to which other specific station and stop amenities can effectively influence user perceptions of waiting time. To address this knowledge gap, the authors conducted a passenger survey and video-recorded waiting passengers at different types of transit stops and stations to investigate differences between survey-reported waiting time and video-recorded actual waiting time. Results from the survey and video observations show that the reported wait time on average is about 1.21 times longer than the observed wait time. Regression analysis was employed to explain the variation in riders' reported waiting time as a function of their objectively observed waiting time, as well as station and stop amenities, weather, time of the day, personal demographics, and trip characteristics. Based on the regression results, most waits at stops with no amenities are perceived at least 1.3 times as long as they actually are. Basic amenities including benches and shelters significantly reduce perceived waiting times. Women waiting for more than 10 min in perceived insecure surroundings report waits as dramatically longer than they really are, and longer than do men in the same situation. The authors recommend a focus on providing basic amenities at stations and stops as broadly as possible in transit systems, and a particular focus on stops on low-frequency routes and in less safe areas for security measures.

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1. Introduction

Travel time is an important predictor of mode choice—especially in the developed world, it can even outweigh monetary costs associated with modes, urban form, and personal socio-demographics (Cervero, 2002; Frank et al., 2008). Time, however, can be measured both objectively and subjectively. Objectively, "time is what clocks measure" (Caroll, 2011). Subjectively, time can be perceived and experienced differently based on events (Andersen and Grush, 2009). This brings in a contrasting viewpoint: time can be defined as a fundamental intellectual structure within which humans sequence and compare events (Allison, 2004). Individual perceptions of time can vary significantly from any externally measurable "objective" time (Block, 2014; Fraisse, 1984). Events experienced can either moderate or exacerbate these variations. For example,

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events occurring at regular intervals tend to produce underestimates of objective time, while events occurring at irregular intervals tend to produce overestimates (Yarmey, 2000). Intense experiences—positive or negative—are found to produce overestimates of duration (Angrilli et al., 1997; Ariely and Zakay, 2001; Droit-Volet et al., 2004; Effron et al., 2006). Tipples (2008) specifically found high-arousal experiences with negative emotionality produce greater overestimates of duration than high-arousal experiences with positive emotionality or emotionally neutral experiences. In a transportation context, increasing task complexity (e.g., route complexity) may increase perceived time (Carrion and Levinson, 2013; Parthasarathi et al., 2013).

When it comes to travel times of different modes, public transit faces an inherent disadvantage not shared by other modes: waiting time. Waiting time in transit travel tends to be perceived negatively. Time spent aboard transit vehicles (In-Vehicle Time, or IVT) is generally perceived as taking roughly as long as it really does (Wardman, 1998, 2004). Transit users, however, perceive waits for transit vehicles to arrive as significantly *longer* than they really are. This phenomenon is commonly expressed in terms of a waiting time multiplier—or the ratio of perceived waiting time to either actual waiting time or in-vehicle time (Wardman, 2014). Auto users similarly overweight stopped time at traffic lights and ramp meters (Levinson et al., 2004; Wu et al., 2009). Negative perceptions of waiting time have negative implications for users' overall feelings about their mode (St-Louis et al., 2014; Tyrinopoulos and Antoniou, 2008; Walle and Steenberghen, 2006), and present a significant obstacle to increasing the competitiveness of public transit, which is more environmental friendly than the private automobile mode (El-Geneidy et al., 2009; Watkins et al., 2011).

Transit agencies increasingly propose high-amenity transit stops and stations for mitigating the perceived burden of waiting time (Denver Union Station Project Authority, 2004; Metropolitan Council, 2012; Transit Planning Board, 2008). However, beyond the amenity of at-stop realtime arrival information (Brakewood et al., 2014, 2015a,b; Dziekan and Kottenhoff, 2007; Gooze et al., 2013; Watkins et al., 2011), existing research does not sufficiently explore how specific station and stop amenities (e.g., benches, shelters) can effectively reduce transit users' perceptions of waiting time. This missing knowledge is problematic for efforts to increase transit use: users' perceptions of transit service play an important role in determining mode choice (Walle and Steenberghen, 2006) and often cannot be determined from common system-level performance measures (Eboli and Mazzulla, 2011). To address this gap in transit planning knowledge, the authors conducted a unique study in the Minneapolis-St Paul (MSP) metropolitan region that combines an onboard survey with video observation to compare transit users' self-reported waiting time with external measures of their actual waiting time. The study takes a uniquely systematic perspective, including a wide range of stop and station types, transit modes, times of day and seasons. We then explain waiting time perceptions as a function of stop/station design and environment. We offer generalizable recommendations that can be applied from a light rail station to a curbside bus stop for reducing perceived waiting times.

2. Related studies

Transit users often perceive their waiting time as considerably longer than it actually is. Table 1 summarizes existing research assessing perceived waiting time in comparison with other travel time concepts. These studies found that a minute of perceived waiting time is equivalent to up to 2.5 min of in-vehicle time (IVT), and is equivalent to 1.2 min of actual wait time. For example, Wardman (2004) finds that a 2.5:1 ratio of waiting time to in-vehicle time (IVT) is more appropriate for schedule planning and ridership forecasting than the traditional British 2:1 assumption. Horowitz (1981) finds that any wait at all is perceived as equivalent to an extra 8.4 minutes' IVT in a 30 min trip and 13 minutes' IVT in a 45 min trip, and that a ten-minute wait is equivalent to an extra 18.9 or 23.2 min of IVT, respectively.

Waiting time ratios can differ significantly between stated preference (SP; in which participants are asked directly what value they place on waiting time) and revealed preference (RP; in which participants valuations of waiting time are observed from their behavior) data collection protocols: Abrantes and Wardman (2011) found a relatively low ratio of 1.43 among state preference designs, and a considerably higher ratio of 2.32 among revealed preference designs. Wallis et al. (2013) also pointed to a predominance of stated preference designs in interpreting their finding of a low waiting-time ratio of 1.25 in a review of six Australian and one New Zealand studies.

Table 1
Waiting time ratios in existing research.

Study	Ratio	Notes
Dziekan and Kottenhoff (2007)	1.2:1	Perceived vs. actual wait time before implementation of realtime info on high-frequency tram line; 1:1 after implementation
Watkins et al. (2011)	1.2:1	Perceived vs. actual time in at-stop survey after ~5 min wait time, without realtime transit information mobile app
Wardman (1998a)	1.2:1–1.7:1	Perceived waiting time vs. perceived IVT
Wallis et al. (2013)	1.3:1	Perceived waiting time vs. perceived IVT; meta-analysis of primarily SP designs
Wardman (2013)	1.5:1–1.9:1	Perceived waiting time vs. perceived IVT. Varies by trip distance and purpose
Abrantes and Wardman (2011)	1.4:1–2.3:1	Perceived waiting time vs. perceived IVT; ratio differs based on SP vs. RP design
Horowitz (1981)	1.9:1–2.3:1	Perceived waiting time vs. perceived IVT; found non-linear relationship by length of wait and trip
Wardman (2004)	2.5:1	Perceived waiting time vs. perceived IVT

Waiting time perceptions may vary depending on circumstances including transit service factors, such as on-time performance (Daskalakis and Stathopoulos, 2008) and service information (Monzon et al., 2013), as well as stop/station factors, such as surroundings, perceived security, and amenities such as enclosed waiting areas, seating or restrooms (Evans et al., 2004; Wardman, 1998a). However, beyond recent evidence that real time arrival information reduces perceived waiting time, there is limited empirical evidence as to which other specific station and stop amenities can effectively influence user perceptions of waiting time.

Globally, the passenger perception influences of transit stop design have received some attention in the literature. Cascetta and Cartenì (2014) found that Napolitan commuters would accept an additional seven minutes of waiting time and ten minutes of access time in order to use a new rail line with markedly more attractive stations than an older line serving similar trips, yet their study did not isolate the impact of specific station and stop amenities. Moreau (1992) found transit users in Grenoble, France tend to overestimate their waiting times overall but that stop design factors such as light, heat/ventilation and general comfort influence estimates. In a study of Dutch railway passengers, van Hagen (2011) found lighting, music and aesthetics important in shaping perceptions of waiting time, but that stated preferences differ from revealed perceptions: passengers say they prefer bright lighting, calming music and warm colors, but experience waits in dim lighting, with stimulating music and cool colors as taking less time. This result reinforces the importance of directly studying passengers time perceptions as distinct from their stated preferences.

Traveler and trip characteristics can impact waiting time perceptions as well: Psarros et al. (2011) found that old age (of research subjects) and utilitarian trip purposes (i.e. to work, school or personal business) increase Athenian bus users' perceived waiting times by as much as 44%, while a morning departure reduces waiting time perceptions by four percent. Wardman (2013) found higher waiting time ratios for short-distance trips (of which waiting accounts for a greater portion of total trip time), and lower ratios for personal business trips than commute or other trips. General research on transit service quality in Athens and Thessaloniki, Greece, found female transit users are more sensitive to waiting time than male transit users (Tyrinopoulos and Antoniou, 2008).

Despite this existing body of literature, three factors suggest further study of transit stops' wait time perception impacts in a United States context will meaningfully deepen understanding of the relationship: First, wide variability in the quality of U. S. transit stops maximizes the difference between "pleasant" and "unpleasant" waiting environments. Second, wide variability in U. S. street design provisions for pedestrians versus automobiles maximize the importance of transit stops' surroundings in shaping user perceptions. Finally, the low cost and ubiquity of automotive transportation in the U. S. may increase individuals' sensitivity to the quality of experience offered by transit. Yet, existing pertinent research on U. S. (or North American) transit systems is sparse. Diab and El-Geneidy (2014) found average waiting time perception reductions as great as 4.4 min following a variety of largely schedule reliability-focused improvements (reserved lanes, signal priority, articulated buses, etc.) to a major bus corridor in Montreal, QC, but their study did not focus specifically on stops. Fan and Guthrie (2012), Taylor et al. (2009), as well as Iseki and Taylor (2010) found station and stop characteristics to be important in shaping users' overall perceptions of transit service quality based on stated preference surveys. None of the three studies, however, offer direct, quantitative evidence that amenities can effectively make waiting time during transit trips seem "shorter" to users.

Recent evidence on the effects of providing realtime transit arrival information at stations and stops has been consistent across various cities and regions in the world. Dziekan and Kottenhoff (2007) found that adding realtime arrival information signs to tram stops in The Hauge, The Netherlands reduced perceived waiting times by more than twenty percent based on a longitudinal, before/after survey of passengers. They suggested that realtime arrival information signs improved the experience of using transit as much as reducing headways from ten to eight minutes, at less than one-fifth the cost. Watkins et al. (2011) reached nearly identical results for perceived versus measured waiting time for bus passengers in King County, Washington, USA using an at-stop, in person survey. In a 2014 follow-up study of the King County Metro, Gooze et al. (2013) found continued effects of shortened time perceptions, as well as self-reported more frequent transit use due to realtime information availability by nearly 30% of respondents. They also find that inaccurate realtime information increases waiting time estimates. Recent studies on the effects of smartphone-based realtime transit arrival information applications find similar results with the effects of electronic realtime information signs. Brakewood et al.'s (2014, 2015b) work on realtime information via mobile devices finds a decrease in reported wait times of (on average) 1–2 min for Boston commuter rail riders and Tampa bus riders who used realtime information apps. In addition, the more heavily-used routes in a New York realtime information pilot program see a median 2.3% increase in ridership after implementation (Brakewood et al., 2015a).

Methodologically, research on waiting time perceptions includes some form of survey focused on transit passengers. This component is difficult to avoid, as individual perceptions of time—by definition—cannot be externally observed. Most existing research compares perceived waiting time with perceived in-vehicle time (Horowitz, 1981; Wardman, 1998b, 2004). The more recent studies compare perceived waiting time with a direct measurement of actual waiting time (Dziekan and Kottenhoff, 2007; Watkins et al., 2011). Studies comparing perceived waiting time to perceived IVT have the practical data collection advantage of not requiring an external measurement of subjects' actual waiting time, which can significantly simplify data collection. Studies comparing perceived waiting time to actual waiting time offer the ability to compare results based on a standard, external reference point. They also offer a direct focus on the waiting experience, regardless of the quality of in-vehicle experience provided. However, this type of research requires an objective, external measurement of how long subjects actually wait (Dziekan and Kottenhoff, 2007; Reed, 1995; Watkins et al., 2011).

This research adopts the recently prominent approach of comparing subjects' reported waiting times to external measures of their actual waiting times. We conduct a unique study in which an onboard survey is combined with at-station/stop video footage to measure participants' subjective and objective lengths of waiting time.

3. Methods

The research revolved around comparing transit riders' actual and self-reported waiting times at 36 light rail, commuter rail and bus rapid transit stations, bus transit centers, and curbside bus stops in the MSP metropolitan region, U.S. The MSP region is nicknamed the Twin Cities for its two largest cities: Minneapolis, the largest city in the state of Minnesota, and St. Paul, the state capital. The two downtowns lie roughly 18 km (11 mi.) apart, surrounded by a variety of urban and suburban neighborhoods. As of 2013 (the year most representative of data collection), the regional transit system was operated by six non-competing transit providers and carried 86.6 million rides on a variety of local and express bus routes, one light rail line, one freeway bus rapid transit line, and one commuter rail line (Metro Transit, 2014; Minnesota Valley Transit Authority, 2015). Data were collected by an onboard survey of transit riders, a series of observations made from video footage of respondents' waiting time, and an audit of station and stop amenities, design characteristics, and surrounding environments. The study area has an extreme climate, particularly in winter—daytime high temperatures during data collection ranged from −13 °C (8°F) to 34 °C (94°F). To consider potential impacts of temperature on time perceptions, as found experimentally by Hancock (1993), both summer and winter data were collected. After data collection, regression analyses were performed to examine respondents' reported waiting time as a function of objectively observed waiting time and characteristics of station and stop amenities, while controlling for weather, time of day, self-reported and observed socio-demographic characteristics and trip characteristics.

3.1. Site selection

The research team selected 36 data collection sites chosen from a complete list of MSP transit stations and stops. Stratified sampling was used in the site selection process. The first step in the process began with removing all bus stops with fewer than 50 average weekday boardings. This left a total of 703 transit stops and stations. The second step developed a classification schema based upon station/stop types and neighborhood types. Thirty-six sites were selected to ensure representation from each classification. Table 2 illustrates the distribution of study sites by each classification scheme.

As shown in Table 2, these sites offer a full range of amenity levels from full-featured light rail stations to simple curbside bus stops. The sites also provide a mix of urban and suburban locations as well as attractive and unattractive surrounding environments. Transitway stations are the most common individual site type with 13 locations, but are slightly surpassed if all curbside stops (15 locations) are combined. We deliberately include park-and-ride facilities to obtain a comprehensive picture of the transit system, but walk-and-ride stops and stations form a comfortable majority, with 28 of 36 locations. Just over half of all sites are located in commercial, office and/or industrial areas outside of either downtown, partially reflecting the study's focus on high-ridership stops, which tend to be on major thoroughfares. Twenty-one study sites are in one of the central cities, while 15 are in suburbs. Nineteen sites are in neighborhoods with a "low" pleasantness rating, while 17 were in neighborhoods with "Medium" or "High" ratings. To maximize variation, we excluded areas of "medium" pleasantness, with the exception of two suburban transitway stations. We include these due to a lack of suburban transitway stations in areas with "high" pleasantness. Fig. 1 shows locations of study sites in the Twin Cities region, demonstrating the broad urban, suburban and modal distribution of data collection sites.

3.2. Onboard survey

The first primary data collection task was a brief survey of Twin Cities transit riders who boarded trains or buses at the 36 study sites. The survey was conducted during July and August, 2013, and February, March and April, 2014. Each site was

Table 2
Distribution of study sites.

Stop type		Primary access mode		Surrounding land use		Neighborhood location		Neighborhood pleasantness	
Unimproved curbside	8	Park-and-ride	8	Commercial/Industrial/Office	18	Suburban	15	High	15
Improved curbside	8	Walk-up	28	Residential	10	Urban	21	Medium	2
Transit center	7			Downtown	8			Low	19
Rail/BRT station	13								
Total	36	Total	36	Total	36	Total	36	Total	36

Note: Pleasantness ratings were done by a trained researcher via a rough, at-a-glance assessment to speed the selection process. A rough assessment of pleasantness was necessary in the initial site selection process as no comprehensive, metropolitan source of pleasantness data exists. Factors used in pleasantness ratings include sidewalk presence/width, amount and location of off-street parking, tree cover, enclosure of street scenes, architectural variety and ground floor window, etc.

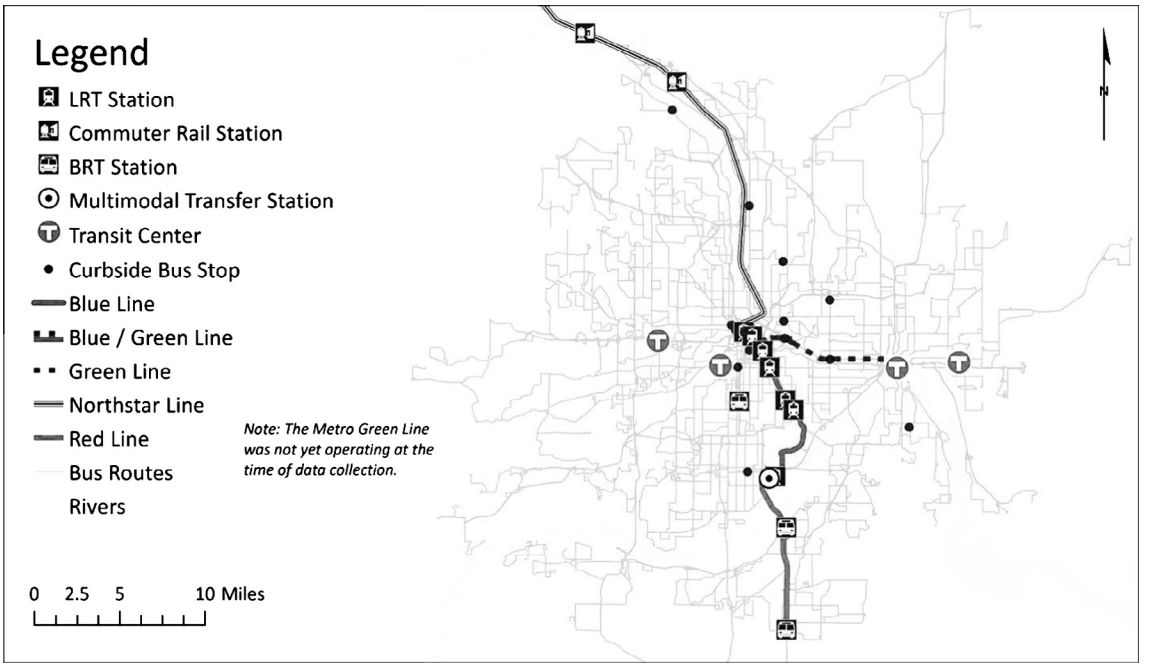


Fig. 1. Study site locations.

surveyed during each of four time periods as defined by Twin Cities Metro Transit: Morning Peak (6:00–9:00 am), Mid-day Off-Peak (9:01 am–2:59 pm), Evening Peak (3:00–6:30 pm) and Late Evening Off-Peak (after 6:30 pm). Survey teams attempted to obtain at least four responses from each site in each time period (sixteen responses per site in total). If they were unsuccessful on the initial visit to a given site at a given time, survey teams made up to two return visits. In some cases, particularly at high-volume locations such as light rail stations, one boarding would yield more than four responses; as a result, some locations have more than the goal of 16 responses.

To allow respondents to complete their entire waiting period as they normally would, recruiting and survey administration took place on board transit vehicles after all passengers had boarded. Survey team members waited unobtrusively at the station/stop, positioned themselves at the back of the boarding queue, and boarded with passengers. Once on board, survey team members recruited as many passengers who had just boarded as possible.

The survey questionnaire began with the key question "How many minutes do you think you waited at the station/stop before you boarded this train/bus?" This question captured the respondent's self-reported waiting time—used as a measure of their perception. The questionnaire was self-administered in writing, and also collected basic information on perceptions of the "pleasantness" of the station/stop, forms of schedule information used (pocket schedules, realtime information app, etc.), approximate trip origin and destination, primary activities at origin and destination, access and planned egress modes, general travel behavior, and basic demographic information.

Upon collecting each completed questionnaire, surveyors (with respondents' permission) took a photograph of each respondent holding up their questionnaire, with a preprinted ID number visible. These photographs enabled the visual identification of respondents without the need to collect any other identifying information such as names.

Self-reported waiting times are not necessarily identical to *perceptions* of waiting time. However, perceptions, by their very nature, cannot be directly measured. We employ self-reported waiting time as an externally measurable proxy for time perceptions. Our discussion of perceptions in this paper reflects the relationship between reported and actual waiting times.

3.3. Respondent observations

The second data collection task involved unobtrusively recording video footage of potential respondents during their wait for the train or bus, and making a series of observations about those who elected to participate from the video. The photographs taken of respondents with their questionnaires were used to connect survey responses with observations, and to assign each set of observations an ID number later used to merge the two data sets. Once a respondent was identified arriving at the station or stop, a researcher recorded the counter time in the video file. During video playback, the researcher made a series of observations about the respondent, including: demographics such as gender, race, and approximate age; manner of dress; items carried; mobility devices, if any; activities engaged in while waiting; and travelling companions, if any. A significant body of research supports the accuracy of at-a-glance estimates of age from photographs (Burt and

Perrett, 1995; Sörqvist and Erikssön, 2007; Rhodes, 2009) when to-the-year precision (such as for eligibility to purchase alcohol) is not required (George and Hole, 2000). Readily observable respondent characteristics were observed (rather than asked in the questionnaire) to maximize responses by keeping the questionnaire as brief as possible.

Finally, the researchers recorded the counter time at which the respondent boarded the train or bus. The difference between this observation and the initial arrival time observation provided the measure of actual waiting time.

While unusual in research on urban public transit, video observations of individuals while waiting are common in other fields, for example airport design and operations research (Popovic et al., 2009; Wales et al., 2002). Van Hagen (2011) employs a similar protocol with unobtrusive observations while waiting followed by a reflective on board survey to study perceptions of waiting time at railway stations, albeit with in-person observations as opposed to video footage.

3.4. Waiting environment audit

To obtain a standardized list of amenities and design features present at data collection sites, as well as information on surrounding environments, the researchers also conducted a waiting environment audit of each data collection site. Based on the common practice of pedestrian environment audits, the audit tool included both quantitative information (identifying the presence/absence/prevalence of features) and qualitative information (identifying the auditor's perception of a given quality using a four-part Likert scale ranging from "Not at all", "Somewhat", "Mostly", to "Very" for each quality). Troped et al. (2006) as well as Millstein et al. (2013) find acceptable inter-rater reliability from similarly designed path and pedestrian environment audits. Specific topics covered by the audit included: the physical layout of the waiting area (separation from surrounding pedestrian flow, boarding from curb vs. transit platform, etc.), shelter provided, seating, other amenities such as water fountains or restrooms, overall physical comfort, route and schedule information provided, maintenance, visual appeal, traffic level, neighborhood security, noise and air quality, and overall perception of pleasantness.

The winter audit also included questions on snow removal. To lessen the influence of individual bias, each site was audited by two members of the research team, one male and one female; each site received the average of both auditors' responses in the final data. Audit data collection was limited to two auditors by budgetary constraints and a need to devote maximum possible resources to the video observation and on-board survey efforts. The use of only two auditors reduces the external validity of the variables derived from the waiting environment audit. In other words, there is no guarantee any other two people would produce the same absolute values. It does less damage to the internal validity of the audit: we can be more confident in the relative values assigned to different sites due to both auditors auditing every site. Finally, the goal of the audit is not to produce an absolute measure of conditions at any one site, nor to approximate the absolute ratings of an average transit user, but to measure the relative difference between sites—a goal served by having both auditors audit every site.

