Cynulliad Cenedlaethol Cymru / National Assembly for Wales
Pwyllgor yr Economi, Seilwaith a Sgiliau/ Economy, Infrastructure and Skills Committee
Effeithiau tagfeydd ar y diwydiant bysiau yng Nghymru / Impacts of congestion on the bus industry in Wales
Ymateb gan Yr Athro Stuart Cole / Evidence from Professor Stuart Cole

1. INTRODUCTION

1.1 The core of the inquiry relates to:

- The effect of traffic congestion on bus operations in Wales
- How policy can be improved to address the issue (by both local authorities and by Welsh Government)
- The impact on public bus subsidy

1.2 The important element underlying these is the impact on the bus passengers and on their decision on whether to use the bus or take alternative modes – the car, walking or cycling and in a few geographical areas of Wales, the train

The key factors determining that decision are:

- Reliability (i.e. the bus turning up)
- Timekeeping
- Frequency
- Convenience
- Fares (this is not for many the main causal factor in their decision)
- Availability of a car

It is these travel factors which have to be influenced

1.3 Road congestion is an important (but not the only) reason for poor reliability and timekeeping. This inquiry examines the effects of traffic congestion and the policy actions to reduce it.

2. EFFECT OF CONGESTION ON BUS OPERATIONS

2.1 There does appear to be a link between reliability and the provision of bus priority schemes. While generalised conclusions may be drawn, detailed instances or particular case studies are also valuable in providing the evidence.

The summary case studies relate to those two indicators of congestion effects on bus operations – punctuality (congestion is at a low if the bus run on time) and journey time (where the bus has a relatively unhindered journey). A more detailed case study is presented on Swansea bus operations based on a scoping study *Swansea Public Transport Hubs – bus hubs and passenger generators* by Professor Stuart Cole CBE for the Welsh Government (April 2016).

<u>Case studies</u>

2.2 Bournemouth

Punctuality satisfaction	76%	(2013 average 76%)
Journey time satisfaction	82%	(2013 average 85%)

Local authorities and operators work together within a 'very effective and active' voluntary South East Dorset Quality Bus Partnership which provides investment including bus infrastructure.

Source: A five year vision for the bus industry 2015, TAS Partnership / Passenger Focus satisfaction surveys 2013

2.3 Brighton

Punctuality satisfaction	82%
Journey time satisfaction	84%

Brighton & Hove Bus & Coach Company Ltd (BHBC - part of Go-Ahead) operates in a market with several competitors. The local authority Brighton & Hove Council has a long standing partnership with BHBC. The former has provided considerable investment in the city centre with bus lanes and traffic management with bus – only infrastructure. In 2009 a tracking system was introduced which enables congestion points to be identified and, as a by-product, real time information at bus stops.

Source: A five year vision for the bus industry 2015, TAS Partnership / Passenger Focus satisfaction surveys 2013

2.4 Edinburgh

Punctuality satisfaction	91%
Journey time satisfaction	89%

Transport for Edinburgh (TfE) is the co-ordination authority for Edinburgh, Midlothian and East Lothian areas. It owns Edinburgh Trams and is the principal bus operator through Lothian Buses and the recently established East Lothian Buses. First and Stagecoach have a presence in the area's inter-urban routes. Bus operations have been helped by high parking charges and a relatively low number of car parking spaces

The Lothian Buses fleet is, on average under 5 years old, with high capacity buses and has many relatively high frequency late evening and night services (thus providing for the journey home), a comprehensive network, low fares and multi ride (e.g. day) tickets encourage bus usage.

The bus tracker system enables congestion points to be identified and to provide real time information. There is a high level of bus priority at traffic signals and in 2013, 37% of Lothian Buses route mileage operated along bus lanes (Source: TAS Partnership) where speeds are nearly 4 mph faster than on shared road space. Enforcement of bus lanes is extensive in the central area

Source: A five year vision for the bus industry 2015, TAS Partnership / Passenger Focus satisfaction surveys 2013 /Discussion between Professor Stuart Cole and Lothian Transport / TfE 2017

2.5 Nottingham

Punctuality satisfaction	83%
Journey time satisfaction	91%

Nottingham City transport operated a comprehensive, high frequency network of services with modern buses so increasing demand over the last several years

Bus flow has improved through traffic management and the managing of bus stops so improving punctuality and reliability – two major factors in the decision to use the bus

Source: A five year vision for the bus industry 2015, TAS Partnership / Passenger Focus satisfaction surveys 2013

2.6 Reading

Punctuality satisfaction	85%
Journey time satisfaction	88%

Reading Buses and Reading Borough Council have invested heavily in the city's main bus routes with relatively new buses, real-time information helping to identify congestion points and to provide information for passengers. It claims more bus lanes per mile of road than the rest of Britain. This close working between the company and the council has seen the role of bus lanes in improving journey times and reliability

Source: A five year vision for the bus industry 2015, TAS Partnership / Passenger Focus satisfaction surveys 2013

2.7 Manchester

Stagecoach Greater Manchester sees the biggest issue facing Greater Manchester is 'the crippling and worsening traffic congestion which is plaguing the region, damaging mobility by… public transport … as well as other road users. Congestion pushes up the cost and damages the reliability and competitiveness of bus travel'

Source: Passenger Transport

2.8 Dublin

The impact of reduced congestion effects on bus popularity was seen in Dublin as far back as the 1980's. The introduction of a bus lane between St Stephen's Green (city centre) and UCD campus to the south of the city was initially unpopular with car users. Dublin Transportation Office had reached an agreement with the European Commission to purchase buses whilst waiting for the EU funded tram system. These used the five mile long bus lane enforced by random Garda visits. The realisation that it was quicker by bus than car and that parking in the city centre was no longer a problem persuaded a significant move to bus from car on that corridor

Source: Research by Professor Stuart Cole 1988; Dublin Transportation Office

2.9 Cardiff – Illustrative examples

- Cardiff is becoming an international event city. Arrivals by air are increasing and a key criterion for airlines deciding to serve an airport is the provision of a direct, fast exclusive bus service to/from the city centre. In Cardiff this is provided by the Cardiff Airport Express (TrawsCymru T9 service). It can however be delayed on the A4232 distributor road at peak times, where a bus lane (such as is provided on other sections of the route and for the equivalent service in Edinburgh) would be appropriate (see *Actions* section 4).
- In Cardiff city centre the CAE's inbound timing (important to travellers) is affected by a bus lane entrance block across its entrance by cars accessing their lane at Callaghan Square. A simple solution has been suggested to Cardiff City Council but the cooperation seen in other cities has not been forthcoming.
- Cardiff has a high capacity P&R site at Pentwyn on the A48 which illustrates the ideal with an (almost) continuous inbound bus lane to the Cardiff Royal Infirmary (Newport Road) and

slightly less so outbound. Buses giving a shorter journey time compared with car journeys have been shown to attract car users (e.g. Dublin; several Netherlands cities)

- Cardiff sees itself as an international events city. Cardiff Airport makes clear that a dedicated bus service is a key criterion for airlines wishing to operate into Cardiff. At the Callaghan Square / Bute Street junction, cars attempting to cross into the general traffic lane are stationery across the entrance to the bus lane causing delays of up to 15 minutes to the Cardiff Airport Express and to the baycar, two of Cardiff's most tourism / business visitor market related routes. However despite several requests a short extension to the bus lane has not been forthcoming from the City Council. This contrasts with the cooperation level indicated in other case studies.
- North Road and its extensions northwards to Manor Way and the A 470 are one of the city's busiest arteries and along which operate over ten high frequency bus routes. This amounts to up to forty buses each hour. It is this level of frequency together with reliability (derived from bus priority measures) which can attract passengers from the motor car. Bus lanes on this route to the city centre should be extended. In an FSB 2016 survey 44.7% of commuters said that frequency would encourage them to transfer to bus and improved punctuality / reliability would attract 36% of car users – who would wish to stand in a cold wet bus shelter for a bus delayed by 20 minutes by not being able to circumvent other general traffic). To increase that transfer bus priority measures (particularly at peak times) would add to the attraction. In surveys car users make clear that shorter journeys (implying bus priority measures) would make them consider that alternative.