4. Results

The survey produced a total of 822 valid responses, for which the respondent was successfully identified in video footage, and for which the questionnaire was substantially complete, including an estimate of waiting time. (For 113 additional survey responses, the respondent could not be conclusively matched with video footage; these responses were not included in the analysis.) Of these 822 responses, our final sample includes 702 observations: the regression models estimated to explain reported waiting time as a function of observed waiting time, stop, respondent and trip characteristics exclude observations with missing values on their variables. Table 3 provides a sample distribution. The sample is, perhaps not surprisingly, composed heavily of population groups likely to use transit, particularly low-income riders, people belonging to minority racial or ethnic groups, and riders without cars. By comparison, 79% of the Twin Cities metropolitan statistical area was made up of non-Hispanic whites as of the 2010 census, while non-Hispanic whites made up of 59% of the study sample. In terms of income, only 18% of metropolitan households had an income less than $25,000, while 38% of the study sample had an income

Table 3
Sample distribution.

Household income		Race	
<$25,000	38%	White, non-Hispanic	59%
$25,000–$39,999	18%	Black	27%
$40,000–$59,999	14%	Hispanic	5%
$60,000–$99,999	15%	Asian	6%
$100,000 or more	15%	American Indian	1%
		Other	1%
Transit use frequency		**Transit pass**	
5x/wk or more	60%	Have:	63%
2–4x/wk	19%		
1–4x/mo	9%	Car	
<1x/mo	8%	Have:	41%
First time	4%		

less than $25,000. In terms of auto ownership, 92% of households in the Twin Cities region had at least one motor vehicle (Minnesota Population Center, 2011), compared to 41% in the study sample.

Fig. 2a is a box plot comparing the distribution of reported waiting time to that of actual waiting time. To interpret a box plot, the top of the box represents the 75th percentile, the band inside the box represents the median, and the bottom of the box represents the 25th percentile. The ends of the whiskers represent the 2nd percentile and the 98th percentile. As shown in Fig. 2a, 75% of respondents have an actual waiting time below 7.5 min and yet these respondents have a reported waiting time below 10 min. The median value of actual waiting time is 4.5 min and yet the median of reported waiting time is as high as 5 min. These statistics show that respondents tend to overestimate waiting time.

Fig. 2b shows a box plot of the ratio of reported to actual waiting time in five-minute increments of actual waiting time. We choose not to show the ratio for respondents whose actual waiting time was longer than 20 min. This is largely due of the small number of such respondents ($N = 16$, which is 2% of the final sample). The small number of observations with long actual waiting times is a limitation of this study, but it is also an unavoidable consequence of the practical decision to constrain site selection to stops with relatively high ridership. Stops with relatively high ridership tend to be located on heavily-used routes with relatively frequent service. It is also possible that users of lower frequency routes check schedules more carefully before setting out for their transit trips.

As shown in Fig. 2b, for zero to five minutes of actual waiting time (55% of the sample), reported waiting time shows a significant trend of over-estimates, with a 25th percentile of 1, a median of roughly 1.5, and a 75th percentile of nearly 2.7. Estimates tend to be more accurate for longer actual waits: 5–10 min of actual waiting time produces a median ratio close to 1, though the 75th percentile extends considerably farther from the median than the 25th percentile. Longer actual waits produce slightly underestimated reported waiting time, but as explained earlier, account for only a small percentage of responses.

4.1. Regression model

The three data sets from the on-board survey, at-the-stop video observations, and the waiting environment audit were merged and used to estimate a log–log regression model with interaction terms using the equation:

$$y = \beta_0 + \beta_A * x_A + \beta_2 * x_2 + \beta_{A2} * x_A * x_2 + \ldots + \beta_i * x_i + \beta_{Ai} * (x_A * x_i) \ldots \beta_i * x_n + \beta_{An} * (*x_A * x_n) + e \quad (1)$$

where

y equals the natural logarithm of reported waiting time (with 1 added to the raw variable to avoid losing 0 values),
x_A equals the natural logarithm of actual waiting time (also with 1 added), and
x_2 through x_i equal the binary explanatory variables listed below.

Note that variables identified by † below were also interacted with the natural logarithm of actual waiting time (i.e., x_A) to capture the change in its relationship with reported waiting time over actual waiting time. We believe it is theoretically crucial to include interaction terms for some variables because certain explanatory variables likely have different impacts on time perceptions in short and long waits. For example: a bench may have little impact at all on perceptions of a wait so short that a rider faced with it would likely stand anyway, yet may have a profound impact on perceptions of a very long wait. A woman waiting in unsafe surroundings might at first feel relieved at reaching her stop safely, then become increasingly apprehensive as her wait drags on. We do not assume such processes take place, but the use of interaction terms where appropriate allows us to see their effects if they do, an insight the raw variables alone do not offer. While it is true that

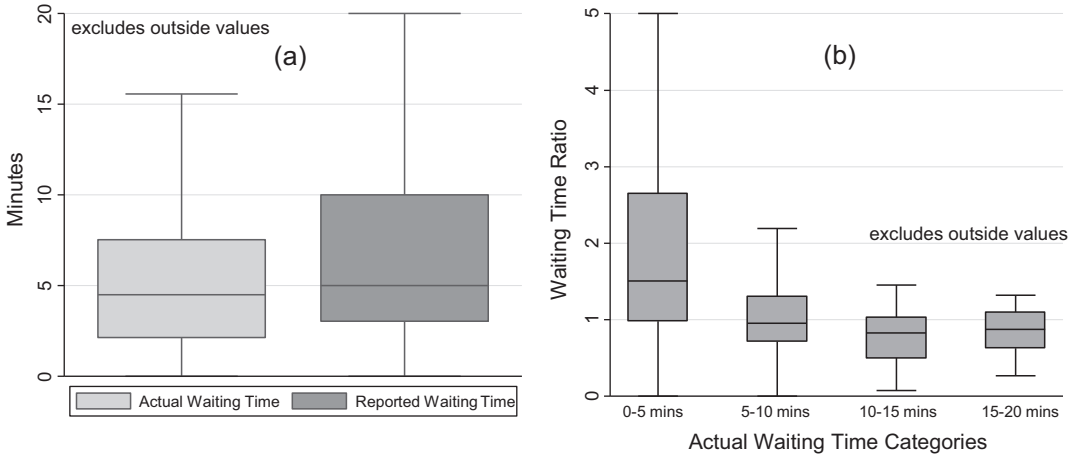


Fig. 2. Box plots comparing Reported and Actual Waiting Times. *Note:* "Waiting Time Ratio" refers to reported waiting time divided by actual waiting time.

interaction terms can introduce co-linearity into a regression model, none of the variables in our model correlate strongly enough with each other to raise this issue. In addition, our model is specified from the outset to avoid such problems through the exclusive use of binary variables for the base terms, with the sole exception of the actual waiting time variable.

- Rail†—A response collected on a light rail or commuter train. Included to account for modal differences in passengers' perceptions.
- Shelter†—A stop or stop/station with some form of shelter provided for waiting passengers. Included as an amenity.
- Bench†—A bench provided as part of the transit station or stop. Included as an amenity.
- Realtime Information Sign†—An electronic display giving passengers realtime transit arrival information. Included due to existing research on time perception impacts of realtime information.
- Female–Female respondent. Included to account for potential gender differences in time perceptions.
- Not/Somewhat Safe—A station or stop rated as "Not safe at all" or "Somewhat safe". Included due to research showing users place high importance on security at transit stations and stops.
- Female & Not/Somewhat Safe†—The interaction of "Female" and "Not/Somewhat Safe". Included to account for gender differences in perceptions of personal security.
- Senior†—A respondent estimated to be 65 years or older. Included to account for generational differences in transit use patterns.
- Minority†—Non-white and/or Hispanic respondent. Included to account for cultural differences in transit use and perceptions of transit. (Note: Variables identifying individual minority groups were insignificant in early model runs.)
- Knew Schedule†—A respondent who reported having known the schedule in advance of boarding. Included to account for the potential effects of a known length of wait on time perceptions.
- Transfer—A respondent who arrived at the station or stop by train or bus and transferred to the route he/she was surveyed on. Included due to existing research indicating high perceived disutility of transfers.
- Utilitarian Personal Destination—A respondent who identified the primary activity at their destination as "Personal Business", "Shopping" or any other non-commute destination besides returning home.
- Recreational Destination—A respondent who identified the primary activity at their destination as "Social", "Recreation" or "Eat Out".
- Mid-Day—A trip made between 9:01 am and 2:59 pm, the mid-day, off-peak service period, as defined by Metro Transit.
- Evening Peak—A trip made between 3:00 pm and 6:30 pm, the evening peak service period, as defined by Metro Transit.
- Late Evening—A trip made after 6:30 pm, the late-evening, off-peak service period, as defined by Metro Transit. Included (along with the two above) to account for potential differences in perceptions of time throughout the service day. "Morning Peak", 6:00 am to 9:00 am, was omitted as the reference.
- Traveled Alone—A respondent who had no traveling companions according to observations made from video footage. Included to account for time perception impacts of solitude versus companionship.
- Activity—A respondent who engaged in some type of activity while waiting other than sitting, standing, looking for the bus, etc. Included to account for the time perception impacts of diversion.
- Winter—A response collected during the winter months. Included to account for weather-linked differences in perceptions.

Early versions of the model also included a binary variable identifying respondents traveling with children as well as interactions between Winter and the station amenity variables. None of these was ever significant. Only 24 respondents were, in fact, travelling with children, likely reducing the explanatory power of the variable. In addition, a long winter period of daytime high temperatures too cold for data collection (less than −18 °C [0°F]), followed by an unusually rapid spring thaw may have influenced the effects of weather on perceived waiting times.

As shown in Fig. 3a, the raw Reported Waiting Time variable is positively skewed; a natural logarithmic transformation (see Fig. 3b) yields a dependent variable that approaches normal distribution. Early models compared a log–log transformation with a log-level transformation and simple linear regression without transformation. The log–log specification performed best in terms of significant explanatory variables. In addition, log–log coefficients represent elasticities—i.e. percentage changes—significantly easing interpretation.

The raw Actual Waiting Time variable (prior to the logarithmic transformation) has a mean of 6.80 min, with a median of 5 min. Raw values of Actual Waiting Time are shorter as a group, with a mean of 5.64 min and a median of 4.5 min. That is, the reported wait time on average is about 1.21 times longer than the observed wait time, which is consistent with the 1.2 ratio found in prior research as shown in Table 1. All dummy variables except Hi-Frequency, Shelter, Bench, Knew Schedule and Traveled Alone have a mode of zero.

The final model (as shown in the column denoted as "Final" in Table 4) includes 702 observations and achieves an acceptable R^2 of 0.412. Besides the final model, Table 4 also presents a simple model excluding interaction terms (shown in the column denoted as "Simplified" in Table 4) and a full model that includes interaction terms for most variables (shown in the column denoted as "Full" in Table 4). As expected, the simple model excluding interaction terms performs significantly worse compared to the full and final models, with a lower R^2, and notably fewer significant explanatory variables, even considering variables only marginally significant. The final model has an improved adjusted R^2 compared to the full model. Specifically, the final model removed most insignificant variables from the full model. Two insignificant variables (Bench

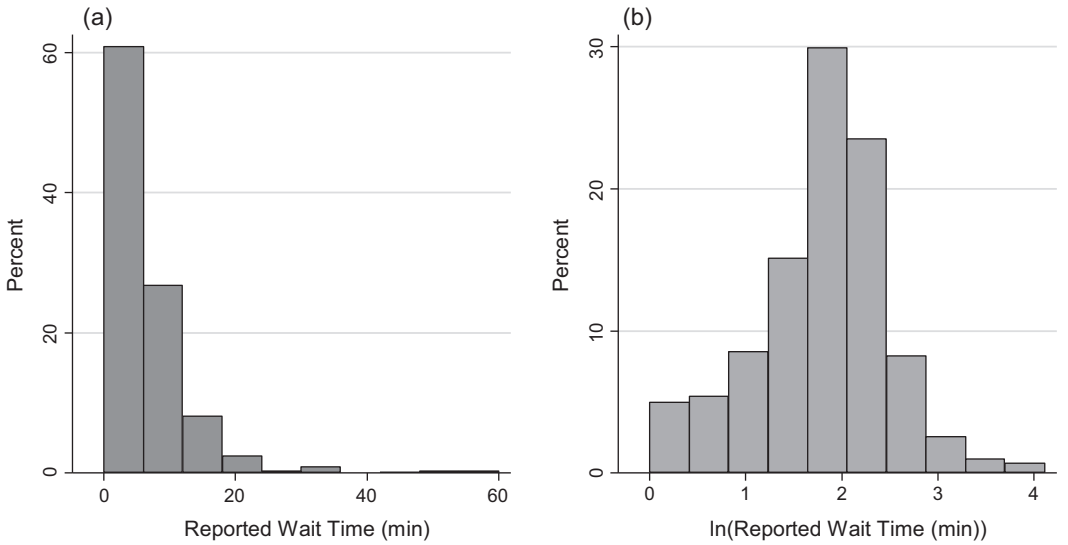


Fig. 3. Histograms of (a) raw and (b) log-transformed reported waiting time.

Table 4
Log–log regression: response variable ln(Reported Wait).

	Response variable: ln(Reported Wait)	Simple-no interaction	Full	Final
	Explanatory variables:	β	β	β
	ln(Observed Wait)	0.5481***	0.6683***	0.6673***
Transit service	Rail	−0.0755	−0.1843	−0.1039*
	Rail ∗ ln(Observed Wait)		0.0497	
Amenities	Shelter	−0.0666	−0.3329**	−0.3388**
	Shelter ∗ ln(Observed Wait)		0.1915**	0.1992**
	Bench	−0.0551	0.1869	0.1772
	Bench ∗ ln(Observed Wait)		−0.1634**	−0.1576**
	Realtime Sign	−0.0909	−0.0844	−0.0920
	Realtime Sign ∗ ln(Observed Wait)		−0.0039	
Respondent characteristics	Female respondent	0.0019	0.0057	
	Not/somewhat safe	−0.0487	−0.0273	
	Female & not/somewhat safe		−0.4038**	−0.3989***
	Female & not/somewhat safe ∗ ln(Observed Wait)		0.2166**	0.2049**
	Senior respondent	0.0126	0.6376**	0.5871**
	Senior Respondent ∗ ln(Observed Wait)		−0.3232**	−0.3045*
	Minority	0.0401	0.4656***	0.4454***
	Minority ∗ ln(Observed Wait)		−0.2539***	−0.2455***
Trip characteristics	Knew schedule	0.1444***	0.4486***	0.4659***
	Knew schedule ∗ ln(Observed Wait)		−0.1933***	−0.1978***
	Transferred	0.0589	0.0871	0.0883
	Utilitarian personal destination	−0.0556	−0.0803	
	Recreational destination	−0.0197	−0.0372	
	Mid-day	0.2001***	0.1897***	0.1758***
	Evening peak	0.1607***	0.1650***	0.1537***
	Late evening	0.1358*	0.1524**	0.1410*
	Traveled alone	0.1600***	0.1610***	0.1584***
	Engaged in activity while waiting	0.0128	−0.0248	
	Winter	−0.1114**	−0.0992**	−0.0985**
	Constant	0.8014***	0.5970***	0.5686***
	N	702	702	702
	R Square	0.3765	0.4141	0.4119
	Adjusted *R*-Square	0.3591	0.3897	0.3938

* $p < .1$.
** $p < .05$.
*** $p < .01$.

and Transfer) are included in the Final model because removing these two insignificant variables results in decrease in the adjusted R-square value. In addition, residual plot from the final model (Fig. 4) shows that residuals of the final model are fairly symmetrically distributed around the zero line in relation to the natural logarithm of actual waiting time (i.e., x_A), indicating good performance of the final model. For these reasons, we base our analysis on the final model, with selected interaction terms included.

As shown in Table 4, the natural logarithm of actual waiting time in the final model is significant and has a positive coefficient, indicating that longer actual waiting times are related to longer reported waiting times. The Rail variable is significant, which indicates that people waiting for rail transit perceive shorter waits compared to people waiting for bus transit. This finding is consistent with prior research (Daskalakis and Stathopoulos, 2008) that service reliability is an important factor of waiting time perceptions (at the time of data collection, the Twin Cities region only had one rail line and the rail line was the most reliable route in the system). Among the station/stop amenities considered, Shelter is significant and negative, though with a positive, significant interaction term, dampening the effect for long waits. Bench is insignificant, but produces a significant, negative interaction, indicating that seating has little initial effect on waiting time perceptions but serves to moderate perceptions of longer waits. Realtime Sign has a negative but insignificant coefficient, which is inconsistent with the existing literature. In the Twin Cities transit system, realtime information signs provide realtime information when available, and default to scheduled arrival times when realtime information is unavailable due to technical difficulties or buses and trains that have yet to start their runs.

Among the respondent characteristics variables, it is particularly notable that the interaction of Female and Not/Somewhat Safe is significant, along with its second-order interaction with ln(Actual Waiting Time). Minority and its interaction term are significant, with positive base and negative interaction coefficients. Senior Respondent and its interaction is also significant. Among the trip characteristics variables, Mid-day and Evening Peak are significant, with positive coefficients. Interestingly, considering Minnesota weather, Winter is insignificant.

4.2. Model predictions

Due to the complexity of the equation produced by a Log–Log model specification with multiple interaction terms, key results are more conveniently interpreted graphically than via the raw regression coefficients. Fig. 5 shows the final model's predictions of Reported Waiting Time under amenity and environment scenarios over values of Actual Waiting Time from zero to 15 min (95% of participating responses have an Observed Wait Time of 10 min or less.)

More specifically, Fig. 5 not only provides mean predictions from the final model but also illustrates the uncertainties surrounding the mean predictions. Statistical software packages including Clarify 2.0 and Stata 13.1 are used to estimate the expected values and their uncertainty (represented in the form of 90% confidence interval). To make predictions of the base scenarios (i.e., no amenities, male and safe), the named dummy variables (i.e., Shelter, Bench, Female, Unsafe) and their interaction terms are both set equal to zero. To make the predications for the alterative scenarios, the named dummy variables are set equal to one, and their interaction terms are set equal to the natural logarithm of each x-axis value shown on the graph, i.e., the product of 1 and ln(Actual Waiting Time). Unless stated otherwise, all other dummy variables and interaction terms are held at their modal values. Graphed y-values are the exponential of the model's prediction of ln(Reported Waiting Time), with 1 subtracted; they represent the model's prediction of Reported Waiting Time on an arithmetic scale.

Fig. 5a shows model estimates of Reported Waiting Time for the base scenario (no amenities) as well as the scenario with bench and shelter. Specifically, both scenarios predict reported wait times for an 18–64 year old, white male who traveled alone without making transfers in the morning peak time period during summer time and who knew the schedule ahead of time. As shown in Fig. 5a, the base scenario produces a notable overestimate of waiting time. For example, on average a 15 min wait is perceived as 20 min, 10 min wait perceived as 15 min, and 5 min wait perceived 10 min. The Shelter and Bench scenario, however, significantly moderate the predicted overestimate, producing 2–3 min of reduction in waiting time perceptions. On average with shelter and bench, a 15 min wait is perceived as 17 min, 10 min wait perceived as 13 min, and 5 min wait perceived as 8 min.

Fig. 5b shows the model estimate of reported waiting time based on respondents' gender and perceived security of stop surroundings with no stop amenities. The baseline scenario in Fig. 5b is the same as that of Fig. 5a. The mean prediction line

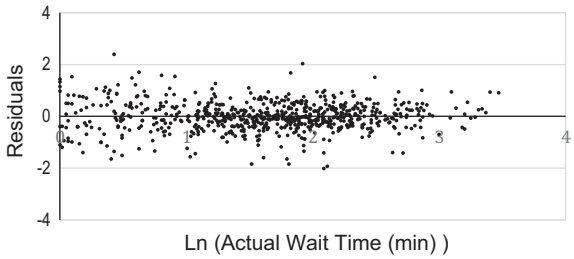


Fig. 4. Residuals vs. log-transformed actual waiting time variable.

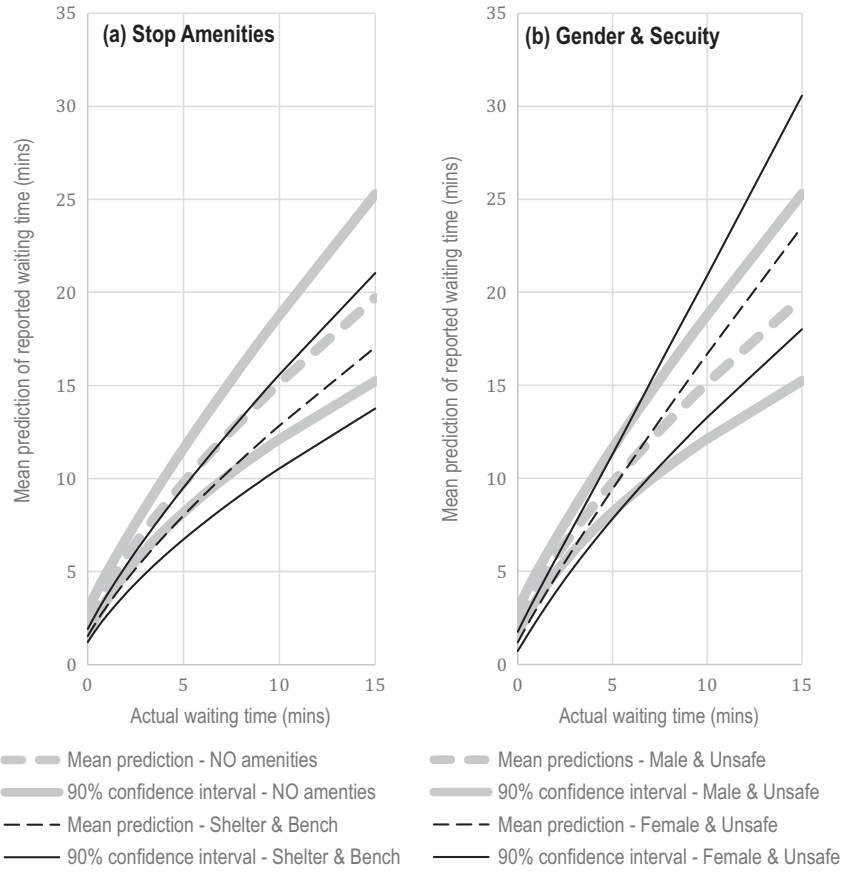


Fig. 5. Model prediction of reported wait time vs. actual waiting time for basic stop amenities and for gender and security.

for a female respondent *and* a "somewhat safe" or "not safe at all" surrounding environment tracks the baseline mean prediction line fairly closely for the first five minutes of observed waiting time, then diverges increasingly upward. For a woman waiting at a simple "pole-in-the-ground" curbside stop with perceived insecure surroundings, on average a 10 min wait seems to take 17 min, and a 15 min wait seems to take 24 min.

5. Conclusions and discussion

Results from this research support the hypothesis that transit users, on the whole, tend to perceive the time spent waiting for a train or bus as longer than it actually is, and that characteristics of the station or stop and its environment can alter those perceptions. Nonetheless, the study findings show that the relationships between station/stop amenities and waiting time perceptions are more complicated than generally assumed. Our results indicate a non-linear relationship between reported and actual waiting time variables, and that some amenities (e.g., bench) are more important to longer waits than shorter waits.