Source: local bus operators; Moving Wales Forward. A report for Federation of Small Business (FSB) by Professor Stuart Cole (2016)

2.10 Newport – Illustrative examples

- Bus services connecting the central area, bus station and the railway station to several key educational / employment sites e.g. to sites near M4 J28 on the A48 SDR are provided partly with bus lanes / priority. But continuous bus lanes are required to achieve reliability and maximise efficiency for the whole route. Pedestrianisation while bringing considerable benefits has limited the provision of an internal city centre bus network.
  Source: local bus operators

2.11 Netherlands Experience

New planning regulations implemented in 1998 required land use change and development consent for any new housing, industrial and commercial plans to include associated passenger transport provision to be funded by the developer.

The extensive bus lane and cycleway networks into central business districts and extensive cycle parking at railway stations (17,000 spaces in Utrecht) have resulted in 40% to 60% of rail travellers using these modes to / from home or work

Source: Study by Professor Stuart Cole for Welsh Government (2016); *Car users can be attracted to reliable bus or train systems* by Professor Stuart Cole, in Western Mail Business in Wales, 3 February 2016

The case studies above indicate the need for local authorities to play their part in providing and enforcing bus lanes.

3. CURRENT POSITION - SWANSEA:

Bus operations in Swansea have been considered in a Welsh Government report *Swansea Public Transport Hubs – bus hubs and passenger generators* by Professor Stuart Cole CBE (April 2016). It is the basis of a more detailed assessment presented here for the inquiry

3.1 Existing major generators of people movement are for example Singleton (Hospital and University), Morriston (Hospital and DVLA), and Liberty Stadium, Swansea University, Bay Campus (as at present) and many secondary schools and colleges.

3.2 The primary routes adversely affected by peak period congestion are:

- from west Swansea along Oystermouth Road / coast road (A4067);
- from the east (east Swansea, Briton ferry, Neath, Port Talbot)along Fabian Way (A483) and on the Tawe bridge;
- from the north west (Llanelli, Fforestfach, Gorseinon etc.) along A 483 (Carmarthen road); A 4067 from J 45;
- From the north / north east Morriston Hospital major new development and J46 along B 4489.

3.3 There are high frequency buses services along all these routes during the working day and a less frequent service after 18.30 (Monday – Saturday) and on Sundays. (Chapter 5 in the Swansea report suggests methods of increasing use of such bus services).

3.4 The coverage of the network with bus lanes and two busways provides a good starting point and extensions are faced with land acquisition. However there are key routes (or parts thereof) e.g. along Carmarthen Road where four traffic lanes exist, and where two (one inbound morning peak and one outbound evening peak) could be utilised.

3.5 The higher peak weekday travel period is 07.30 – 09.30. This combines commercial employees, schools and colleges, and industrial staff movements. The afternoon peak begins with schools and colleges (15.15-16.30) and buses/work traffic causing the highest levels of congestion from 15.15 onwards to 18.30. In both time periods the high level of traffic flows on primary routes to / from / through Swansea city centre creates road congestion with unacceptable journey times.

Typical of the cross-city movements might be an evening car journey from Cardiff city centre to Swansea city centre:

Cardiff – Amazon Distribution Centre: 55 mins (approx. 45 miles at 49 mph)
Amazon to Civic Centre (along Fabian Way): 25 mins (approx. 3 miles at 7 mph)

3.6 Cross - city traffic flows reflect the number of out of town employment locations stretching for example from Neath to Sgeti, Fforestfach, Pontarddulais to Llangyfelach. These are less well defined as key routes but are congested routes between residential areas and education / work places.

It has been estimated (City & County of Swansea) that these through traffic flows account for 40% of the total peak traffic movement. Unlike Cardiff where the central business district (CBD) is a major employment area, Swansea has more widely spread locations e.g. Morriston Hospital and the Enterprise Zone thus reducing the critical mass required for efficient public transport unless major land use considerations (see below) are put in place.

3.6 Fabian Way was designed to be a major road giving access between the M4 and Swansea city centre but has been progressively downgraded to a local distributor road with a speed limit reduced from 70 mph to 50 mph to 30 mph. Increased congestion will increase bus travel time unless there is a modal shift from car to public transport (with additional bus priority schemes / busways) and cycling / walking assisted by using much of the existing 'side road' network. Current extended travel time could have a negative effect on Swansea's attractiveness to inward investors.