Our results corroborate existing research on the importance of factors such as time of day (Psarros et al., 2011), passengers' gender (Tyrinopoulos and Antoniou, 2008), surroundings and security (Evans et al., 2004; Wardman, 1998a) in shaping perceptions of waiting time. Existing research also highlights the importance of transit service reliability to passengers' perceptions of waiting time: perceived unreliable services seem to take longer to arrive (Daskalakis and Stathopoulos, 2008). While our study does not directly address service reliability, our final model's finding that rail passengers perceive shorter waits than bus passengers stands to reason in this context, as rail transit provided the most reliable service in the region studied.

Basic amenities (bench and shelter) at the stop/station are associated with significant reductions in reported waiting time. The variables considered do not differentiate between different bench or shelter types or designs—indeed, early attempts to distinguish between "basic" and "premium" shelters found little difference. This conclusion appears to echo the findings of existing stated-preference research on the relative importance of basic station amenities in improving overall transit user experiences (Iseki and Taylor, 2010; Liu et al., 1997). This research provides direct evidence that the broad provision of basic stop amenities can significantly reduce the perceived burden of transit use.

The insignificance of at-stop realtime information signs goes against the established body of literature on the subject (Dziekan and Kottenhoff, 2007; Gooze et al., 2013; Monzon et al., 2013; Watkins et al., 2011). Existing research specifically on realtime information often adopts a pre-test/post-test design, measuring waiting time perceptions at the same set of stops before and after installation of realtime information signs in the interest of minimizing the influence of other factors. This study differs in seeking the transit stop amenities that best explain variation in passengers' perceived waiting times overall. In addition, specific circumstances in the Twin Cities region at the time of data collection may confound the influence of the realtime sign variable: during data collection, Twin Cities light rail stations (served by the most frequent, reliable transit in the region) did not have functioning realtime information signs. Besides the influences of at-stop realtime information signs, this study is also unable to provide insights into the influences of realtime information via mobile devices or posted schedule information at the stop. Due to respondents' apparent conflation of online schedules and realtime information apps (based on common responses to a question about mobile device use), our survey failed to produce reliable data on the use of "next bus" apps, which may serve as a substitute for realtime signs. In addition, a strong correlation between the presence of a shelter and the presence of a posted schedule prevented the inclusion of posted schedules in the final model. Given the recent evidence that realtime information via mobile devices are effective in reducing waiting time perceptions (Brakewood et al., 2014, 2015a,b), more detailed comparative study of alternative methods for communicating departure information presents a valuable direction for further research. Such research on alternative communication methods will have important policy implications because broad deployment of at-stop realtime information signs often faces cost limitations.

The significance of the minority variable may capture important community-level differences in familiarity with and attitudes toward transit. Alternatively, this variable may be capturing the effects of respondents' income. While the survey questionnaire asked respondents' household income, the response rate to this question was poor compared with others: there were 101 missing values for the observations included in the models. This low response rate prevented explicit inclusion of income in the models. While minority status is certainly not a perfect predictor of low household income, the two are strongly related. Compared non-Hispanic whites and/or high-income individuals, racial/ethnic minority groups and low-income individuals have relatively high transit use rates and may be less likely to associate social stigma with transit use. These differences may be responsible for shorter perceptions of waiting time. If true, this situation speaks to the importance of social perceptions in shaping the experience of transit use.

Finally, the stark difference between the baseline and Female Respondent in Unsafe Environment scenarios points to an important direction for improving the transit experience of female users. In the region studied, women account for a majority of transit commutes (United States Bureau of the Census, 2014). It appears that, in unsafe locations, women's experience of waiting for a train or a bus differs substantially from men's. The long reported waits for women in unsafe or somewhat safe environments appear to indicate a needlessly stressful passenger experience which is unlikely to help ridership. Perceptions of personal security in some locations may impede female choice riders from relying on transit. Further qualitative study may be warranted to determine specific issues such as fear of crime, street harassment, etc. Still, focusing on basic security improvements around less-safe transit stops appears to be an important gender equity measure, and one with the potential for significant returns in terms of reducing gender gap in perceived waiting times.

To summarize, the results of this analysis indicate the potential for transit stations and stops, and the waiting environments they create, to significantly influence passengers' perceptions of waiting time. In particular, they point to the importance of providing basic amenities where possible, as well as the importance of increasing perceptions of personal security around the least safe stops, particularly from the perspective of female passengers. The topics of stop amenities, gender, security, and waiting time merits more tightly focused research.

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Wait time, travel time and waiting during travel: existing research and future directions

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Wait time, travel time, and waiting during travel are closely related time uses that often overlap in how they are perceived, viewed, and/or valued. Studying these time uses is critical within a transport context because they can define or influence the experience of the overall trip. In this editorial, we synthesise major themes, and identify avenues for future research, a key one being the bi-directional relationship between travel and the duration and experience of the activity at the destination.

1. Parallels between the utilities of wait time, travel time, and waiting during travel

Waiting is an inevitable part of life. We often wait, for instance, for someone to arrive, for a favourite TV show to start or at the doctor's office. We wait for a certain activity to happen. Hence, waiting is a derived demand. Waiting time is frequently perceived as wasted time but can also be viewed by some as a welcome window of time that serves as a buffer between activities. Research shows that how long we are willing to wait depends on the activity (or person) for which (or whom) we are waiting for. Web users' tolerable waiting time for information retrieval, for instance, is approximately 2 seconds (Nah, 2004), while the acceptable waiting time for a doctor's appointment is around 23 minutes (Pruyn & Smidts, 1998).

Similar to wait time, travel time is also a derived demand (*most*, though not *all*, of the time), i.e., the time we need to reach out-of-home activities; and as such, is seen as time to minimise. However, studies asking for people's ideal commute time do not find an ideal commute of 0 minutes, but mostly between 10 and 25 minutes (e.g., Redmond & Mokhtarian, 2001; Ye et al., 2020). This indicates that travel time has a certain positive utility. People might enjoy certain aspects of travel (e.g., sensation of speed, exposure to the environment) or can use travel time to escape from obligations, to adjust and alter between places (e.g., as a transition between work and home), or use it to perform certain productive, social or entertaining activities (Jain & Lyons, 2008; Mokhtarian & Salomon, 2001). However, this positive utility of travel disappears when travel durations exceed maximum acceptable or tolerable travel times, which were found to be around 30 to 45 minutes for commuting (Ermagun et al., 2022; Humagain & Singleton, 2021; Milakis et al., 2015).

Waiting during travel – e.g., waiting for a bus or train to arrive, waiting in a traffic jam, or waiting for a traffic/pedestrian crossing light – is closely related to the prior time uses, i.e., wait time and travel time, but has unique attributes that make it worthy of being studied in its own right. In parallel to the previously discussed findings, waiting during travel can have both positive and negative utility. Studies show that there is a cost threshold above which people do not necessarily want to minimise waiting during travel. Hess et al. (2004) found that most people would prefer to wait five minutes for a free bus than pay $0.75 to travel right away, while studies focusing on High Occupancy/Toll (HOT) lanes

indicate that most drivers are not willing to pay for a congestion-free lane (Brownstone et al., 2003). Due to the derived demands of wait time, travel time and waiting during travel, the perceived waiting/travel time has been found to exceed the actual waiting/travel time, both in travel and non-travel contexts (Fan et al., 2016; Meng et al., 2018; Pruyn & Smidts, 1998).

As already alluded to, subsets of wait and travel times are pursued for their own sake, i.e., not always a derived demand. For instance, people may go fishing and wait for hours without catching any fish. In this case, waiting can be regarded as a (recreational) activity. Fishers may enjoy the scenic beauty, the exposure to the environment or just use the waiting time to reflect on aspects of their life. Similarly, people may not always travel to reach out-of-home activities, but may travel for its own sake, without reaching a destination. These undirected trips, such as recreational walking, cycling and jogging, are done because of certain positive aspects they provide, such as physical activity, the sensation of speed, and the enjoyment of the outdoor environment (Mokhtarian & Salomon, 2001). In these cases, travel has become the activity and people may not necessarily want to limit its time. Hook et al. (2021, 2022) found that the average duration of these undirected trips is no less than 71 minutes, that trip duration positively affects trip satisfaction and that people are considerably more satisfied with these trips compared to directed trips (e.g., to work or leisure activities).

2. Perceptions and experiences of wait time, travel time, and waiting during travel

How wait time, travel time and waiting during travel are *perceived* and *experienced* are strongly affected by whether this time is *equipped* or *expected* (Mishra, 2015; Shaw et al., 2021). Note as well that these are related, as perceptions of time use can influence the experience of the time windows discussed, while expectations that wait time will occur can increase the probability of being equipped.

2.1 Equipped time use

Being equipped refers to having tools that can be used to pass the time. For instance, watching TV in the waiting room of a hospital, or the presence of amenities at public transport stops (e.g., benches and shelters) can reduce perceived waiting times (Fan et al., 2016; Pruyn & Smidts, 1998). Similarly, performing certain activities while using public transport, such as entertainment-related activities (e.g., watching videos, listening to music, reading a book), social activities (e.g., making phone calls), or productive activities (e.g., working, studying) may affect perceived travel times. In addition, activities which do not require being equipped with tools (e.g., sleeping, resting, gazing out of the window), may also have their effects. However, the influence of multitasking (performing activities while travelling) on perceived travel time has not been explored adequately (Cornet et al., 2022).

Equipped time may also affect the experience, utility, and satisfaction levels for wait time and travel time, although results are mixed. The TV in the waiting room of a hospital did not affect the experience of waiting (Pruyn & Smidts, 1998), while performing activities (e.g., reading, talking to others, and using a smartphone) while waiting for a bus lowered irritation levels in a Japanese study (Ohmori at el., 2004). Activities performed during travel may also impact travel satisfaction. While Ettema et al. (2012) found that talking to other passengers positively affects satisfaction with public transport, and entertaining and relaxing activities lead to lower satisfaction levels, Wang and Loo (2019) found that the use of mobile Information and Communications Technology (ICT) devices has a positive effect on travel satisfaction of high-speed rail passengers. Further supporting these findings is a large and growing body of literature that has shown positive (and, less frequent but still present, negative) impacts of multitasking on the utility of travel time (Malokin et al., 2019; Shaw et al., 2019).

2.2 Expectations around occurrence and time duration

Waiting time being (un)expected, e.g., because of (a lack of) adequate waiting time information, also affects the perceived waiting time (Antonides et al., 2002). Elements such as traffic congestion and public transport service disruptions may result in unexpected waiting during travel and travel time uncertainty. Psychological and behavioural theories alongside empirical research confirm that mechanisms like advance notice and real time information can improve wait and travel experiences. For example, it has been found that providing road and public transport users with detailed information about the state of the transport network allows them to better anticipate possible delays, and avoid early or late arrival (Cats & Gkioulou, 2017; Ettema & Timmermans, 2006). In fact, satisfaction seems strongly affected by differences between perceived and expected waiting times (e.g., Shaw et al., 2021). When waiting times are longer than expected (e.g., due to certain delays) this may result in uncertainty, anger, and frustration, as found by delayed airline passengers (Taylor, 1994). Unexpected events such as traffic congestion and public transport delays – increasing travel time (uncertainty) – also negatively affect satisfaction levels (e.g., Mouwen, 2015; Smith, 2017).

2.3 Impacts of time perceptions on experiences

The (perception of) wait time, travel time and waiting during travel can also influence satisfaction with these time frames, and with the activity people are waiting for, or are travelling to. In general, a negative relation between (perceived) waiting time and wait evaluation has been found (Antonides et al., 2022), while waiting satisfaction can also be affected by the duration of the activity people are waiting for (Anderson et al., 2007). In the travel behaviour literature, many studies found a negative effect of (self-reported) travel duration on travel satisfaction (e.g., De Vos et al., 2022; Morris & Guerra, 2015), especially when the actual travel time is longer than the ideal travel time (Humagain & Singleton, 2020; Ye et al., 2020). Waiting time for public transport has also been found to negatively affect satisfaction levels (e.g., dell'Olio et al., 2011). The waiting time might not only negatively affect waiting time experience, it can also negatively influence the satisfaction with the activity or service people are waiting for, such as a visit to a hospital, or attractions at a theme park (Pruyn & Smidts, 1998; Torres et al., 2018). In terms of travel, De Vos (2019) found that the duration of a leisure trip has a modest negative effect on satisfaction with the leisure activity at the destination (through satisfaction with the trip to reach the activity), while Clark et al. (2020) found a negative effect of commute duration on job satisfaction. However, more studies on the bidirectional relationships between travel duration and the activity at the destination are desired. Although some studies have found that travel time and activity duration are positively correlated (e.g., Schwanen & Dijst, 2002), and that people generally travel longer durations to work or leisure activities than for shopping (Schwanen et al., 2002), no studies have adequately analysed whether people are willing to travel longer durations for more satisfying activities or whether travel satisfaction is affected by the duration of the activity at the destination. Additionally, despite some studies finding higher travel satisfaction levels for trips to enjoyable activities (e.g., leisure activities) compared to trips to less enjoyable activities (e.g., work) (Anable & Gatersleben, 2005; Mokhtarian et al., 2015), the effect of activity satisfaction on travel satisfaction is largely unknown.

Figure 1 provides an overview of how the experience of travel time is affected by the actual travel time, the activities performed during travel (equipped or not), and travel time uncertainty (partly affected by unexpected delays). The type of activity, (perceived) activity time, and satisfaction with the activity at the destination can affect travel (time) satisfaction. Furthermore, the activity type (e.g., work, leisure, shopping) can determine the time people are willing to travel to them, while activity satisfaction may also be affected by satisfaction with the trip to reach the activity.

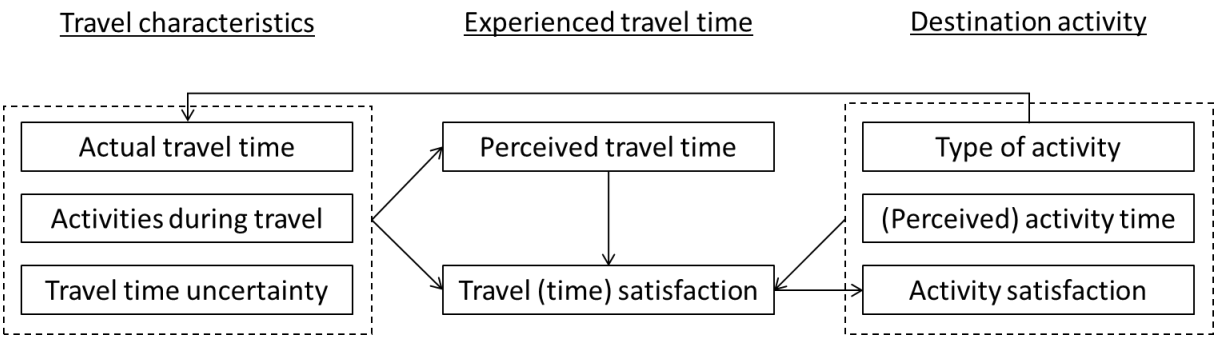


Figure 1. Experienced travel time in relationship with travel characteristics and the destination activity

3. Future directions of research

Despite the body of literature that has analysed ideal and tolerable travel times for commuting, the examination of travel time (preferences) for other purposes (leisure, shopping, undirected travel) is largely absent. Furthermore, how travel and wait time (experiences) relate to the duration and experience of the activity at the destination remains underexplored. For instance, people may be willing to travel for longer durations to activities with long durations (e.g., work), or rewarding activities (e.g., leisure/social activities), in contrast to short and unrewarding activities (e.g., grocery shopping). Since (perceived) travel time can impact travel satisfaction (but also satisfaction with the activity at the destination and satisfaction with life in general (e.g., De Vos, 2019)), it is important to reduce experienced travel time and travel time unreliability. Reducing experienced travel time may be done by either reducing the actual travel time (e.g., increasing public transport frequency and punctuality), but also by reducing the perceived travel time by making travel more comfortable or enjoyable (e.g., by providing free Wi-Fi and increasing comfort and seating capacity on public transport, or by creating comfortable and protected bicycle lanes). Travel time reliability can be improved by providing drivers and public transport users with detailed information on delays in the transport network. However, the extent to which this will result in higher satisfaction levels is unknown.

In sum, future studies on travel time (experience) should focus on (i) trips other than commuting, (ii) the (bidirectional) relations between travel time (experience) and the activity (time/experience) at the destination, and (iii) the effect of activities performed during travel and travel time information on the travel (time) experience. Doing so will help create more insights on how the experience of travel time but also the experience of out-of-home activities – both affecting people's quality of life – can be improved.

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Understanding worthwhile travel time: An empirical study of travel experiences across transport modes

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ABSTRACT

The concept of worthwhile travel time (WTT, Cornet et al., 2022) provides insight into how travellers perceive their travel time. Worthwhileness can be linked to multiple domains, including enjoyment, fitness, and productivity. This study leverages the full open dataset collected by the Woorti app, comprising 38,838 validated trip legs in 8 countries, to empirically substantiate the WTT concept across walking, cycling, public transport, and private motorised travel. Using a structural equation modelling (SEM) approach, we analyse the intertwined relationships among traveller and trip characteristics, experience factors, and travel activities that influence perceived WTT. Our findings reveal that perceived WTT for walking and cycling is higher than for public or private motorised travel. For active modes like walking and cycling, enjoyment impacts perceived WTT more than fitness. Enjoyment is enabled by accompanying someone and listening to audio for walkers, and by thinking and the act of cycling itself for cyclists. For public transport travellers, perceived WTT is determined by personal productivity (browsing the internet, thinking, talking), followed by enjoyment (listening to audio, relaxing, watching/gaming). For private motorised travellers, perceived WTT is determined almost equally by personal productivity (thinking, driving itself) and enjoyment (accompanying someone, talking). Our empirical evidence emphasises the importance of policies that enhance the quality of travel time, such as safe and pleasant infrastructure for walking and cycling, uninterrupted internet access in public transport, and accommodating seating. The paper argues for a more explicit investigation of the factors that make travel time worthwhile, to enable policy makers to better include the enrichment of the travel experience in their decisions.

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1. Introduction

The concept of worthwhile travel time (WTT) provides a framework for unpacking and capturing the subjective quality of the travel time experience from the perspective of travellers (Cornet, 2022). WTT distinguishes between three types of value that travellers can gain from the travel time itself: (a) enjoyment of the trip, (b) fitness gained from conducting the trip, and (c) productivity. Travel activities during the trip (i.e., watching a movie, walking, or working) can enable all three types of value for the travellers. Experience factors (e.g. comfort, travel conditions) and traveller and trip characteristics (e.g. age, trip purpose) can influence the perceived value of the trip. The WTT concept draws from various studies across different fields. For example, (a) from a microeconomic perspective, scholars have recognized the positive, intrinsic, or experienced value of travel time (see e.g., Mokhtarian & Salomon, 2001, Milakis et al., 2015), (b) from a psychological perspective, research has shown that travel can be valuable for several reasons, such as transitioning between places, passing time, experiencing a state of flow (see e.g., Jain and Lyons, 2008; Te Brömmelstroet et al., 2021) and (c) from well-being and travel satisfaction perspective, studies distinguish between hedonic value, which refers referring to short-term benefits from travel like pleasure and enjoyment, and eudaimonic value, which involves long-term benefits like personal growth, purpose, and self-realisation (see e.g. De Vos et al., 2015). Although research underpinning the WTT concept has grown in recent years, WTT as a holistic concept of perceived travel experience has not yet been systematically and comprehensively explored in empirical studies (Cornet, 2022). Addressing this gap is important because it provides policymakers with the evidence needed to enhance the travel experience, rather than mainly focusing on reducing travel time and cost. By offering empirical insights into how travellers perceive the worthwhileness of their travel time through enjoyment, fitness, and productivity, this research contributes to rectifying this gap and provides guidance for policy interventions aimed at improving the quality of travel.

This paper fills this need by offering a deep understanding of what drives the worthwhileness of travel time. It provides a comprehensive assessment of travel experience by empirically investigating the concept of WTT across four transport modes (walking, cycling, public transport and private motorised) in eight European countries. The empirical investigation is based on a large, open and European-wide travel experience dataset (Consonni et al., 2020). Data was collected through an app-based implementation of the WTT concept during 2019 (Cornet et al., 2019). The outcomes provide comprehensive, holistic, and concrete evidence on the influencing factors (i.e., experience factors and travel activities while also controlling for traveller and trip characteristics) of perceived WTT, allowing detailed insights into the conditions under which travel time becomes more worthwhile. Earlier papers have employed certain segments of the same dataset offering useful but partial insights on travel experience for long-distance trips (Malichová et al., 2022, N = 733), short-distance (urban) trips (Pourhashem et al., 2023, N = 8506), cycling trips (Hook et al., 2024, N = 8,543), and the perceived value of travel activities aggregated across all modes (Malichová et al., 2022). This paper is the first one that (1) applies the theoretical concept of WTT developed in Cornet et al. (2022) in a complete and consistent way to the empirical investigation of travel experience, including positive and negative experience factors as distinct variables, and (2) employs the full dataset (N = 38,838 validated trip legs after cleaning) covering all geographical areas (urban, suburban and rural) in eight European countries by four different modes. Hence, it ensures a high degree of robustness in the outcomes, taking into consideration both the theoretical underpinnings and empirical data.

The paper is structured as follows. Section 2 provides a description of the WTT concept and an overview of the background literature on each of the WTT components (i.e. travel activities, experience factors, traveller and trip characteristics) summarising the evidence about their association with the quality of the travel experience, travel satisfaction, and subjective well-being. Section 3 presents the data collection and sample, as well as the selected method of structural equation modelling for the empirical analysis. Section 4 describes the outcomes of the study. First, the variation of the perceived WTT and WTT components across transport modes is provided. Then, the outcomes of the path models about the influence of the WTT components on perceived WTT per transport mode are presented. Section 5 comprises the discussion, conclusions, and policy implications per transport mode as well as the limitations of this study and recommendations for future research.

2. Background

2.1. The concept of WTT

The concept of WTT emerged from research revealing that travellers' do not consider all travel time as wasted (Banister et al., 2019; De Vos et al., 2015; Jain & Lyons, 2008; Ory & Mokhtarian, 2005). For example, Mokhtarian & Salomon (2001) suggested that the overall travel utility does not derive only by the activity at the destination of the trip, but also from the activities that can be conducted during the trip and the activity of travelling itself. The literature provides various reasons and conditions for turning wasted travel time into WTT, such as the opportunity for productive work (Wardman & Lyons, 2016), time-off (Jain & Lyons, 2008), the presence of a co-traveller (Milakis et al., 2015), the empowerment provided by information and communications technologies (Lyons 2019; Wang & Loo 2019; see also Pawlak, 2020 for a review on the topic), crowding conditions and comfort factors (Lyons et al., 2016), traveller attitudes (Ory & Mokhtarian, 2005), trip duration (Milakis & van Wee, 2018), and/or the built environment itself (De Vos et al., 2015).

The proposed concept of WTT distinguishes between three types of value (value domains) that travellers can gain from the travel time itself (Fig. 1, arrow 1): enjoyment, fitness, and productivity. The value is enabled by travel activities during the trip (Fig. 1, arrow 2): (a) enjoyable activities (e.g., watching a movie or talking with a friend or family member) or the joy of the trip activity itself (e.g., relaxing time or enjoying the scenery while driving or cycling), (b) fitness activities (e.g., walking or cycling to work as a way to get exercise), and (c) productive activities (e.g. (completing work or personal tasks). Experience factors (i.e., travel conditions as experienced by the traveller) can affect the ability of travellers to engage in worthwhile activities while travelling (Fig. 1, arrow 3). For

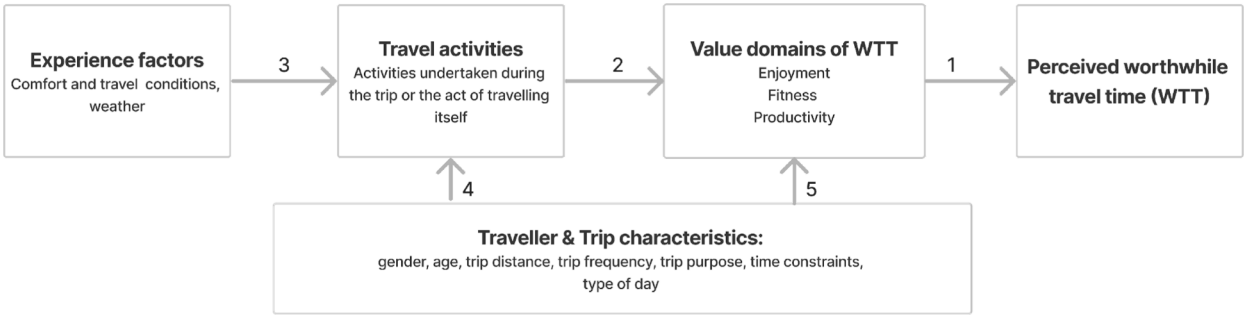


Fig. 1. The conceptual model of WTT, adapted from Cornet et al. (2022).

example, when rail travellers can easily find a seat and thus experience their rail trip as not crowded (= experience factor), then they might engage in activities while travelling such as reading a paper or browsing the internet on their smartphone (= travel activities). Finally, the traveller and trip characteristics (e.g. age, gender, trip frequency, trip purpose) could influence both the travel activities that could be undertaken during a trip and the perception of different values of the trip (Fig. 1, arrows 4, 5). For example, in comparison to older travellers, younger people may carry ICT equipment more frequently, enabling them to undertake numerous activities while travelling. Also, genders might perceive value domains differently.

2.2. Travel activities

Travel activities are central to ascribing value to the trip itself. Travel activities can contribute both to utilitarian purposes (shorter-term hedonic well-being) as well as to eudaimonic well-being (longer-term development and life satisfaction) (De Vos et al., 2013). Social and entertainment activities in public transport improves satisfaction with the work commute, and so does the ability to engage in physical exercise when cycling or walking to work (Olsson et al. 2013). Longitudinal research on UK trains highlighted the importance of travel time use for travellers to consider their travel time worthwhile and for choosing the train (Lyons et al., 2016). However, Lyons and Urry (2005) warned early on that not all travel activities are equal and that positive value can vary greatly, from 'ultra-productive' ("the use of time on the journey has been more beneficial than had that time been used otherwise") to simply 'killing time' (i.e. activities that counteract stress or boredom), to outright 'counter-productive' ("time use that not only achieves no benefit in itself but also has an adverse effect on time use beyond the journey"). Recent research using an app-based multimodal approach confirmed the importance of conducting activities while travelling to increase trip satisfaction, and concluded that non-productive activities (e.g. relaxing or socialising) were more likely to provide higher satisfaction (Le et al., 2020).

2.3. Experience factors

2.3.1. Walking

There are three main groups of factors that impact the quality of the walking experience, and therefore walkability: a) safe infrastructures, b) urban design, and c) weather. The first group of factors involves safe streets and sidewalks (Liao et al., 2022; Singleton, 2019) as well as pavement width and guardrails as buffers from motorised traffic, pavement surface quality and obstructions, lightning, and street parking (Loo, 2021). The second group of factors refers to the enhancement through urban design of the comfort and convenience for pedestrians by decreasing annoyances that can unlock a more fun and friendly experience (Liao et al., 2022; Singleton, 2019) or the ability to engage in activities which are typically considered useful or enjoyable by walkers, such as to relax, reflect, solve problems and daydream while walking (Calvert et al., 2019). Car traffic (including noise and air pollution) can interrupt contemplation by cognitively forcing pedestrians to pay attention to their surroundings (Calvert et al., 2019). Other factors that have been shown to positively affect the walking experience are mixed land use and the proximity of retail services (Cervero & Duncan, 2003), greenery (trees, resting places, scenery) and, quite simply, the directness of the route (Loo, 2021). Finally, the third group of factors comprise, low or high temperatures, wind speed, snowy or raining conditions, but also sunshine that can affect both the travellers' mood and their overall travel satisfaction (Ettema et al., 2017). Walkability preferences may vary with socio-demographic characteristics, particularly distances between home and work locations, income, age and gender (Liao et al., 2022).

2.3.2. Cycling

Perceived safety and travelling comfort, and thus safe and pleasant infrastructures are key determinants of cycling experience (Dill & Carr, 2003). Purpose-built, segregated cycling tracks are considered the basis for (perceived) cycling safety, especially for less confident and cautious cyclists, including dedicated safe designs for intersections and roundabouts (Buehler & Dill, 2016; Heinen et al., 2010; Milakis, 2015). Spatial characteristics, microscale attributes and aesthetics can also play a significant role in the cyclists' travel experience and comfort (Milakis & Athanasopoulos, 2014); fewer stops, less crowding, green surroundings and the presence of shopping opportunities (Vedel et al., 2017); green waves, curbs, footrests and skewed rubbish bins alongside cycle tracks (Gössling,

2013); lighting of cycling facilities, including parking (Reynolds et al., 2009); scenery, traffic noise, air pollution and weather conditions (Winters et al., 2011); hilliness and landscape (Heinen et al., 2010); high levels of visibility and reduced stops (Rybarczyk, 2014), and smoothness and quality of the pavement (van Goeverden et al., 2015). Adequate air temperatures (24 °C is considered ideal) naturally also play a significant role (Ettema et al., 2017). Bikeability is dependent on individual factors, habits and preferences (Handy et al., 2014), but also to wider social characteristics such as social norms, cycling cultures and associated political and/or symbolic factors (Pooley et al., 2013; Spinney, 2009).

2.3.3. Public transport

Public transport passengers have potentially more opportunity to use their travel time for personal activities since they are not preoccupied with operating a vehicle. This suggests travel conditions such as onboard services (e.g. internet connectivity, electric outlets, and the presence of tables; Kenyon & Lyons, 2007; Pawlak, 2020) and comfort factors (e.g., crowding and the availability of seating, space and privacy; Cantwell et al., 2009; Shaw et al., 2019) in general are likely to play an important role for unlocking travel time use. Moreover, predictability and reliability of the trip can significantly affect stress levels and travel satisfaction, which are associated with additional trip characteristics such as trip directness, the number of transfers, proximity to stops and stations, and waiting times (Cantwell et al., 2009; Ha et al., 2020; St-Louis et al., 2014; Wener et al., 2003). Few more factors may play an important role but remain somewhat understudied, such as the presence of toilets (Van Acker et al., 2020), vibrations and motion sickness (Malokin et al., 2019), air quality and noise levels (Ma et al., 2021), general cleanliness and lighting (Sukhov et al., 2021), and weather conditions (Ettema et al., 2017). Personal safety is however considered a necessary condition for overall travel satisfaction (Sukhov et al., 2021). However, these results can vary depending on a combination of traveller characteristics and attitudes, with gender, age and income often playing a key role (Lyons et al., 2016; Mokhtarian et al., 2015; Molin et al., 2020; Shaw et al., 2019).

2.3.4. Private motorised

The literature identifies comfort and convenience as the main positive (Schwanen, 2015) and congestion and travel time unpredictability as the main negative experience factors for private car travel (Chatterjee et al., 2020; Ettema et al., 2013). Driving by car is associated with higher stress and mental fatigue, especially due to congestion, than all other modes (Mokhtarian et al., 2015). Yet, congestion does not trade-off personal space as crowdedness does for public transport users. Moreover, safety risks appear to be 'externalised', offset by the sense of control, protection and autonomy driving a car confers (i.e., accidents happen to others) and the pleasure of driving itself (Morris & Guerra, 2014). Traffic, but also weather and lighting conditions have a significant effect on safety perceptions, driver workload, and therefore stress levels (Li et al., 2022). Overall, although flexibility (i.e., convenience), autonomy (i.e., freedom), comfort and privacy (i.e., personal space) are key determinants of car use, these do not necessarily allow car drivers to use their travel time for something useful other than the driving itself (Wadud & Huda, 2021). Car passengers represent a subcategory of car users with a different experience, more similar to that of public transport where most of the enjoyment comes from interacting with fellow passengers (Morris & Guerra, 2014).

2.4. Traveller and trip characteristics

The traveller and trip characteristics (e.g. transport mode; trip purpose and duration; the presence of a travel companion; traveller socio-demographics, attitudes and preferences) could influence the relationships between experience factors, travel activities and travel satisfaction. For example, travel satisfaction for commuters on any mode decreases as travel duration increases (Chatterjee et al., 2020), although this relationship appears not to be linear, with satisfaction peaking at around 10 min and significantly dropping beyond 30 min (Humagain & Singleton, 2021; Milakis et al., 2015). Regarding trip purpose, commuters travelling for work are least likely to consider their time use very worthwhile, whereas leisure travellers (and those who read particularly) are most likely to rate their travel time positively (Le et al., 2020; Lyons et al., 2016; Molin et al., 2020). Looking at travellers' socio-demographic characteristics, literature suggests that women are more sensitive to travel quality (Erinne et al., 2022), while younger people appear to care less for the weather conditions and are more likely to have the technological means to engage in digital activities, but also to consider their travel time wasted (Lyons et al., 2016; Shaw et al., 2019). Traveller predispositions to various aspects of a trip can also play an important role in variations of trip satisfaction. Manaugh & El-Geneidy (2013) showed the importance of motivations for exercise, social interaction, environmental issues, and aesthetics to better explain the higher satisfaction of some walkers on their commute. Ory & Mokhtarian (2005) introduced a variety of attitudinal variables (e.g. attitudes towards travelling, the commute, stress, urban density and the environment) together with personality and lifestyle to explain nuances in 'travel liking' assessments.

3. Data and methods

3.1. Data collection and sample

The data collection lasted from May to December 2019 and took place in 8 European countries: Belgium, Finland, France, Italy, Norway, Portugal, Slovakia and Spain. People aged 16 and over were recruited through an online campaign to download the Woorti mobile application and track their daily travel activities for at least seven consecutive days. The Woorti app was promoted as a tool to help users understand how they experience travel time from the perspectives of productivity, enjoyment, or fitness (Veiga & Bernardino, 2019; 'Woorti' is a short acronym for worthwhile + time + travel). These three value domains were defined and illustrated with examples during the onboarding process when users first opened the app. To avoid bias, questions were formulated in a neutral

way, such as 'was your travel time wasted or worthwhile?', or 'what value did you take from your time on this part of the trip?' (Cornet et al., 2019). In order to attract a diverse cohort of participants and to ensure their continued engagement throughout the data collection process, a range of engagement tools such as incentives, rewards or lottery were employed (Hudák, Cornet, 2019). The process of capturing travel activities was as follows: the travel time, distance and transport mode of every leg of a detected trip were automatically recorded. Once a full trip was registered, the app notified the traveller, requesting to provide further feedback on their travel experience. Travellers were first asked to confirm their transport modes, their trip purposes, whether they faced time constraints, and the trip's typical frequency. Subsequently, they could choose a specific trip leg to provide further feedback, where they were asked to rate the worthwhileness level of their travel time, the value taken from it (productivity, enjoyment, fitness), the travel activities contributing to this value, and finally the most relevant positive and negative experience factors that impacted the quality of their travel time. All questions from the app can be found in Appendix A, and transport modes, travel activities, experiences factors and other decisions and trade-offs made for the survey design are published in Cornet et al. (2019). Overall, 3,300 respondents reported 67,177 door-to-door trips consisting of 158,897 trip legs, which is the unit of our analysis. After data cleaning, the sample was restricted to 38,838 trip legs reported by 2,576 respondents.

Table 1 shows descriptive statistics of the sample's trip and traveller characteristics as used in the analysis, except for 'country of residence' as the analyses are based on a pooled sample.

Special attention was given to data representativeness per country in terms of gender and age during data collection (Hudák & Cornet, 2019). Comparing our sample for age and gender with data from Eurostat for populations older than 16 years old, we find an overall bias towards male population (54.9 % vs 48.2 % in the 8 analysed countries) and, except for Italy, the sample is slightly skewed towards the 25–50 years old population. However, the aim of this paper is to model relationships among multiple variables of the WTT concept in Fig. 1, and therefore representativeness is not needed in all aspects: the key is to have enough variability within the variables (and there is for example enough variability to test gender or age effects). This is also supported by Groves (1989), who mentioned that a small amount of unrepresentativeness is not a problem if a study's concerns are related to model relationships rather than replication of the population.

3.2. Methods: Structural equation modelling

The conceptual model in Fig. 1 consists of a complex set of relationships where one variable can be a determinant of another variable (e.g., travel activities influencing the values of travel time) and at the same time be influenced by other variables (e.g., travel activities influenced by experience factors). If this conceptual model were to be written down in mathematical equations, it would look like (Eq. 1).

WTT = f (*value domains of WTT)*.

with each value domain = f *(travel activities* + *trip characteristics* + *traveller characteristics)*, and each travel activity = f *(experience factors* + *trip characteristics* + *traveller characteristics)*. (Eq. 1).

Such a system of interrelated relationships with intermediate variables as in Eq. (1) can be estimated using Structural Equation Modelling (SEM). A SEM does not refer to 'independent' and 'dependent' variables like in a regression analysis, but instead distinguishes between 'exogenous' and 'endogenous' variables. Exogenous variables are variables that are not influenced by other variables in the model, while endogenous variables are influenced by other variables in the model. In Fig. 1, the traveller characteristics, trip characteristics and experience factors are considered exogenous variables, while travel activities, values domains and WTT are examples of endogenous variables.

Table 1
Descriptive statistics for respondents and trip legs.

Variable	Frequencies
Gender[1] (N = 2,576 respondents)	45.1 % female, 54.9 % male
Age (N = 2,576 respondents)	19.8 % 16 to 24 year; 60.2 % 25 to 49 year; 20.0 % 50 + year
Country of residence (N = 38,838 trip legs)	15.6 % Belgium; 10.1 % Finland; 4.9 % France; 8.3 % Italy; 13.6 % Norway, 9.8 % Portugal, 20.0 % Slovakia, 14.4 % Spain, 3.4 % Other
Transport mode (N = 38,838 trip legs)	34.5 % walking; 22.6 % cycling; 12.6 % public transport[1]; 30.5 % private motorised[2]
Trip distance (N = 38,838 trip legs)	80.5 % less than 15 km; 19.5 % more than 15 km
Trip purpose (N = 38,838 trip legs)	24.3 % home; 35.3 % work & business; 30.3 % maintenance (including shopping, personal tasks & picking up someone); 19.1 % leisure
Trip frequency (N = 38,838 trip legs)	47.2 % regularly; 52.8 % non-regularly
Time constraint (N = 38,838 trip legs)	58,2% yes; 41.8 % no
Day of week (N = 38,838 trip legs)	78.9 % weekday; 21.1 % weekend
Temperature (N = 27,594 trip legs)	36.3 % cool (less than 15 °C); 41.8 % comfortable (15–24.9 °C); 13.1 % warm (25–31.9 °C); 8.9 % uncomfortably hot (32 °C and more)

1 'public transport' includes train, bus, tram and metro.
2 'private motorised' includes car driver, car passenger, car-sharing, moped, motorcycle and taxi.
[1]In our research and adopted method, gender refers to socially constructed roles, behaviours, and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across societies and over time (as per SAGER guidelines). 15 people (0.5%) in the full MoTiV dataset identified as non-binary or "other" along the gender identities spectrum. After data cleaning, the sample did no longer contain trip legs from this category.

In a full SEM, variables can be manifest (i.e., directly observed such as age) or latent variables. Latent variables such as socio-economic status are hypothetical constructs that can only be observed by its underlying indicators such as income, education and profession in this example. In this paper, all key concepts in Fig. 1 will be measured with manifest variables only. Consequently, this paper will estimate a path model which is a special case of a SEM consisting of only manifest variables. We will eventually estimate four path models, one for each transport mode (i.e., walking, cycling, public transport, private motorised) separately.

Fig. 1 also shows how value domains of WTT are the only variables with a direct effect (i.e., a direct arrow or 'path') on WTT. All the other exogenous (i.e., traveller characteristics, trip characteristics, experience factors) and endogenous variables (i.e., travel activities) will have an indirect effect on WTT. This indirect effect can be defined as the impact of one variable on another via one or multiple mediating variables. For example, experience factors will have an indirect effect on WTT via travel activities and value domains of WTT. The magnitude of this indirect effect is then equal to the product of the various direct effects along the entire path from one variable to another. The total effect of one variable on another is then the sum of its direct and indirect effect (if any). However, in this paper, all variables have either a direct or an indirect effect on WTT, but never both. Consequently, the total effect of the value domains on WTT corresponds to its direct effect, and the total effects of the other remaining variables on WTT correspond to their indirect effects.

To estimate a path model (or a SEM), the covariance matrix of the observed data is matched to a model-based estimated covariance matrix usually using Maximum Likelihood (ML) estimation. ML estimation assumes multivariate normal distribution of all endogenous variables, but many of the endogenous variables identified in Fig. 1 violate this assumption. After all, in each path model for each transport mode, experience factors and travel activities are used as binary variables, value domains were re-coded into binary variables, and the continuous variable of WTT is not normally distributed according to Kolmogorov-Smirnov testing. This paper therefore applied ML with bootstrapping as it has proven to be a good solution for the analysis of non-normal data (Byrne, 2010). The path models were estimated using SPSS Amos 28 Graphics.

AMOS offers a wide range of measures to assess model fit. It starts with the χ^2-statistic which measures the difference between the sample-based and the model-based estimated covariance matrices. Small values of χ^2 with a p-value higher than 0.05 (or any other chosen significance level) indicates good model fit. However, the χ^2-statistic is known for easily and falsely rejecting the null hypothesis as its calculation depends on the sample size. Therefore, various alternative model fit measures are used as well. Other measures of absolute model fit are the χ^2-statistic divided by the degrees of freedom (which should be less than 2) and the Root Mean Square Error of Approximation (RMSEA, which should be lower than 0.05). Comparative measures such as the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) are another category of model fit measures. Such measures assess the improvement of the hypothesised model over the independence model with unrelated variables. Values higher than 0.9 are generally considered as good model fit. A third type of model fit measures are those that take into account model complexity, e.g. the Parsimonious Normed Fit Index (PNFI) with values higher than 0.7 indicating good model fit.

Because of the complexity of the conceptual model in Fig. 1, we decided to use a stepwise modelling approach. We first estimated the direct effects from trip and traveller characteristics onto the value domains and the direct effects from these value domains on WTT. Only significant relationships were retained (in this case defined as relationships with $p < 0.05$). We then continued with adding the direct effect of travel activities onto the value domains and the direct effect of trip and traveller characteristics on these travel activities. Again, we only retained significant relationships with $p < 0.05$. After that, we added the direct effect of negative and positive

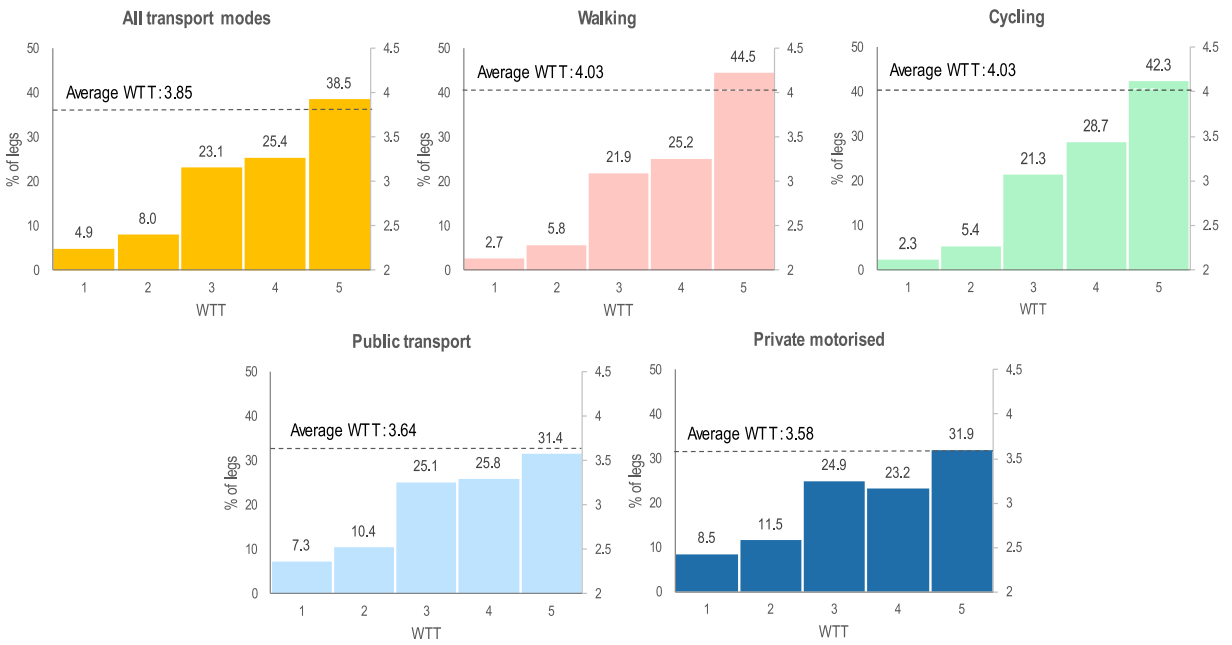


Fig. 2. Distribution of perceived WTT ratings per transport mode.

experience factors onto the travel activities, again retaining only significant relationships. Finally, we added covariances among all exogenous variables (i.e., trip characteristics, traveller characteristics, and positive and negative experience factors). We also conducted sensitivity analyses for the path models for 'public transport' and 'private motorised'. After all, 'public transport' combines train, bus, tram and metro trips in a single path model, and 'private motorised' does the same for car driver, car passenger, car-sharing, taxi, moped and motorcycle. However, there may be important mode specific effects. We therefore tested the robustness of our results by re-estimating the final path model for 'public transport' with a smaller sample including train users only and another one with bus/tram/metro (BTM) users only. Similarly, we re-estimated the final path model for 'private motorised' with a smaller sample including car drivers and passengers, a second one with car passengers only and a third one with car drivers only.

4. Results

4.1. The variation of perceived WTT and WTT components across transport modes

This section describes how key concepts from Fig. 1 (i.e., perceived WTT, value domains, travel activities, and experience factors) were operationalised for the path analysis, and how these key concepts differ across transport modes. Trip and traveller characteristics were described earlier in Table 1.

4.1.1. Perceived WTT

Travellers were asked to indicate the worthwhileness of a trip leg on a 5-point star scale with 1 star meaning 'All travel time was wasted' and 5 stars 'All travel time was worthwhile'. In general, travellers perceived their travel time as more worthwhile (Average WTT = 3.85). For all transport modes, a higher number of trip legs were rated with five stars, which means that respondents generally considered their travel time worthwhile (Fig. 2). However, the distributions for walking and cycling show that the perceived WTT is higher than travelling by public transport or private motorised modes. Up to 71 % of cycling trip legs and 69.7 % of walking trip legs were rated highly worthwhile (four or five stars), contrary to only 58.2 % of public transport trip legs and 54.1 % of private motorised trip legs.

4.1.2. Value domains: Enjoyment, fitness, productivity

Travellers were asked how much value they obtained from their travel time on this trip leg with respect to four domains of value (i.e., enjoyment, fitness, productivity related to personal tasks, and productivity related to paid-work). For each value domain of WTT, they could choose between (0) None, (1) Some and (2) High value. Regardless of any transport mode, people seem to value their trip legs most for enjoyment and least for paid work (Fig. 3). Cycling and walking are highly valued for fitness. In contrast, this value for fitness is very limited for public transport and private motorised modes. While the original variable has three categories, in the subsequent path analysis this will be reduced to two: None (0) versus Some to High value (1) due to limited observations in certain categories and the need to simplify the models.

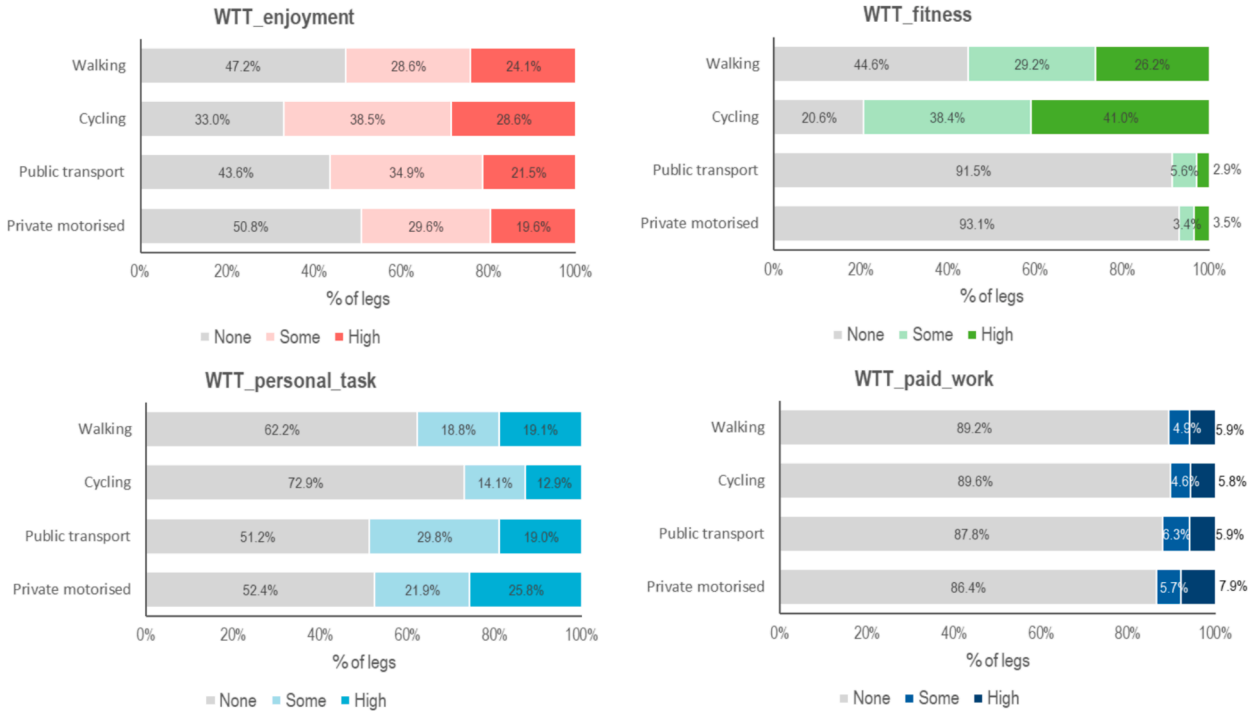


Fig. 3. Contribution of values domains to WTT per transport mode.

4.1.3. Travel activities

Travellers were asked to select all travel activities (from a predefined list per transport mode) that have contributed to the valuation of their trip leg. 28.1 % of the people who walk reported that walking itself had contributed to their perceived value of travel time. The value from travelling itself is also high for cyclists, where 43.9 % reported 'the cycling itself' as contributing to WTT. Other valuable activities frequently reported by active mode users are accompanying someone, thinking, and talking (Fig. 4). Public transport users mainly value browsing the internet (13.3 %), listening to audio (12.1 %) and thinking (11.7 %) while travelling. Private motorised mode users mainly value accompanying someone (18.7 %), talking (13.2 %), listening to audio (12.5 %) and the act of driving itself (12.9 %).

4.1.4. Experience factors

Travellers were asked if certain experience factors (from a predefined list per transport mode) contributed positively or negatively to the quality of their travel time. Travellers reported positive factors more frequently than negative ones, which aligns with the overall assessment of WTT (Fig. 5). For walking, travellers selected most often simplicity of the route (37 %), weather (30 %) and road path availability (26 %) as positive experience factors. On the contrary, crowdedness and congestion (8 %), noise (7 %), air quality and temperature (7 %), and cars and other vehicles (7 %) were the most frequently selected negative experience factors. For cycling, today's weather (39 %) and simplicity of the route (38 %) were the most chosen positive experience factors, followed by road path availability and safety (29 %), while cars and other vehicles (21 %), road path availability and safety (17 %) and air quality and temperature (17 %) were mentioned as negative experience factors. In the case of public transport, the presence of a toilet appears to be especially positively valued (59 %). In addition, the simplicity of the route (39 %) and predictability of travel time (35 %) were also very often perceived positively, while privacy (12 %), noise (11 %), other people (11 %) and crowdedness and seating (11 %) were most often considered as negative experience factors by public transport users. Private motorised mode users most frequently selected simplicity of the route (36 %), vehicle quality (26 %) and today's weather (24 %) as positive experience factors, and traffic congestion (11 %), today's weather (7 %) and cars and other vehicles (7 %) as negative experience factors. This list of positive and negative experience factors per transport mode is quite long. To avoid unnecessary complexity to the path models, we decided to include only those experience factors which proportion was higher than the median of all experience factors.

4.2. The influence of WTT components on perceived WTT per transport mode: Path model results

The model fit of each path model is considered adequate to good, based on CFI (> 0.9) and RMSEA (< 0.05) in particular. PNFI values are below threshold in every case, but this is not surprising given the complexity of the path models. For each transport mode, we first describe the direct effect of the value domains on WTT, then how these value domains are determined by travel activities

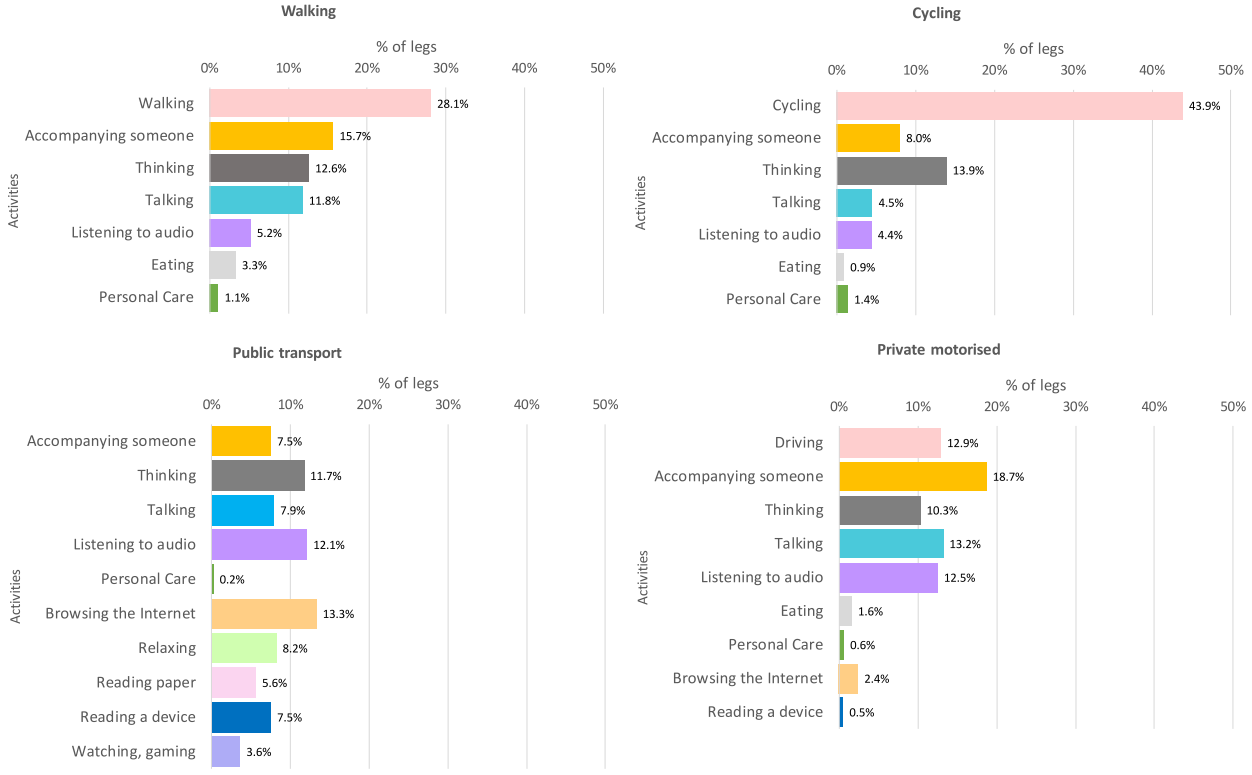


Fig. 4. Frequency of valuable activities per transport mode performed during travelling.

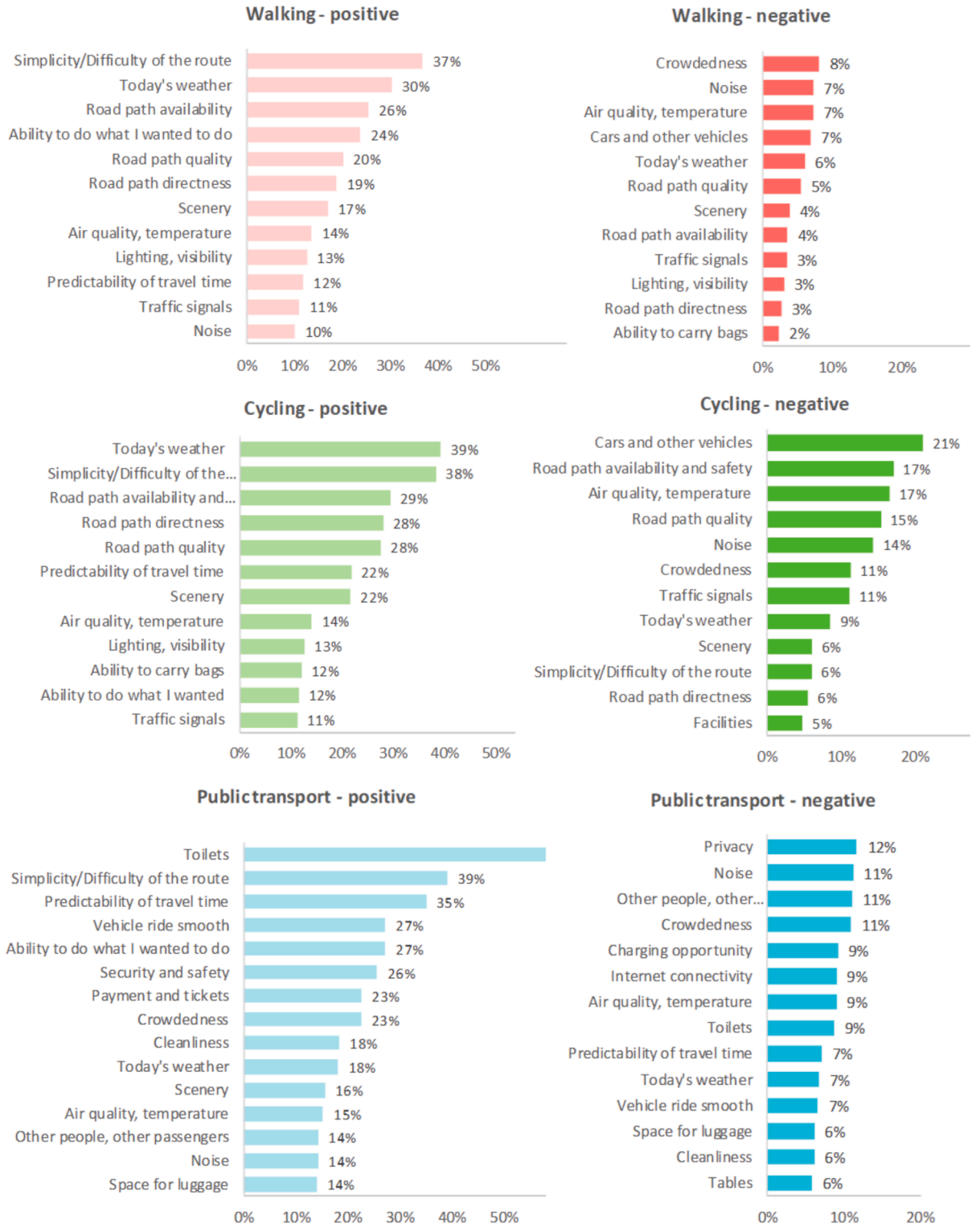


Fig. 5. Frequency of positive and negative experience factors per transport mode.

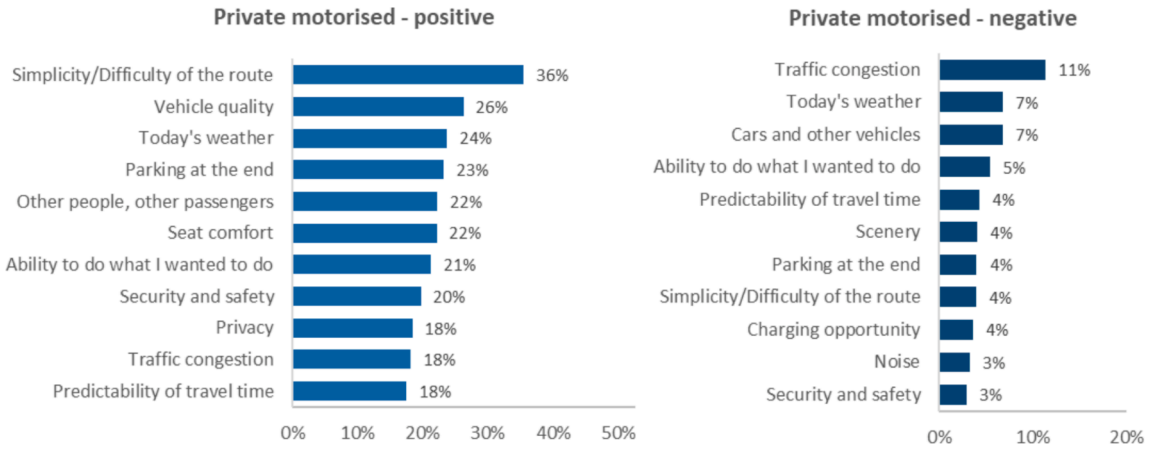


Fig. 5. (*continued*).

resulting in an indirect effect of these travel activities on WTT, and finally how experience factors enable the participation in certain travel activities also resulting in an indirect effect on WTT (see Fig. 1).

4.2.1. Walking

The direct effect of value domains on perceived WTT of walking trips.

All value domains have a significant and positive effect on the perceived WTT of walking trips, but they differ in importance. The value of enjoyment is most important (β = 0.211), followed by productivity related to personal tasks (β = 0.153), fitness (β = 0.100) and finally productivity related to paid work (β = 0.081) (Table 2). At first sight, this looks somewhat opposite to the findings based on the average scores of each value domain per transport mode (Fig. 2). Indeed, Fig. 2 showed that pedestrians value their trips mainly for fitness reasons and not enjoyment. However, although fitness is a significant contributor to WTT, *changes* in 'fitness' levels would lead to smaller increments in WTT than changes in 'enjoyment'. One should remember that a high average score of a value domain does not automatically mean that this value domain is also strongly correlated with WTT, and only value domains with strong correlations with WTT will eventually result in larger standardised effects in the path analysis.

The indirect effect of travel activities on perceived WTT of walking trips.

Travel time by walking is perceived as worthwhile mainly because of the travel activities of talking (β = 0.031), listening to audio (β = 0.028), and thinking (β = 0.024) (Table 2). Appendix BI offers more in-depth insights into where those indirect effects come about. It shows how talking first has a direct effect on the value of enjoyment (β = 0.088) and, almost to the same extent, to the value of productivity related to personal tasks (β = 0.080)). These two value domains then in turn have a direct effect on WTT (β = 0.211 for enjoyment, β = 0.153 for productivity related to personal tasks). The combination of all these different paths from talking to WTT ultimately explains the indirect effect of talking on WTT (β = 088 * 0.211 + 0.080 * 0.153 = 0.031). In a similar way, Appendix BI shows how listening to audio also directly affects the value of fitness (β = 0.043), but this is less important compared to its direct effect on the value of enjoyment (β = 0.115). Thinking has a direct effect on all four value domains and it is especially important for the values of fitness (β = 0.054) and productivity (β = 0.059 for personal tasks, β = 0.050 for paid work) compared to the value of enjoyment (β = 0.025).

As the value of enjoyment appeared most important to increase WTT of walking trips (see previous section), we could also focus on the travel activities that significantly contribute to this specific value domain only. In order of importance, these are the travel activities of accompanying someone (β = 0.125), listening to audio (β = 0.115), talking (β = 0.088), eating (β = 0.027), thinking (β = 0.025) and browsing the internet (β = 0.020).

The indirect effect of experience factors on perceived WTT of walking trips.

Travel time by walking is perceived as more worthwhile mainly because of the positive experience factors today's weather (β = 0.010), ability to do what one wanted to do (β = 0.009), simplicity of the route (β = 0.004), and – rather surprisingly – the negative experience factor of air quality and temperature (β = 0.004). It is perceived as less worthwhile due to the negative experience factors of lighting and visibility (β = -0.002), and scenery (β = -0.002) (Table 2). The most important pathways through which experience factors influence WTT of walking trips are as follows: (Appendix BI):

- If today's weather is perceived as positive, it stimulates the probability of accompanying someone (β = 0.090) while walking. This in turn, determines the value of enjoyment (β = 0.090 * 0.125), and ultimately has a positive impact on WTT of the walking trip (β = 0.090 * 0.125 * 0.211 = 0.0024). Note that this indirect effect of today's weather on WTT does not equal the one reported in Table 2. That is because several other paths exist through which today's weather has an effect on WTT. However, the path described here is the most important one. This also applies to the following experience factors explained here.

Table 2
Standardised effects on WTT of walking, cycling, public transport and private motorised trips.

	Walking	Cycling	Public transport	Private motorised
Direct effect of value domains on WTT				
Enjoyment	0.211**	0.274**	0.238**	0.279**
Fitness	0.100**	0.105**	0.048**	0.061**
Productivity related to paid work	0.081**	0.118**	0.135**	0.137**
Productivity related to personal tasks	0.153**	0.105**	0.272**	0.304**
Indirect effect of travel activities on WTT via value domains				
Accompanying someone	0.020**	0.019**	0.019**	0.047**
Browsing the internet	0.011**	n.s.	0.047**	0.018**
Eating	0.012**	0.012**	n.s.	0.019**
Listening to audio	0.028**	0.021**	0.032**	0.023**
Personal care	0.011**	0.010**	0.018**	0.019**
Reading device	n.a.	n.a.	0.028**	0.007**
Reading paper	n.a.	n.a.	0.024**	n.s.
Relaxing or sleeping	n.a.	n.a.	0.027**	n.s.
Talking	0.031**	0.008**	0.034**	0.036**
Thinking	0.024**	0.034**	0.047**	0.045**
Walking/Cycling/Driving itself	0.018**	0.034**	n.a.	0.049**
Watching video, gaming	0.018**	n.a.	0.012**	n.s.
Indirect effects of positive experience factors on WTT via travel activities and value domains				
Ability to carry bags	b.m.	0.003**	n.a.	n.a.
Ability to do what I wanted to do	0.009**	0.005**	0.009**	0.022**
Air quality, temperature	n.s.	0.001**	0.001	b.m.
Crowdedness, seating	n.a.	n.a.	0.015**	n.a.
Lighting, visibility	−0.002**	−0.002**	n.a.	n.a.
Noise	0.001**	b.m.	−0.004**	b.m.
Other people, other passengers	b.m.	b.m.	−0.001	0.008**
Parking at the end	b.m.	b.m.	n.a.	−0.004**
Payment and tickets	n.a.	n.a.	−0.008**	n.a.
Predictability of travel time	−0.002**	−0.000	−0.002**	−0.010**
Privacy	n.a.	n.a.	b.m.	−0.004**
Road path availability	0.001**	0.003**	n.a.	n.a.
Road path directness	−0.001*	n.s.	n.a.	n.a.
Road path quality	0.001*	−0.000**	n.a.	n.a.
Scenery	0.003**	0.004**	n.s.	b.m.
Seat comfort	n.a.	n.a.	n.a.	0.005**
Security and safety	n.a.	n.a.	0.008**	0.005**
Simplicity/Difficulty of the route	0.004**	0.006**	0.002**	0.004**
Space for luggage	n.a.	n.a.	0.008**	b.m.
Today's weather	0.010**	0.009**	0.009**	0.001**
Toilets	n.a.	n.a.	0.013**	n.a.
Traffic congestion	n.a.	n.a.	n.a.	0.002**
Traffic signals	−0.002**	−0.004**	n.a.	n.a.
Vehicle quality	n.a.	n.a.	n.a.	0.014**
Indirect effects of negative experience factors on WTT via travel activities and value domains				
Ability to carry bags	+0.000	b.m.	n.a.	n.a.
Ability to do what I wanted to do	b.m.	b.m.	b.m.	−0.001**
Air quality, temperature	0.004**	n.s.	n.s.	b.m.
Cars and other vehicles	+0.000	n.s.	n.a.	−0.002**
Charging opportunity	n.a.	n.a.	−0.007**	n.s.
Crowdedness, seating	−0.001**	−0.001*	0.006**	n.a.
Facilities	b.m.	−0.005**	n.a.	n.a.
Internet connectivity	n.a.	n.a.	0.001	n.a.
Lighting, visibility	−0.002**	b.m.	n.a.	n.a.
Noise	0.001**	0.001*	n.s.	−0.000
Parking at the end	n.a	b.m.	n.a.	+0.000
Predictability of travel time	b.m.	b.m.	n.s.	−0.005**
Road path availability	0.001**	n.s.	n.a.	n.a.
Road path directness	+0.000	0.002**	n.a.	n.a.
Road path quality	0.000	n.s.	n.a.	n.a.
Scenery	−0.002**	0	n.s.	−0.002**
Security and safety	n.a.	n.a.	b.m.	0.001*
Space for luggage	n.a.	n.a.	0.001**	b.m.
Simplicity/Difficulty of the route	b.m.	0.002**	b.m.	−0.000**
Today's weather	n.s.	−0.000	0.001	−0.007**
Toilets	n.a.	n.a.	0.001	n.a.
Traffic congestion	n.a.	n.a.	n.a.	n.s.
Traffic signals	.s.	−0.004**	n.a.	n.a.
Indirect effects of traveller's characteristics on WTT via travel activities and value domains				

(*continued on next page*)

Table 2 (*continued*)

	Walking	Cycling	Public transport	Private motorised
Gender, female	−0.000	0.003	−0.019**	−0.006**
Age, 16–24 (ref.: 25–49)	0.013**	0.010**	0.016**	0.067**
Age, 50 and more (ref.: 25–49)	−0.015**	−0.039**	−0.024**	+0.000
Indirect effects of trip characteristics on WTT via travel activities and value domains				
Distance, 15 km and more	0.004**	0.022**	0.028**	0.036**
Trip frequency, non-regularly	0.008**	−0.007*	−0.006	0.003
Trip purpose, work related	0.002	0.028**	0.050**	−0.016**
Trip purpose, maintenance related	0.004	0.017**	0.038**	0.023**
Trip purpose, leisure	0.008**	−0.003*	0.030**	−0.010**
Weekend	0.013**	0.016**	0.007	0.023**
Time constraint, yes	−0.008**	−0.01**	−0.018**	−0.026**
Weather: rain	0.016**	0.025**	0.030**	0.024**
Temperature, cool (ref.: comfortable)	0.011**	−0.006*	−0.007**	0.010**
Temperature, warm to hot (ref.: comfortable)	−0.024**	−0.04**	−0.020**	−0.024**
Model fit				
Chi^2 (df) p	8065.898 (346) 0.000	6846.659 (334) 0.000	4001.290 (420) 0.000	9048.229 (368) 0.000
Chi^2 / df	23.312	20.499	9.527	24.588
RMSEA	0.041	0.047	0.042	0.045
CFI; TLI	0.945; 0.829	0.930; 0.782	0.935; 0.833	0.926; 0.783
PNFI	0.302	0.299	0.361	0.314
R^2	8.5 %	11.0 %	15.4 %	18.8 %

*p ≤ 0.05; ** p ≤ 0.01.
b.m. = experience factor below median and therefore not considered in the path model.
n.a. = travel activity or experience factor is not applicable for this transport mode and therefore not considered in the path model.
n.s. = direct effect of travel activity on value domains (or direct effect of experience factor on travel activities) tested but found insignificant at 95 % and therefore deleted from the path model.

- If one can do what they wanted to do, it stimulates the probability of thinking while walking (β = 0.134). This in turns, determines the value of productivity related to personal tasks (β = 0.134 * 0.059), and ultimately has a positive impact on WTT of the walking trip (β = 0.134 * 0.059 * 0.153).
- If the simplicity of the walking trip is perceived as positive, it stimulates the appreciation of walking activity in itself (β = 0.101). This in turns, determines the value of fitness (β = 0.101 * 0.149), and ultimately has a positive impact on WTT of the walking trip (β = 0.101 * 0.149 * 0.100).
- If air quality and temperature are perceived as negative, it stimulates the appreciation of walking as an activity in itself (β = 0.075). This in turns, determines the value of fitness (β = 0.075 * 0.149), and ultimately has a positive impact on WTT of the walking trip (β = 0.075 * 0.149 * 0.100). This path indicates that even when air quality or temperature are perceived negatively, it can still lead to a positive experience of travel, particularly when walking is considered for fitness.
- If lighting and visibility are perceived as negative, it discourages pedestrians from thinking while walking (β = -0.022). This in turn lowers the value of productivity related to personal tasks (β = -0.022 * 0.059), and ultimately has a negative impact on WTT of the walking trip (β = -0.022 * 0.059 * 0.153).
- If scenery is perceived as negative, it makes pedestrians reluctant to accompany someone while walking (β = -0.042). This in turn lowers the value of enjoyment (β = -0.042 * 0.125), and ultimately has a negative impact on WTT of the walking trip (β = -0.042 * 0.125 * 0.211).

As the travel activity of talking is considered most important for WTT of walking trips, we could also focus on the experience factors that significantly contribute to this travel activity. In order of importance, these are the positive experience factors of today's weather (β = 0.073), simplicity of the route (β = 0.054), scenery (β = 0.041), predictability of travel time (β = -0.034), ability to do what one wanted to do (β = 0.031), and quality of roads and paths (β = 0.030) (Appendix BI). Thus, it seems that people are more likely to talk while walking when their walking trip happens in a pleasant setting (witness the importance of weather, scenery and quality of roads and paths).

The indirect effect of traveller and trip characteristics on WTT of walking trips.

There appears to be no significant influence of gender on WTT of walking trips, while it is mainly the younger age group who values walking trips more (Table 2). Of all trip characteristics, weather conditions in particular appear to be most important. Surprisingly, walking on a rainy day appears to be associated with higher ratings of WTT (β = 0.025). This is because despite the rain, it still encourages people to participate in a variety of travel activities (i.e., accompanying someone, listening to audio, thinking, and enjoying the walking activity itself, see Appendix BI) which then contributes to value domains and the overall WTT of walking trips. Walking during the weekend also appears to have an equivalent influence on WTT of walking trips (β = 0.013). Other significant trip characteristics – are the trip distance (β = 0.004) and trip regularity (β = 0.008). WTT of walking trips is higher for longer and less regular trips.

4.2.2. Cycling

The direct effect of value domains on WTT of cycling trips.

WTT of cycling trips is significantly and positively influenced by all four value domains, and in particular by the value of enjoyment

(β = 0.274) (productivity related to paid work: β = 0.118, productivity related to personal tasks: β = 0.105, fitness: β = 0.105) (Table 2). Like walking, the standardised coefficient of 'enjoyment' is more than double the ones of the other value domains.

The indirect effect of travel activities on WTT of cycling trips.

Thinking and the act of cycling are the two most important travel activities determining the WTT of cycling trips (β = 0.034 for both) (Table 2). This is because thinking not only stimulates the value of enjoyment (β = 0.083), but also the value of productivity related to personal tasks (β = 0.069) and fitness (β = 0.039) (Appendix BI). These three value domains then in turn have a direct effect on WTT (β = 0.274 for enjoyment; β = 0.105 for productivity related to personal tasks; β = 0.105 for fitness). The combination of all these different paths from thinking to WTT ultimately explains the indirect effect of thinking on WTT (β = 0.083 * 0.274 + 0.069 * 0.105 + 0.039 * 0.105 = 0.034). In a similar way, Appendix BI shows how the act of cycling itself also directly affects the value of fitness (β = 0.130), and this is even more important than its direct effect on the value of enjoyment (β = 0.074).

As with walking, the value of enjoyment is also the most important value domain of cycling trips (see previous section). We already mentioned that this value domain is directly influenced by the travel activities of thinking (β = 0.083) and the act of cycling itself (β = 0.074), but there are other travel activities with a significant but admittedly smaller influence on the value of enjoyment. In order of importance, these are the travel activities of accompanying someone (β = 0.066), listening to audio (β = 0.062), eating (β = 0.025), and personal care (β = 0.022).

The indirect effect of experience factors on WTT of cycling trips.

Travel time by bicycle is perceived as more worthwhile mainly because of the positive experience factors of today's weather (β = 0.009), simplicity of the route (β = 0.006), and the ability to do what one wanted to do (β = 0.005). It is perceived as less worthwhile due to the negative experience factors of facilities (β = -0.005), and traffic signals (β = -0.004) (Table 2). The most important pathways through which experience factors influence WTT of cycling trips are as follows (Appendix BI):

- The most important paths from these three positive experience factors all run via the appreciation of the cycling trip itself (β = 0.151 for today's weather; β = 0.098 for simplicity of the route; β = 0.042 for the ability to do what one wanted to do), which then positively influences the value of enjoyment, and ultimately results in a positive impact on WTT of the cycling trip.
- The most important path from traffic signals to WTT runs via the appreciation of the cycling trip (β = -0.080), but it lowers this appreciation (and then continues via the value of enjoyment to WTT). When facilities are considered negatively, it mainly lowers the likelihood of thinking while cycling (β = -0.097, and then also continues via the value of enjoyment to WTT).

As the travel activities of thinking and the act of cycling itself are considered equally most important for WTT of cycling trips (see previous section), we could also focus on the experience factors that significantly contribute to these two travel activities. For the travel activity of thinking, these positive experience factors are – in order of importance – ability to do what one wanted to do (β = 0.083), ability to carry bags (β = 0.080), simplicity of the route (β = 0.075), today's weather (β = 0.064), scenery (β = 0.061), and traffic signals (β = -0.051) (Appendix BI). For the travel activity of cycling itself, these positive experience factors are – in order of importance – today's weather (β = 0.151), simplicity of the route (β = 0.098), traffic signals (β = -0.070), scenery (0.055), lighting and visibility (β = -0.047), ability to do what one wanted to do (β = 0.042), and availability and safety of roads and paths (β = 0.034).

The indirect effect of traveller and trip characteristics on WTT of cycling trips.

Similar to walking, there is again no significant influence of gender on WTT, while age, on the other hand, has a significant influence with a higher WTT of cycling trips among younger than older respondents (Table 2). Of all trip characteristics, weather conditions are again important. Cycling on a rainy day is nevertheless associated with higher ratings of WTT (β = 0.025). This is because cyclists still participate in travel activities such as listening to audio and enjoying the cycling activity itself, and they still value the cycling trip directly for paid and personal work (Appendix BI). Temperature is again important, but now both cool and warm temperatures appear to have a negative impact on WTT (β = -0.006 and −0.040 respectively). Longer cycling distances (β = 0.022), cycling trips for work (β = 0.028) and for maintenance (β = 0.017), and cycling during the weekend are all associated with higher ratings of WTT. Trip characteristics such as trip regularity, leisure trip purpose and time constraints all have a significant indirect effect on WTT of cycling trips, but are less important.

4.2.3. Public transport

The direct effect of value domains on WTT of public transport trips.

All four value domains have again a significant and positive effect on WTT. However, the order of importance based on their standardised coefficients looks different compared to those for active transport. The value of travelling by public transport can be influenced primarily by changes in the productivity related to personal tasks (β = 0.272), followed by changes in enjoyment (β = 0.238) and productivity related to paid work (β = 0.135), and not surprisingly much less for fitness (β = 0.048) (Table 2). Moreover, sensitivity analyses show that the value of fitness only matters for BTM users and not for train users, while the other value domains have comparable effects for both types of public transport.

The indirect effect of travel activities on WTT of public transport trips.

Travel time in public transport is perceived as worthwhile mainly because of the travel activities of browsing the internet and thinking (both have β = 0.047), talking (β = 0.034) and listening to audio (β = 0.032) (Table 2). These indirect effects exist because travel activities such as browsing the internet, thinking and talking first impact on personal productivity (β's are respectively 0.139, 0.127, 0.088) and to a lesser extent on the value of enjoyment (β's are respectively 0.038, 0.054, 0.040) (Appendix B3). Contrary to the other travel activities, listening to audio only has a significant influence on the value of enjoyment (β = 0.133) and not on any of the other value domains.

In the previous section, we identified the value of productivity related to personal tasks as the most important value domain for WTT of public transport trips. This value originates from travel activities such as browsing the internet, thinking and talking as explained above, but also exists because of other travel activities such as reading on a device (β = 0.082), reading on paper (β = 0.065), watching or gaming (β = -0.030), and personal care (0.027).

Sensitivity analyses clarify that travel activities contribute to WTT, but especially for BTM users. In the analysis of train users, several travel activities (i.e., accompanying someone, personal care, reading on paper, relaxing, talking) were found to no longer have a significant indirect effect on WTT.

The indirect effect of experience factors on WTT of public transport trips.

Travel time in public transport is perceived as more worthwhile mainly because of the positive experience factors of crowdedness and seating (β = 0.015), toilets (β = 0.013), ability to do what one wants to do (β = 0.009) and today's weather (β = 0.009), and surprisingly also because of the negative experience factor of crowdedness and seating (β = 0.006). It is perceived as less worthwhile due to the negative experience factors of charging opportunity (β = -0.007) (Table 2). The most important pathways through which experience factors influence WTT of public transport trips are as follows (Appendix B3):

- If crowdedness and seating is perceived positively (probably meaning that one was seated during that particular public transport trip), it stimulates the participation in many travel activities (i.e., browsing the internet β = 0.045, listening to audio β = 0.087, relaxing β = 0.097, thinking β = 0.081, reading on a device β = 0.066, reading on paper β = 0.057, and watching or gaming β = 0.051). The other positive experience factors have a similar effect, but on a less diverse range of travel activities.
- The most important path from crowdedness and seating as a positive experience factor to WTT runs via thinking and then the value of productivity related to personal tasks (β = 0.081 * 0.127 * 0.272 = 0.0028). The same path also appears to be most important for the positive experience factor of being able to do what one wants to do.
- The most important path from toilets to WTT runs via browsing the internet and then the value of productivity related to personal tasks (β = 0.085 * 0.139 * 0.272 = 0.0032).
- The most important path from today's weather to WTT runs via talking and then again via the value of productivity related to personal tasks (β = 0.199 * 0.088 * 0.272 = 0.0048).
- If crowdedness and seating is perceived negatively, it can still stimulate participation in certain travel activities (i.e., thinking β = 0.057, reading on a device β = 0.054, and reading on paper β = 0.050). This path indicates that even when travel conditions are not attractive, some travellers engage in some activities, possibly to shield themselves from the crowd or simply to kill time.
- The most important path from charging opportunity (as a negative experience factor) to WTT runs via reading on a device: if charging opportunities are lacking in public transport, it lowers the likelihood to read on a device (β = -0.093), which then lowers the value of personal productivity (β = -0.093 * 0.082) and eventually lowering the WTT of public transport trips (β = -0.092 * 0.082 * 0.272 = -0.0021).

As the travel activities of browsing the internet and thinking are considered equally most important for WTT of public transport trips (see previous section), we could also focus on the experience factors that significantly contribute to these two specific travel activities. For the travel activity of browsing the internet, positive experience factors are – in order of importance – today's weather (β = 0.090), toilets (β = 0.085), other people and passengers (β = -0.054), and crowdedness and seating (β = 0.045) (Appendix B3).

For the travel activity of thinking, positive experience factors stimulating this travel activity are space for luggage (β = 0.100), security and safety (β = 0.086), crowdedness and seating (β = 0.081), toilets (β = 0.072), and the ability to do what one wants to do (β = 0.061). On the other hand, some experience factors prevent the engagement in thinking while travelling in public transport. These are the positive experience factor of payment and tickets (β = -0.091) and the negative experience factor of a charging opportunity (β = -0.057).

Sensitivity analyses show how some positive experience factors are no longer significant for train users (i.e., ability to do what I wanted to do, noise, predictability of travel time, simplicity), while they remain important for BTM users. This is also the case for negative experience factors, although this is for far fewer factors (i.e., charging opportunity, space for luggage).

The indirect effect of traveller and trip characteristics on WTT of public transport trips.

Gender has a significant indirect effect on WTT of public transport trips with lower ratings for women compared to men (Table 2). Women are less likely to participate in travel activities, and in particular, they are less likely to listen to audio, to relax and to read on a device while using public transport compared to men (Appendix B3). Similar to active transport, young age groups have higher WTT of public transport compared to older age groups. Using public transport on a rainy day is associated with higher ratings of WTT (β = 0.030). Cool and warm temperatures have a significant indirect effect, but it is less important compared to other trip characteristics (β = -0.007 and −0.020 respectively). Longer trips are associated with higher ratings of WTT (β = 0.028). The same applies for work (β = 0.050), maintenance (β = 0.038) and leisure trips (β = 0.030).

4.2.4. Private motorised trips

The direct effect of value domains on WTT of private motorised trips.

All four value domains have a significant and positive effect on WTT for private motorised trips. The order of importance of the four different value domains is remarkably similar to that of public transport trips. For private motorised trips, the most important value appears to be productivity related to personal tasks (β = 0.304), closely followed by enjoyment (β = 0.279), and then to a lesser extent productivity related to paid work (β = 0.137) and finally fitness (β = 0.061) (Table 2). A similar pattern was found for the different forms of private motorised trips in the sensitivity analyses.

Indirect effect of travel activities on WTT of private motorised trips.

Travel time of private car trips is perceived as worthwhile mainly because of the travel activities of the act of driving itself (β = 0.049), accompanying someone (β = 0.047), thinking (β = 0.045), and talking (β = 0.036) (Table 2). The indirect effects of these travel activities arise from the interaction with all four value domains, but contrary to other transport modes there is not always a clear pattern. For example, many of these travel activities have a positive impact on the value of productivity related to personal tasks, but to varying degrees. The act of driving and thinking are the only two travel activities that primarily influence personal productivity (both have β's = 0.106) (Appendix B4). Accompanying someone has the strongest influence on enjoyment (β = 0.082), followed by personal productivity (β = 0.074) and finally fitness (β = 0.034). Talking has the strongest influence on enjoyment first (β = 0.069), followed by productivity related to paid work (β = 0.040) and finally personal productivity (β = 0.036).

As the value of productivity related to personal tasks appeared most important for WTT of private car trips (see previous section), we could also focus on the travel activities that significantly contribute to this value domain only. We already mentioned the importance of thinking and the act of driving (both have β's = 0.106). Other travel activities also have a significant influence on this value domain, but to a lesser extent: accompanying someone (β = 0.074), talking (β = 0.036), browsing the internet (β = 0.026), personal care (β = 0.023), and reading on a device (β = 0.022).

Sensitivity analyses indicated, however, some interesting differences between car drivers and passengers. While driving itself is the most important travel activity influencing WTT for car drivers (β = 0.060), the indirect effect of this travel activity on WTT is no longer significant for car passengers. Other important travel activities for car drivers are – in order of importance – accompanying someone (β = 0.052), thinking (β = 0.051) and listening to audio (β = 0.032). For car passengers this is talking (β = 0.039), thinking (β = 0.025) and accompanying someone (β = 0.020).

The indirect effect of experience factors on WTT of private motorised trips.

Travel time of private motorised trips is perceived more as worthwhile mainly because of the positive experience factors of the ability to do what one wants to do (β = 0.022), vehicle quality (β = 0.014), and predictability of travel time (β = -0.010) (Table 2). It is perceived as less worthwhile due to the negative experience factors of today's weather (β = -0.007), predictability of travel time (β = -0.005), and scenery (β = -0.002). The most important pathways through which experience factors influence WTT of private car trips are as follows (Appendix B4):

- The ability of someone to do what they want to do, but also the vehicle quality increases the likelihood of many travel activities (e.g., accompanying someone, eating, listening, personal care, talking, thinking, the act of driving itself), with the most important path running via the activity of accompanying someone to the value of enjoyment to WTT.
- Similar to the positive experience factors, the most important paths of the three negative experience factors all run via the value of enjoyment to WTT but they all start with different travel activities. Perceiving today's weather as negative seems to discourage accompanying someone (β = -0.067), while negative perceptions of predictability of travel time and scenery decrease the likelihood of browsing the internet (β = -0.025), respectively thinking (β = -0.040).

As the travel activities of driving itself and accompanying someone are considered equally most important for WTT of private motorised trips (see previous section), we could also focus on the experience factors that significantly contribute to these two particular travel activities. For the activity of driving itself, positive experience factors are – in order of importance – other people, other passengers (β = -0.120), simplicity of the route (β = 0.081), ability to do what one wants to do (β = 0.063), vehicle quality (β = 0.061), seat comfort (β = 0.055), predictability of travel time (β = -0.054), cars and other vehicles (β = -0.042) security and safety (β = 0.036), and parking at the end (β = 0.026) (Appendix B4).

For the travel activity of accompanying someone, positive experience factors stimulating this travel activity are other people, other passengers (β = 0.224), ability to do what one wants to do (β = 0.089), and vehicle quality (β = 0.064). However, when private car users positively value their trip for privacy (β = -0.053), they are not surprisingly less likely to accompany someone. When today's weather (β = -0.067) and the predictability of travel time (β = -0.034) is experienced negatively, it seems that private car users are more likely to travel alone.

Sensitivity analyses, however, indicate that several experience factors are only significant for car drivers and not for car passengers. For positive experience factors, this was the case for the ability to do what I wanted to do, parking at the end, predictability of travel time, privacy, seat comfort, security and safety, simplicity. For negative experience factors, this was the case for the ability to do what I wanted to do, cars and other vehicles, predictability of travel time, scenery.

4.2.5. The indirect effect of traveller and trip characteristics on WTT of private motorised trips

Gender has a significant indirect effect on WTT of private car trips with women being less positive compared to men (Table 2). Women are less likely to participate in a variety of travel activities (in this case: eating, talking and the activity of driving itself) (see Appendix B4). However, sensitivity analyses show that this is mainly the case for car drivers. For car passengers, no significant indirect effect of gender on WTT was found. Younger people have again higher WTT ratings as they are more likely to participate in various travel activities compared to older people, positively contributing to the four value domains and overall WTT of private car trips. Travelling by private car during the weekend is associated with higher ratings of WTT, although the results of the sensitivity analyses indicate that this may be true for car drivers only and not for car passengers. A positive indirect effect on WTT was also identified for trips longer than 15 km (β = 0.036) and maintenance trips (β = 0.023). On the contrary, work (β = -0.016) and leisure trips (β = -0.010) are associated with lower ratings on WTT. Like all transport modes, using cars on a rainy day contributes to higher ratings of WTT (β = 0.024), while warm temperatures negatively affect WTT (β = -0.024).

5. Discussion, conclusions and policy implications

This paper empirically explored the concept of perceived WTT, according to which a range of human experience factors stimulate various travel activities and consequently add value to the travel experience. Using a large dataset of 38,838 validated, mode-specific trip legs in 8 European countries, the paper analysed the perceived levels of WTT for different transport modes, revealing the mechanisms and paths through which the traveller and trip characteristics, experience factors, and travel activities could influence perceived WTT. A number of conclusions and policy implications can be drawn, which we present here.

5.1. Travel experience across modes

Our findings unequivocally support the literature suggesting that travel time is more than just "wasted time" (Jain and Lyons, 2008; Milakis et al., 2015, 2018; Mokhtarian and Salomon, 2001): for all travellers and for the four types of modes under scrutiny – walking, cycling, public transport and private motorised – worthwhileness of travel time varies substantially and can be explained by a wide range of elements. Four distinct value domains were explored – productivity related to paid work, productivity related to personal tasks, enjoyment and fitness – and all were found to be positively correlated with WTT in all modes. When addressing the question 'what value domain, if improved, would lead to larger changes in WTT?', enjoyment is the most important for active transport, and second for public transport and private motorised. Productivity for personal tasks is especially important for public transport and private motorised (more so than for paid work). In terms of socio-demographic characteristics, younger age groups tend to have higher WTT ratings consistently over all transport modes, whereas the opposite holds true for older age groups.

5.2. Walking

Improving the enjoyment of a walking trip is likely to have the largest impact on WTT, double that of the importance of fitness. While fitness is, as expected, a main contributor of WTT for active modes (see Fig. 3), improving the fitness value domain would have a smaller impact on WTT than improving other domains – indicating perhaps that fitness is somewhat intrinsic to those modes. Improving the ability to undertake personal tasks while walking is also more likely to increase WTT. Our results point towards two categories of travellers: those valuing accompanying someone else while walking, and those for whom walking is more a solitary experience. For both cases, talking (to someone or on the phone) is a valuable activity. The mere act of thinking was also among the main contributors, as well as listening to audio. All these activities can be enabled by policy focusing on improving the availability, quality, directness, scenery, and lighting of roads and paths, and by reducing external stresses such as crowdedness, noise, air pollution, and the presence of vehicles. Although rain does not seem to discourage most walkers, hot weather can act as a disincentive. This could be addressed by providing adequate protection from sun and heat with shading or treetops, for example. Overall, our results are in agreement with the literature which stresses the importance of safety and comfort, particularly the provision of a pleasant setting in improving the attractiveness and value of walking beyond the inherent health benefits it provides (Liao et al., 2022; Singleton, 2019).

5.3. Cycling

For cycling, the value of enjoyment is more than double that of fitness. We find this entirely plausible and in fact revealing for the development of planning tools and policy: if the goal is to increase the attractiveness of cycling, the focus should be placed on capturing enjoyment factors (fitness – the health benefits – are already there to grab). Compared to walking, this mode distinguishes itself by the importance of the activity of cycling itself. An important 'add-on' activity for cyclists (other than cycling itself) is the ability to 'think' while cycling. Thinking requires a level of peace of mind, and the absence of unwanted physical, cognitive or emotional stressors to allow for the mind to wander. As poor facilities and traffic signals have a negative impact on thinking, policy could focus on reducing distractions related to the cycling itself e.g. replacing red lights by green waves, clearly separating car and pedestrian traffic from cycle lanes, providing high quality, smooth, barrier- or obstacle-free lanes, and ensuring a pleasant, inspiring environment and scenery following human-scale design practices i.e. providing a diversity of details that please without bothering the mind, and inversely, avoiding long, monotonous and unsafe bike paths alongside busy roads. Our results are in agreement with the literature about the importance of safe, continuous and pleasant infrastructures (Dill & Carr, 2003), suggesting also more effort could be put to incorporate "reducing distractions" in the design of cycling infrastructures as a whole (Gössling, 2013; Vedel et al., 2017). Although rain does not appear to dampen cyclists' enthusiasm against expectations, the negative impact of cold or hot weather suggests measures designed to protect cyclists from cold wind or direct sunlight are relevant. Finally, our outcomes confirm the richness of individual characteristics, habits and preferences associated with cycling experience (see Handy et al., 2014; Milakis et al., 2015), suggesting the need for a more detailed approach in the cycle planning practice to better distinguish between different types of cyclists.

5.4. Public transport

Time in public transport can be valued for multiple reasons (personal productivity, enjoyment and to a lesser extent paid-work related to productivity) and might therefore attract different types of users. The perceived WTT of public transport is more likely to increase if services enable people to undertake personal tasks and to enjoy the journey i.e. to do tasks that are not related to paid work. This is an important finding to add to the Value of Travel Time Savings (VTTS) literature which has focused more on paid work productivity, e.g. via the Hensher equation (see Wardman et al. 2016; Wardman & Lyons, 2016; Batley et al, 2019) as opposed to

personal productivity. Firstly, we find that digital activities such as browsing the internet and reading on a device are more important than activities such as thinking or talking. Reading, in particular, has been highlighted in earlier research as one of the key activities leading to major reductions in the value of travel time for train travellers, either as commuters (about 31 %) or as leisure travellers (about 47 %) (Molin et al., 2020). Although it remains unclear to what extent those digital activities are truly engaging or done simply to kill time, ensuring uninterrupted internet access and providing charging opportunities are key policies that can improve the attractiveness of public transport. Abeille et al. (2022) showed that reliable information about the existence of such facilities is critical for travellers, so that they can plan ahead the type of activities they would like to perform, and thus be productive even without, for example, an internet connection. Secondly, results about the importance of reduced levels of crowdedness and the availability of seating are in agreement with the literature (Cantwell et al., 2009; Lyons et al., 2016; Shaw et al., 2019). To this, we add the importance of (clean) toilets. Overall, policies that ensure basic comfort enable the participation in many and diverse travel activities, which in turn increases WTT in public transport. Finally, we note a clear need for a gendered approach in public transport planning and appraisal, particularly to address concerns of women, who according to our results, are less likely to participate in travel activities, and therefore less likely to judge their travel time as valuable in the current mobility context.

5.5. Private motorised

Private motorised modes users value their travel time primarily for personal productivity (as time out for thinking or as an opportunity for talking to other passengers or on the phone) and for enjoyment (usually when accompanying someone or talking). Personal comfort factors such as quality and safety of the vehicle, seat comfort and privacy are key positive conditions, but the value they provide is balanced out by congestion, other vehicles, and the lack of parking, which is largely in agreement with the literature (Chatterjee et al., 2020; Ettema et al., 2013). We note that congestion and other passengers negatively influence the joy of driving, showing that some people like the act of driving, but especially when they are alone in their cars and in free flow road conditions. From a policy perspective, this may have implications for the various futures imagined for the role of the car. Car-sharing, for example, would benefit from high quality and comfortable vehicles, as well as plentiful (even dedicated) parking opportunities. But considering the value of privacy and the preference for solitary travel, car-pooling (with a driver or in automated vehicles) faces higher adoption barriers, particularly when sharing a confined space with strangers. Moreover, automated vehicles, even if not shared, are likely to reduce the 'joy' of solitary drivers. Yet, privately owned automated vehicles are expected to lower the valuation of travel time by facilitating activities related to productivity and leisure (Pudāne & Correia, 2020). Finally, there is likely to be value in considering interventions from a wider, multimodal perspective. For example, constraining private car use (automated or not) and reducing the associated negative implications such as noise, air pollution, or simply the vehicle objects as physical and visual obstructions, would improve the travel experience of greener modes such as cycling and walking.

5.6. Limitations and future research

Future data collection on travel time experience could benefit from methodological improvements. In survey design, revising the nature of the WTT and value domain assessment variables might be useful: although they were respectively captured as an ordinal 5-star variable and a 3-level Likert scale for simplicity, travel time worthwhileness and value are more akin to continuous variables, better captured by sliders for example. Regarding experience factors, hitting the right balance between capturing nuances, frustrating respondents with too few or too many choices, and analysing results can be problematic. For example, factors like bicycle path availability, safety, quality, directness, simplicity of the route, traffic lights and crowdedness might be relevant, but such fine categories could dilute the results. There is also the risk of misinterpretation of some of the questions, for example, 'the ability to do what I want' was specified to be 'while travelling', but respondents may have interpreted it as simply the convenience and freedom of this specific mode. Similarly, although attention was paid to name experience factors in a neutral way, interpreting positive and negative experience factors can be difficult. Addressing conceptual gaps, like distinguishing between time-killing and valuable activities, and clarifying the opportunity cost of engaging in alternative, more valuable activities across all modes is necessary, since the tool only captured actual, not desired activities under ideal travel conditions. Integrating questions about the type and satisfaction with activities before and after travelling could allow even deeper insights into the travel experience and perceived value in accordance with the "activity envelope" concept (Rasouli & Timmermans, 2014; Pawlak et al., 2017).

This research suggests the need for refined grouping and analysis of travellers beyond just socio-demographic characteristics like age and gender. The cycling section showed that subjective influencers such as habits, preferences, and attitudes in addition to objective socio-demographic characteristics will influence travellers' behaviours. Therefore, a more finely grained understanding of national or regional culture and attitudes towards existing or new door-to-door travel options and the use of travel time could increase the explanatory power of our model and help tailor policies for specific regions. Because data collection aimed to reach the same number of respondents from each participating country (N = 500), the dataset is not proportional to each country's population, with Belgium, Slovakia and Spain more represented in the analysis. We recognise the multiple possible differences between countries that could have affected results. However, controlling at a country level would have multiplied the number of models, would require bigger sample sizes for certain countries in this dataset, and would not necessarily offer additional insights into the outcomes for the purpose of this paper. Additionally, choosing a country as a key distinguishing variable is not without its own problems and the same logic can be said to differences between regions, between cities, between urban vs rural environments etc. As we do not aim to make country-specific policy recommendations, we have chosen to exploit the data at an aggregate, European, 8-country level. Nevertheless, more specific possible variations among countries, such as weather and temperature, were still controlled for in our analysis. In addition to

country or region-specific analyses, analyses for specific target groups are also needed. Children are missing from this dataset. What their preferences are or what makes their travel time valuable is rarely taken into consideration in transport planning. Such research could be particularly relevant at a time where one leading vision for their school run is to strap them in an automated car.

In terms of analytical methods, path analysis in SEM is shown to be a powerful tool to analyse multiple variables all at once. In this paper, the descriptive analysis (section 4.1) showed the most frequent (i.e. most often reported) factors or activities, and the SEM analysis showed those that significantly contributed to adding value and to what extent (i.e. strongest correlation with WTT). This approach provides deeper insights for this type of complex dataset. Yet, we also made simplifications which are worth pointing out: for example, the data collection consisted of 27 distinct transport modes (Cornet et al. 2019), which we grouped under four broad categories. Future SEM analysis could provide more mode-specific policy recommendations by distinguishing between different types of public transport modes (e.g. road-based vs rail), by disaggregating car users and car passengers, or by comparing different types of active and electromobility (e.g. bicycles vs e-bikes).

Regarding future research, the role of perceived quality of travel time in transport project planning and appraisal has often been rather implicit, not yielding itself easily to act as a policy lever, in contrast to the role of time savings. The end goal of exploring WTT empirically in a more systematic way is to contribute to future advances that ensure that the quality of the travel experience is explicitly considered and better accounted for in transport planning and appraisal, and thus in future transport infrastructure investment decisions. Further theoretical work would be required to first establish whether existing planning and appraisal methods sufficiently consider the travel experience and if not, how a better empirical understanding of WTT could have implications for the appraisal process of transport policies. For instance, better knowledge on WTT can inform future VTTS studies for use in appraisal (see e.g. Wardman and Lyons, 2016). Likewise, further refinement and empirical evidence on WTT concepts would be a welcome step forward to continue bridging the gap that this paper began to address. If WTT significantly influences transport appraisal, we can hypothesise that greener modes of transport may benefit, as the travel experience appears to be relatively more appreciated on these modes.

CRediT authorship contribution statement

Veronique Van Acker: Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Yannick Cornet:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Conceptualization. **Dimitris Milakis:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Eva Malichová:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation. **Manuel Ojeda-Cabral:** Writing – original draft, Formal analysis.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. The Woorti mobile app questionnaire

Connection to:	Question	Answers
Onboarding	Where do you live?	Belgium, Finland, France, Italy, Norway, Portugal, Slovakia, Spain, Other
	What is your age?	16–19, 20–24, 25–29, 30–39, 40–49, 50–64, 65–74, 75+
	What is your gender?	Male, Female, Other
Trip	Confirm the modes of your trip: Did you go by___?	Yes/No, List of transport modes (Cornet et al., 2019)
	Overall, how did you feel about this trip?	5-star scale: 1 – Lousy, 5 – Great
	What was the purpose of your trip?	Home, Work/School, Everyday shopping, Business trip, Leisure/Hobby, Personal tasks and other errands, Pick of or drop off somebody, Other
	Did you have to arrive at a fixed time?	Yes, No, Not sure
	How often do you make this trip?	Regularly, Occasionally, First time, Not sure
Trip leg	Was your travel time wasted or worthwhile?	5-star scale: 1 – All time was wasted, 5 – All time was worthwhile
	What value did you take from your time on this part of the trip?	Enjoyment, Fitness, Productivity (Personal task), Productivity (Paid work) at 3-point scale: 1 – None, 2 – Some, 3 – High
	What exactly did you value doing?	List of activities (Cornet et al., 2019)
	Select the most important factors for the quality of your travel time.	List of experience factors (Cornet et al., 2019)

Appendix B. The direct effects of the WTT components

Appendix B1. Walking

	Travel activities									Value domains				Worthwhileness of travel time
	Accompanying someone	Browsing the Internet	Eating	Listening to audio	Personal care	Talking	Thinking	Walking itself	Enjoyment	Fitness	Productivity related to paid work	Productivity related to personal tasks	
	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect	Unstan. effect p Stan. effect
Value domains													
Enjoyment													0.452 ** 0.211
Fitness													0.215 ** 0.100
Productivity related to paid work													0.279 ** 0.081
Productivity related to personal tasks													0.336 ** 0.153
Travel activities													
Accompanying someone									0.170 ** 0.125	-0.036 ** -0.026		-0.034 ** -0.025	
Browsing the Internet									0.070 * 0.020			0.155 ** 0.044	
Eating									0.076 ** 0.027	-0.111 ** -0.040	0.039 * 0.023	0.149 ** 0.055	
Listening to audio									0.256 ** 0.115	0.095 ** 0.043			
Personal care										0.175 ** 0.038		0.202 ** 0.045	
Talking									0.136 ** 0.088			0.121 ** 0.080	
Thinking									0.038 ** 0.025	0.081 ** 0.054	0.047 ** 0.050	0.087 ** 0.059	
Walking itself										0.165 ** 0.149		0.025 * 0.023	
Experience factors, positive													
Ability to do what I wanted to do	0.035 ** 0.041	0.013 ** 0.040	0.022 ** 0.053	0.026 ** 0.049	0.015 ** 0.061	0.024 ** 0.031	0.105 ** 0.134	0.029 ** 0.027					
Air quality, temperature													
Lighting, visibility	-0.052 ** -0.048							-0.044 ** -0.033					
Noise					0.018 ** 0.049								
Predictability of travel time	-0.042 ** -0.037					-0.034 ** -0.034	-0.030 * -0.029						
Road path availability	0.035 ** 0.041				-0.006 ** -0.025			0.041 ** 0.040					
Road path directness								-0.036 * -0.031					
Road path quality	0.049 ** 0.054		-0.016 ** -0.020		-0.008 * -0.018	0.024 * 0.030		-0.034 * -0.030					
Scenery			-0.023 ** -0.048			0.035 ** 0.041	0.029 ** 0.032	0.098 ** 0.082					
Simplicity/Difficulty of the route			0.011 ** 0.029			0.036 ** 0.054		0.094 ** 0.101					
Today's weather	0.071 ** 0.090		0.021 ** 0.054	0.018 ** 0.038	0.005 * 0.022	0.051 ** 0.073	0.072 ** 0.099	0.078 ** 0.080					
Traffic signals	-0.033 * -0.029						-0.046 ** -0.043	-0.045 ** -0.031					
Experience factors, negative													
Ability to carry bags				0.062 ** 0.042		-0.061 ** -0.029							
Air quality, temperature						0.087 ** 0.070		0.131 ** 0.075					
Cars and other vehicles		0.015 ** 0.028				-0.034 * -0.026	0.051 ** 0.039						
Crowdedness, congestion				-0.039 ** -0.038									
Lighting, visibility							-0.042 * -0.022	-0.153 ** -0.058					
Noise				0.044 ** 0.052									
Road path availability	0.065 ** 0.033												
Road path directness				-0.05 ** -0.034		0.094 ** 0.046							
Road path quality					-0.006 ** -0.018	0.043 * 0.030	-0.030 * -0.020						
Scenery	-0.08 ** -0.04					-0.077 ** -0.046							
Today's weather				0.018 ** 0.038									
Traffic signals													
Traveller's characteristics													
Gender, female	-0.048 ** -0.066	-0.006 ** -0.023	-0.013 ** -0.035			-0.016 ** -0.025		-0.034 ** -0.038		0.031 ** 0.031			
Age, 16-24 (ref.: 25-49)	0.017 ** 0.048					0.074 ** 0.092		0.030 ** 0.026			-0.06 ** -0.08	0.124 ** 0.102	
Age, 50 and more (ref.: 25-49)	-0.011 ** -0.031	-0.008 * -0.018	-0.040 ** -0.071	0.009 ** 0.032	-0.051 ** -0.064	-0.029 ** -0.035			-0.06 ** -0.048		-0.03 ** -0.04	0.041 ** 0.034	
Trip characteristics													
Distance, 15km and more				0.051 ** 0.056				0.048 ** 0.027		0.038 * 0.019			
Trip frequency, non-regularly	0.043 ** 0.059	-0.012 ** -0.043		-0.039 ** -0.085			-0.030 ** -0.044	-0.066 ** -0.073	0.048 ** 0.047	-0.043 ** -0.042		0.040 ** 0.041	
Trip purpose, work related				0.013 ** 0.027		0.015 * 0.021			-0.054 ** -0.051		0.07 ** 0.1	0.025 * 0.024	
Trip purpose, maintenance related	0.026 ** 0.033	0.012 ** 0.041				0.026 ** 0.037	0.014 * 0.019		-0.054 ** -0.050			0.080 ** 0.077	
Trip purpose, leisure	0.053 ** 0.062		0.011 ** 0.027			0.027 ** 0.035	0.025 ** 0.031	-0.031 ** -0.029		-0.020 * -0.017	0.01 * 0.02	0.038 ** 0.033	
Weekend	0.055 ** 0.062			-0.011 * -0.020		0.023 ** 0.030			0.113 ** 0.094		-0.08 ** -0.11		
Time constraint, no	-0.044 ** -0.058	-0.008 ** -0.026	-0.012 ** -0.032	-0.017 ** -0.036	-0.009 ** -0.039	-0.031 ** -0.046	-0.025 ** -0.036	-0.066 ** -0.071	-0.050 ** -0.049		0.07 ** 0.11		
Weather: rain	0.033 ** 0.043			0.016 ** 0.035	-0.007 ** -0.031		0.036 ** 0.052	0.058 ** 0.062	-0.035 ** -0.034		0.04 ** 0.05	0.100 ** 0.100	
Temperature, cool (ref.: comfortable)	-0.020 * -0.024	0.012 ** 0.037	-0.013 ** -0.030	-0.009 * -0.018	0.015 ** 0.059				-0.440 ** 0.038	0.084 ** 0.073	0.02 ** 0.03	-0.050 ** -0.044	
Temperature, warm to hot (ref.: comfortable)	-0.083 ** -0.088		-0.013 ** -0.028			-0.057 ** -0.069	-0.054 ** -0.063	-0.186 ** -0.159		-0.041 ** -0.032	-0.03 ** -0.04	-0.075 ** -0.060	

Appendix B2. Cycling

	Travel activities														Value domains										Worthwhileness of travel time		
	Accompanying someone			Eating			Listening to audio			Personal care			Talking			Thinking			Cycling itself			Enjoyment			Fitness			Productivity related to paid work			Productivity related to personal tasks					
	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect
Value domains																																			
Enjoyment																																	0.597	**	0.274
Fitness																																	0.264	**	0.105
Productivity related to paid work																																	0.395	**	0.118
Productivity related to personal tasks																																	0.241	**	0.105
Travel activities																																			
Accompanying someone																						0.114	**	0.066	-0.066	**	-0.045				0.083	**	0.051			
Eating																						0.123	**	0.025							0.238	**	0.052			
Listening to audio																						0.142	**	0.062							0.079	**	0.037			
Personal care																						0.089	*	0.022							0.126	**	0.033			
Talking																									0.075	**	0.039	0.051	**	0.035						
Thinking																						0.113	**	0.083	0.045	**	0.039				0.088	**	0.069			
Cycling itself																						0.07	**	0.074	0.106	**	0.130									
Experience factors, positive																																			
Ability to carry bags																0.084	**	0.080																	
Ability to do what I wanted							0.028	**	0.044							0.089	**	0.083	0.065	**	0.042															
Air quality, temperature										0.019	**	0.055																								
Lighting, visibility																			-0.071	**	-0.047														
Predictability of travel time							-0.021	**	-0.043	0.013	**	0.046																									
Road path availability and safety	0.049	**	0.082										0.022	**	0.047				0.037	*	0.034															
Road path directness																																			
Road path quality										-0.012	**	-0.046																								
Scenery																0.052	**	0.061	0.066	**	0.055														
Simplicity/Difficulty of the route										0.007	*	0.030				0.054	**	0.075	0.100	**	0.098														
Today's weather	0.041	**	0.073										0.035	**	0.082	0.045	**	0.064	0.153	**	0.151														
Traffic signals	-0.052	**	-0.061				0.024	*	0.037							-0.056	**	-0.051	-0.111	**	-0.070														
Experience factors, negative																																			
Air quality, temperature																																			
Cars and other vehicles																																			
Crowdedness, congestion																-0.035	*	-0.033																	
Facilities							-0.032	**	-0.036							-0.145	**	-0.097	-0.084	**	-0.039														
Noise				-0.007	*	-0.025										0.050	**	0.051																	
Road path availability and safety																																			
Road path directness				0.021	**	0.05				0.022	**	0.044							0.064	**	0.029														
Road path quality																																			
Scenery				0.038	**	0.093										-0.056	*	-0.039																	
Simplicity/Difficulty of the route										0.020	**	0.041							0.123	**	0.059														
Today's weather				-0.008	**	-0.024				-0.017	**	-0.041							0.048	**	0.027														
Traffic signals	-0.03	**	-0.04	-0.010	**	-0.032													-0.126	**	-0.080														
Traveller's characteristics																																			
Gender, female	-0.037	**	-0.062				0.013	**	0.030	0.011	*	0.044	-0.020	**	-0.045	0.074	**	0.099				-0.05	**	-0.05	0.084	**	0.097	0.019	**	0.028						
Age, 16-24 (ref.: 25-49)	0.073	**	0.058													0.054	**	0.034										-0.045	*	-0.032	0.225	**	0.109			
Age, 50 and more (ref.: 25-49)	-0.046	**	-0.078	0.009	**	0.042				-0.007	**	-0.026	-0.030	**	-0.067	-0.039	**	-0.052	-0.064	**	-0.059	-0.15	**	-0.14	-0.05	**	-0.05				0.103	**	0.107			
Trip characteristics																																			
Distance, 15km and more										0.009	**	0.024				0.05	**	0.045	0.077	**	0.049	0.096	**	0.065	0.066	**	0.051	0.028	*	0.029	-0.11	**	-0.08			
Trip frequency, non-regularly							-0.019	**	-0.044										-0.026	*	-0.025				-0.136	**	-0.163	0.028	**	0.045	0.057	**	0.062			
Trip purpose, work related							0.029	**	0.071							0.019	*	0.027	0.046	**	0.046							0.178	**	0.290	-0.087	**	-0.097			
Trip purpose, maintenance related	0.085	**	0.133	0.019	**	0.086							0.040	**	0.083	0.029	*	0.030							-0.044	**	-0.046	-0.044	**	-0.061	0.242	**	0.232			
Trip purpose, leisure	0.092	**	0.121	0.014	**	0.053				0.013	**	0.04	0.047	**	0.081				0.040	*	0.029				-0.039	**	-0.034	-0.042	**	-0.049						
Weekend	0.038	**	0.051										0.031	**	0.054	-0.031	**	-0.032	-0.043	**	-0.031	0.077	**	0.060											
Time constraint, no				-0.007	**	-0.037	-0.025	**	-0.060				-0.016	**	-0.039	-0.026	**	-0.037	-0.105	**	-0.105							-0.015	*	-0.025						
Weather: rain	-0.024	**	-0.036				0.029	**	0.059										0.082	**	0.068							0.098	**	0.132	0.069	**	0.064			
Temperature, cool (ref.: comfortable)	0.032	**	0.052										0.019	**	0.041							-0.029	*	-0.027											
Temperature,warm to hot (ref.: comfortable)				-0.008	**	-0.025	-0.06	**	-0.09										-0.245	**	-0.144	-0.12	*	-0.08				-0.106	**	-0.101						

Appendix B3. Public transport

	Travel activities																								Value domains												Worthwhileness of travel time		
	Accompanying someone			Browsing the Internet			Listening to audio			Personal care			Relaxing			Talking			Thinking			Reading device			Reading paper			Watching, gaming			Enjoyment			Fitness			Productivity related to paid work			Productivity related to personal tasks					
	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect
Value domains																																											
Enjoyment																																								0.596	**	0.238
Fitness																																								0.210	**	0.048
Productivity related to paid work																																								0.509	**	0.135
Productivity related to personal tasks																																								0.678	**	0.272
Travel activities																																											
Accompanying someone																															0.146	**	0.078										
Browsing the Internet																															0.055	**	0.038							0.202	**	0.139	
Listening to audio																															0.200	**	0.133										
Personal care																																		0.422	*	0.075	0.332	*	0.050	0.274	*	0.027	
Relaxing																															0.175	**	0.098	0.075	**	0.074							
Talking																															0.073	*	0.040							0.162	**	0.088	
Thinking																															0.082	**	0.054							0.196	**	0.127	
Reading device																																		-0.029	*	-0.028	0.066	**	0.053	0.154	**	0.082	
Reading paper																															0.054	*	0.025							0.139	**	0.065	
Watching, gaming																															0.22	**	0.083							-0.079	*	-0.030	
Experience factors, positive																																											
Ability to do what I wanted							0.033	*	0.045				0.043	**	0.070				0.044	**	0.061				0.025	**	0.048	0.045	**	0.107														
Air quality, temperature	-0.036	*	-0.049																			0.055	**	0.075																			
Cleanliness																																											
Crowdedness, seating				0.037	*	0.045	0.068	**	0.087				0.063	**	0.097				0.062	**	0.081	0.042	**	0.066	0.031	**	0.057	0.023	**	0.051														
Noise	-0.055	**	-0.074													-0.056	**	-0.072																									
Other people, other passengers	0.091	**	0.121	-0.052	**	-0.054	-0.067	**	-0.071							0.071	**	0.092				-0.044	**	-0.059																			
Payment and tickets	0.023	*	0.036										-0.048	**	-0.074				-0.070	**	-0.091	-0.047	**	-0.075																			
Predictability of travel time							-0.038	**	-0.056																																			
Scenery																																												
Security and safety																0.047	**	0.076	0.063	**	0.086	0.029	*	0.048																			
Simplicity/Difficulty of the route													0.063	**	0.112													-0.032	**	-0.083												
Space for luggage							0.048	**	0.051				0.062	**	0.079				0.093	**	0.100																							
Today's weather	0.031	*	0.046	0.080	**	0.090										0.084	**	0.119																									
Toilets	0.030	**	0.055	0.059	**	0.085	0.042	**	0.063										0.047	**	0.072	0.054	**	0.100																			
Vehicle ride smoothness										0.006	**	0.05													-0.027	**	-0.051																
Experience factors, negative																																											
Air quality, temperature																																											
Charging opportunity													-0.045	*	-0.048				-0.063	**	-0.057	-0.085	**	-0.093																			
Cleanliness																																											
Crowdedness, seating																			0.058	**	0.057	0.054	**	0.064	0.037	**	0.050																	
Internet connectivity										-0.005	**	-0.026										0.052	*	0.057																			
Noise																																											
Other people, other passengers																																											
Predictability of travel time																																											
Privacy																																											
Space for luggage																																											
Tables																																											
Today's weather	0.049	**	0.046										-0.041	*	-0.038	0.080	*	0.074				-0.042	*	-0.040																			
Toilets				0.049	*	0.038																			-0.037	**	-0.046																
Vehicle ride smoothness																																											
Traveller's characteristics																																											
Gender, female							-0.027	**	-0.042				-0.042	**	-0.077							-0.044	**	-0.084							-0.07	**	-0.07	-0.02	**	-0.04	0.022	**	0.034				
Age, 16-24 (ref.: 25-49)													0.034	**	0.051	0.030	**	0.046	0.042	**	0.055	-0.032	**	-0.050				-0.023	**	-0.052				0.086	**	0.127	-0.047	**	-0.060	0.066	**	0.055
Age, 50 and more (ref.: 25-49)	-0.027	**	-0.040				-0.039	**	-0.047													-0.034	**	-0.051				-0.023	**	-0.050	-0.11	**	-0.09								
Trip characteristics																																											
Distance, 15km and more							0.051	**	0.072				0.044	**	0.074							0.041	**	0.071	0.05	**	0.1				0.038	*	0.035							0.042	**	0.039	
Trip frequency, non-regularly	0.027	**	0.051	-0.031	**	-0.045	-0.037	**	-0.055				-0.015	*	-0.028										-0.042	**	-0.091	-0.036	**	-0.096	-0.070	**	-0.070	0.036	**	0.064	0.074	**	0.111				
Trip purpose, work related				0.038	**	0.056	0.043	**	0.066										0.023	*	0.037	0.027	**	0.050													0.136	**	0.207	0.053	**	0.054	
Trip purpose, maintenance related	0.046	**	0.067																									0.030	**	0.063	0.065	**	0.051							0.045	**	0.054	0.145	**	0.114	
Trip purpose, leisure	0.060	**	0.076				0.050	**	0.051	-0.002	**	-0.015																			0.143	**	0.096							0.064	**	0.064	0.071	**	0.047	
Weekend	0.055	**	0.068				0.044	**	0.045	-0.002	**	-0.015				0.067	**	0.081				0.028	**	0.034							0.057	**	0.038							0.026	*	0.027				
Time constraint, no				0.051	**	0.075	0.022	*	0.034																0.018	**	0.039	0.019	**	0.051	0.079	**	0.080							0.035	**	0.053				
Weather: rain	0.047	**	0.087													0.022	*	0.040	0.038	**	0.058							0.036	**	0.094	0.047	**	0.046										
Temperature, cool (ref.: comfortable)	0.028	**	0.047				0.027	*	0.037				0.032	**	0.051				0.057	**	0.080													0.045	**	0.078	0.043	**	0.064				
Temperature,warm to hot (ref.: comfortable)	0.083	**	0.120				0.054	**	0.062				0.062	**	0.086	0.054	**	0.076	0.086	**	0.102							0.035	**	0.071							0.036	*	0.042				

Appendix B4. Private motorised

	Travel activities																				Value domains										Worthwhileness of travel time		
	Accompanying someone			Browsing the Internet			Eating			Listening to audio			Personal care			Talking			Thinking			Reading device			Driving itself			Enjoyment			Fitness			Productivity related to paid work			Productivity related to personal tasks					
	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect	Unstan. effect	p	Stan. effect
Value domains																																									
Enjoyment																																							0.720	**	0.279
Fitness																																							0.309	**	0.061
Productivity related to paid work																																							0.515	**	0.137
Productivity related to personal tasks																																							0.786	**	0.304
Travel activities																																									
Accompanying someone																									0.104	**	0.082	0.022	**	0.034				0.094	**	0.074			
Browsing the Internet																									0.113	**	0.035							0.086	**	0.026			
Eating																									0.178	**	0.045	0.087	**	0.043	0.071	**	0.026						
Listening to audio																									0.103	**	0.068				0.027	**	0.026						
Personal care																									0.183	**	0.028	0.205	**	0.062				0.150	**	0.023			
Talking																									0.101	**	0.069				0.040	**	0.040	0.053	**	0.036			
Thinking																									0.036	*	0.022	0.029	**	0.034	0.037	**	0.033	0.173	**	0.106			
Reading device																																		0.161	**	0.022			
Driving itself																												0.075	*	0.100	0.080	**	0.079	0.157	**	0.106			
Experience factors, positive																																								
Ability to do what I wanted	0.085	**	0.089				0.016	**	0.052	0.066	**	0.082	0.012	**	0.064	0.032	**	0.039	0.157	**	0.212				0.052	**	0.063													
Other people, other passengers	0.210	**	0.224	-0.011	**	-0.030	0.008	*	0.025	-0.030	**	-0.037				0.088	**	0.109							-0.087	**	-0.120												
Parking at the end	-0.047	**	-0.051				-0.006	**	-0.021										-0.044	**	-0.062				0.021	*	0.026												
Predictability of travel time	-0.052	**	-0.050							-0.021	*	-0.025	0.005	*	0.023	-0.076	**	-0.086	-0.039	**	-0.049				-0.048	**	-0.054												
Privacy	-0.053	**	-0.053										0.007	**	0.036	-0.042	**	-0.048																				
Seat comfort				0.018	**	0.049										0.030	*	0.036							0.044	**	0.055												
Security and safety																0.028	*	0.033	0.039	**	0.051				0.030	**	0.036												
Simplicity/Difficulty of the route																									0.057	**	0.081												
Today's weather																0.025	**	0.032																				
Traffic congestion																0.041	**	0.046																				
Vehicle quality	0.057	**	0.064	0.014	**	0.041				0.055	**	0.073				0.041	**	0.054	0.053	**	0.076				0.046	**	0.061												
Experience factors, negative																																								
Ability to do what I wanted				-0.021	**	-0.032																																		
Cars and other vehicles				-0.015	*	-0.025																			-0.056	**	-0.042												
Charging opportunity																																								
Noise				0.021	*	0.025	-0.012	*	-0.018				-0.008	**	-0.018							-0.005	**	-0.013														
Parking at the end													-0.007	**	-0.019	0.038	*	0.022																				
Predictability of travel time	-0.066	**	-0.034	-0.018	*	-0.025										-0.044	**	-0.027							-0.054	**	-0.033												
Scenery																			-0.062	**	-0.040																	
Security and safety																			0.040	*	0.022																	
Simplicity/Difficulty of the route																																								
Today's weather	-0.103	**	-0.067							-0.035	**	-0.027				-0.074	**	-0.055	-0.030	**	-0.025																		
Traffic congestion																																								
Traveller's characteristics																																								
Gender, female							-0.006	**	-0.023							0.026	**	0.037							-0.055	**	-0.080				-0.013	*	-0.019						
Age, 16-24 (ref.: 25-49)	-0.032	**	-0.028	0.019	**	0.043	0.009	*	0.026	0.053	**	0.055				0.057	**	0.058				0.012	**	0.060	0.029	**	0.030	0.109	**	0.076	0.137	**	0.188	-0.023	**	-0.024	0.151	**	0.106		
Age, 50 and more (ref.: 25-49)	-0.052	**	-0.056				-0.005	*	-0.018	-0.037	**	-0.047	0.010	**	0.057	-0.054	**	-0.068	-0.036	**	-0.050				-0.029	**	-0.037				-0.02	**	-0.04				0.046	**	0.039		
Trip characteristics																																								
Distance, 15km and more	0.028	**	0.035	0.016	**	0.052	0.011	**	0.043	0.051	**	0.075				0.043	**	0.061	0.044	**	0.069				0.041	**	0.059												
Trip frequency, non-regularly				0.008	**	0.025				-0.051	**	-0.075							-0.033	**	-0.052				-0.025	**	-0.036												
Trip purpose, work related										0.052	**	0.071							0.014	*	0.021	-0.003	*	-0.020														
Trip purpose, maintenance related	0.060	**	0.075	-0.015	*	-0.048				0.017	*	0.025	0.005	**	0.034	0.025	**	0.036							0.022	**	0.032												
Trip purpose, leisure	0.041	**	0.042				0.015	**	0.047	0.060	**	0.073				0.031	**	0.037							-0.023	**	-0.027												
Weekend	0.053	**	0.061													0.021	**	0.028							-0.017	*	-0.023												
Time constraint, no	-0.025	**	-0.032				-0.009	**	-0.035	-0.050	*	-0.075	-0.004	**	-0.027	-0.032	**	-0.047	-0.031	**	-0.050				-0.018	*	-0.026												
Weather: rain	0.050	**	0.059	0.013	**	0.041				0.024	**	0.034	-0.005	**	-0.029	0.027	**	0.037	-0.024	**	-0.037				0.054	**	0.075												
Temperature, cool (ref.: comfortable)	-0.040	**	-0.045				-0.005	*	-0.018				0.006	**	0.032	0.026	**	0.033																				
Temperature,warm to hot (ref.: comfortable)	-0.131	**	-0.124	-0.021	**	-0.050	-0.010	*	-0.030							-0.074	**	-0.081							-0.120	**	-0.132												

Appendix C. Sensitivity analysis

Appendix C1. Private motorised trips

Note: 'private motorised trips' include car driver, car passenger, motorcycle, moped, taxi, car sharing.

Table A
Standardized effects on WTT of private motorised trips – sensitivity analysis.

	Car driver only	Car passenger	Car driver + car passenger	Private motorised
	N = 9,269	N = 2,189	N = 11,458	N = 11,859
Direct effect of value domains on WTT				
Enjoyment	0.286**	0.174**	0.277**	0.279**
Fitness	0.076**	0.009**	0.064**	0.061**
Productivity related to paid work	0.139**	0.086**	0.131**	0.137**
Productivity related to personal tasks	0.317**	0.202**	0.300**	0.304**
Indirect effect of travel activities on WTT via value domains				
Accompanying someone	0.052**	0.020**	0.047**	0.047**
Browsing the internet	0.021**	0.014*	0.018**	0.018**
Eating	0.023**	0.006	0.019**	0.019**
Listening to audio	0.032**	−0.006	0.022**	0.023**
Personal care	0.020**	0.007*	0.018**	0.019**
Reading device	−0.006**	0.012**	0.007**	0.007**
Reading paper				n.s.
Relaxing or sleeping				n.s.
Talking	0.020**	0.039**	0.035**	0.036**
Thinking	0.051**	0.025**	0.045**	0.045**
Walking/Cycling/Driving itself	0.060**	−0.004	0.049**	0.049**
Watching video, gaming				n.s.
Indirect effects of positive experience factors on WTT via travel activities and value domains				
Ability to carry bags	n.a.	n.a.	n.a.	n.a.
Ability to do what I wanted to do	0.030**	0.001	0.023**	0.022**
Air quality, temperature				b.m.
Crowdedness, seating	n.a.	n.a.	n.a.	n.a.
Lighting, visibility	n.a.	n.a.	n.a.	n.a.
Noise				b.m.
Other people, other passengers	0.006**	0.004**	0.008**	0.008**
Parking at the end	−0.007**	−0.001	−0.005**	−0.004**
Payment and tickets	n.a.	n.a.	n.a.	n.a.
Predictability of travel time	−0.013**	−0.002	−0.010**	−0.010**
Privacy	−0.003**	−0.000	−0.003**	−0.004**
Road path availability	n.a.	n.a.	n.a.	n.a.
Road path directness	n.a.	n.a.	n.a.	n.a.
Road path quality	n.a.	n.a.	n.a.	n.a.
Scenery				b.m.
Seat comfort	0.006**	0.001	0.005**	0.005**
Security and safety	0.006**	0.000	0.005**	0.005**
Simplicity/Difficulty of the route	0.007**	0.000	0.004**	0.004**
Space for luggage				b.m.
Today's weather	+0.000	0.003**	0.001**	0.001**
Toilets	n.a.	n.a.	n.a.	n.a.
Traffic congestion	0.001*	0.003**	0.002**	0.002**
Traffic signals	n.a.	n.a.	n.a.	n.a.
Vehicle quality	0.016**	0.005*	0.014**	0.014**
Indirect effects of negative experience factors on WTT via travel activities and value domains				
Ability to carry bags	n.a.	n.a.	n.a.	n.a.
Ability to do what I wanted to do	−0.001**	−0.000	−0.001**	−0.001**
Air quality, temperature				b.m.
Cars and other vehicles	−0.004**	0.000	−0.003**	−0.002**
Charging opportunity				n.s.
Crowdedness, seating	n.a.	n.a.	n.a.	n.a.
Facilities	n.a.	n.a.	n.a.	n.a.
Internet connectivity	n.a.	n.a.	n.a.	n.a.
Lighting, visibility	n.a.	n.a.	n.a.	n.a.
Noise	−0.000	+0.000	−0.000	−0.000
Parking at the end	−0.000	0.002*	+0.000	+0.000
Predictability of travel time	−0.006**	+0.000	−0.004**	−0.005**
Road path availability	n.a.	n.a.	n.a.	n.a.
Road path directness	n.a.	n.a.	n.a.	n.a.
Road path quality	n.a.	n.a.	n.a.	n.a.

(*continued on next page*)

Table A (*continued*)

	Car driver only	Car passenger	Car driver + car passenger	Private motorised
Scenery	−0.002**	−0.000	−0.002**	−0.002**
Security and safety	0.001	0.001	0.001	0.001*
Space for luggage				b.m.
Simplicity/Difficulty of the route	0.000**	0.000*	−0.000**	−0.000**
Today's weather	−0.006**	−0.005**	−0.007**	−0.007**
Toilets	n.a.	n.a.	n.a.	n.a.
Traffic congestion				n.s.
Traffic signals	n.a.	n.a.	n.a.	n.a.
Indirect effects of traveller's characteristics on WTT via travel activities and value domains				
Gender, female	−0.008**	−0.002	−0.006**	−0.006**
Age, 16–24 (ref.: 25–49)	0.072**	0.023**	0.067**	0.067**
Age, 50 and more (ref.: 25–49)	0.003	−0.005	0.001	+0.000
Indirect effects of trip characteristics on WTT via travel activities and value domains				
Distance, 15 km and more	0.037**	0.023**	0.036**	0.036**
Trip frequency, non-regularly	0.002	0.004*	0.003	0.003
Trip purpose, work related	−0.016**	−0.008	−0.017**	−0.016**
Trip purpose, maintenance related	0.023**	0.026**	0.022**	0.023**
Trip purpose, leisure	−0.010*	−0.012*	−0.009**	−0.010**
Weekend	0.025**	0.006	0.023**	0.023**
Time constraint, yes	−0.027**	−0.011**	−0.025**	−0.026**
Weather: rain	0.037**	−0.020**	0.024**	0.024**
Temperature, cool (ref.: comfortable)	0.009	0.014*	0.010**	0.010**
Temperature, warm to hot (ref.: comfortable)	−0.032**	0.021**	−0.019**	−0.024**
Model fit				
Chi^2 (df) p	7196.795 (368) 0.000	2488.874 (368) 0.000	8811.599 (368) 0.000	9048.229 (368) 0.000
Chi^2 / df	19.557	6.763	23.945	24.588
RMSEA	0.045	0.051	0.045	0.045
CFI; TLI	0.927; 0.786	0.898; 0.700	0.925; 0.779	0.926; 0.783
PNFI	0.315	0.302	0.314	0.314
R^2	20.4 %	7.3 %	18.8 %	18.8 %

* $p \leq 0.05$; ** $p \leq 0.01$.
b.m. = experience factor below median and therefore not considered in the path model.
n.a. = travel activity or experience factor is not applicable for this transport mode and therefore not considered in the path model.
n.s. = direct effect of travel activity on value domains (or experience factor on travel activities) tested but found insignificant at 95 % and therefore deleted from the path model.

Appendix C2. Public transport

Note: 'public transport' includes train, bus, tram, subway/metro.

Table B
Standardized effects on WTT of public transport trips – sensitivity analysis.

	Train	BTM	Public transport
	N = 1,102	N = 3,805	N = 4,907
Direct effect of value domains on WTT			
Enjoyment	0.200**	0.236**	0.238**
Fitness	0.032	0.057**	0.048**
Productivity related to paid work	0.148**	0.125**	0.135**
Productivity related to personal tasks	0.291**	0.263**	0.272**
Indirect effect of travel activities on WTT via value domains			
Accompanying someone	0.002	0.022**	0.019**
Browsing the internet	0.035**	0.049**	0.047**
Eating			n.s.
Listening to audio	0.026**	0.032**	0.032**
Personal care	0.014	0.019**	0.018**
Reading device	0.019*	0.028**	0.028**
Reading paper	0.015	0.027**	0.024**
Relaxing or sleeping	0.010	0.032**	0.027**
Talking	0.012	0.040**	0.034**
Thinking	0.069**	0.041**	0.047**
Walking/Cycling/Driving itself	n.a.	n.a.	n.a.
Watching video, gaming	−0.007	0.015**	0.012**
Indirect effects of positive experience factors on WTT via travel activities and value domains			
Ability to carry bags	n.a.	n.a.	n.a.
Ability to do what I wanted to do	0.005	0.008**	0.009**

(*continued on next page*)

Table B (*continued*)

	Train	BTM	Public transport
Air quality, temperature	0.001	−0.001	0.001
Crowdedness, seating	0.018**	0.013**	0.015**
Lighting, visibility	n.a.	n.a.	n.a.
Noise	−0.001	−0.004**	−0.004**
Other people, other passengers	−0.002	−0.001	−0.001
Parking at the end	n.a.	n.a.	n.a.
Payment and tickets	−0.015**	−0.001	−0.008**
Predictability of travel time	−0.001	−0.002**	−0.002**
Privacy			b.m.
Road path availability	n.a.	n.a.	n.a.
Road path directness	n.a.	n.a.	n.a.
Road path quality	n.a.	n.a.	n.a.
Scenery			n.s.
Seat comfort	n.a.	n.a.	n.a.
Security and safety	0.009**	0.006**	0.008**
Simplicity/Difficulty of the route	0.001	0.002*	0.002**
Space for luggage	0.018**	0.002	0.008**
Today's weather	0.006**	0.009**	0.009**
Toilets	0.010**	0.014**	0.013**
Traffic congestion	n.a.	n.a.	n.a.
Traffic signals	n.a.	n.a.	n.a.
Vehicle quality	n.a.	n.a.	n.a.
Vehicle ride smooth	−0.002	+0.000	−0.000
Indirect effects of negative experience factors on WTT via travel activities and value domains			
Ability to carry bags	n.a.	n.a.	n.a.
Ability to do what I wanted to do			b.m.
Air quality, temperature			n.s.
Cars and other vehicles	n.a.	n.a.	n.a.
Charging opportunity	−0.005	−0.004**	−0.007**
Crowdedness, seating	0.010**	0.003*	0.006**
Facilities	n.a.	n.a.	n.a.
Internet connectivity	0.001	0.001	0.001
Lighting, visibility	n.a.	n.a.	n.a.
Noise			n.s.
Parking at the end	n.a.	n.a.	n.a.
Predictability of travel time			n.s.
Road path availability	n.a.	n.a.	n.a.
Road path directness	n.a.	n.a.	n.a.
Road path quality	n.a.	n.a.	n.a.
Scenery			n.s.
Security and safety			b.m.
Space for luggage	+0.000	0.001**	0.001**
Simplicity/Difficulty of the route			b.m.
Today's weather	−0.001	0.002	0.001
Toilets	0.001	0.001	0.001
Traffic congestion	n.a.	n.a.	n.a.
Traffic signals	n.a.	n.a.	n.a.
Indirect effects of traveller's characteristics on WTT via travel activities and value domains			
Gender, female	−0.019*	−0.016**	−0.019**
Age, 16–24 (ref.: 25–49)	0.032**	0.017**	0.016**
Age, 50 and more (ref.: 25–49)	−0.025**	−0.023**	−0.024**
Indirect effects of trip characteristics on WTT via travel activities and value domains			
Distance, 15 km and more	0.053**	−0.001	0.028**
Trip frequency, non-regularly	−0.009	−0.002	−0.006
Trip purpose, work related	0.048**	0.045**	0.050**
Trip purpose, maintenance related	0.018	0.042**	0.038**
Trip purpose, leisure	0.008	0.032**	0.030**
Weekend	0.006	0.008	0.007
Time constraint, yes	−0.023**	−0.014	−0.018**
Weather: rain	0.025*	0.033**	0.030**
Temperature, cool (ref.: comfortable)	−0.005*	−0.008**	−0.007**
Temperature, warm to hot (ref.: comfortable)	−0.020*	−0.022**	−0.020**
Model fit			
Chi^2 (df) p	1914.221 (420) 0.000	2963.456 (420) 0.000	4001.290 (420) 0.000
Chi^2 / df	4.558	7.056	9.527
RMSEA	0.057	0.040	0.042
CFI; TLI	0.902; 0.748	0.938; 0.841	0.935; 0.833
PNFI	0.343	0.361	0.361
R^2	15.4 %	14.7 %	15.4 %

* $p \leq 0.05$; ** $p \leq 0.01$.
b.m. = experience factor below median and therefore not considered in the path model.
n.a. = travel activity or experience factor is not applicable for this transport mode and therefore not considered in the path model.
n.s. = direct effect of travel activity on value domains (or experience factor on travel activities) tested but found insignificant at 95 % and therefore deleted from the path model.

Data availability

The empirical investigation is based on a large, open and European-wide travel experience dataset available at https://doi.org/10.5281/zenodo.4027465

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