3.7 Congestion affects the journey times and operational efficiency of bus services – Swansea's most important form of transport for those with no access to the car. It is currently the most practical alternative to the car as a means of modal transfer to reduce congestion. As train services in Swansea only provide for limited east – west journeys.

On all public transport reliable on - time operation is an incentive to attracting passengers onto public transport. This becomes even more significant a factor where interchanging between services at a hub is concerned and particularly where services may have low frequencies. This is where there is a gap of over 30 minutes between the service time at which the passengers arrive and the one at which they depart. On high frequency routes (12 minutes or less) this is less important for making connections.

3.8 There are several good examples of bus hubs in the Swansea Bay City Region:

- Swansea bus station
- Gorseinon bus station
- Llanelli
- Ammanford
- Port Talbot (integrating with rail)

However there is a need to extend the provision of interchange hubs in Swansea and also to improve interchange between bus and rail services.

4. ACTIONS TO BE TAKEN / POLICY TO BE FOLLOWED BY PUBLIC AUTHORITIES

4.1 Integration – transport and land use

Traffic congestion on primary routes is already at a high level in many urban areas; space for new or widened roads is at a premium in both cost and spatial terms. For example the land development proposals for Swansea are often extensive and will require parallel discussions on sustainable transport provision for workers, students and visitors to travel into / out of and within the area.

Any land developments to be considered for new services by bus operators. Bus companies might be aware of proposed housing sites and numbers of homes set out in the LDP. The need is for conditions to be inserted into planning approvals for potential development. This is not easy. Often new housing developments are too small to attract Section 106 conditions, but the development as a whole might have done so. A new element has therefore to be introduced where developers part - fund the start-up of bus operations which may not be financially viable initially but could be when the full number of houses at that location in the LDP is achieved. The influences on travel decisions by travellers depend on the bus being an attractive option.
New educational and health facilities funded by government (local and central) can be used to illustrate the process. Swansea University and First Cymru (bus operator) joint plan for student movements between Singleton / SA1 campuses, the city centre and student residences have shown how this can work. A similar process would be useful at the Morriston Hospital development

4.2 Park and Ride

Action by local authorities to provide of out of town park and ride has been shown to reduce car flows into central business districts and increase bus usage. The size of car parks have to be commensurate with current and future traffic flows and estimated diversion rates for those currently driving to the final destination.

4.3 Bus priority schemes / Bus Lanes / Busways

This has been seen to be an important part of achieving high quality frequent and sustainable bus networks. This is a role for local authorities working in unison with bus companies providing the facility for delivery – good quality bus infrastructure and improved management of the highway network. These should be associated with P&R schemes.

4.4 Forecast modelling

Action to provide for the increased passenger movements through an assessment of demand, specification of routes, times of operation, timetables, and capacity on bus services. This increases the probability of viable bus routes
A forecasting model based on anonymous mobile phone data analysing travel for home/work journeys using origin/destination post codes. It can differentiate between walking, cycling and car use. It is currently being extended to analyse bus travel and can become base data for modal split forecasts.
The mobile phone data contains 1.2m trips/week. The demand matrix fed into the model can show links and nodes for any rate by time of day, turning movements at junctions, queuing vehicles and queue composition. Public transport surveys can also assist in targeting particular trend opportunities for transfer to bus and rail.

Source: City & County of Swansea; Arup Consultants; Welsh Government

4.5 Provision for modal shift

Associated with this is the period when travellers move from car to bus. This is a high risk and potentially high cost to operate buses which at first may have low load factors/higher subsidy. However evidence has shown that patronage can be increased over a relatively short period if high service quality elements are achieved.
The provision of a high quality, low carbon emission public transport service will involve public and private sector finance. To succeed it will require real time information, easy interchange and an extensive promotion campaign.

4.6 Busways/bus lanes
A busway,(including guided busway), proposal is generally provided by local authorities. These separate buses from general traffic enabling higher speeds and more attractive journey times especially for commuters.

4.7 Rail/bus service integration – contribution to easing congestion in Swansea
Swansea Railway Station is located at the northern end of the High Street, historically in the retail centre of Swansea. However this has now moved to Quadrant area to which the bus station is well connected. Twelve bus services operating at about 2/3 minute intervals throughout the working day connecting rail and bus stations.
A critical need in the Swansea public transport system is a coordinated bus / rail operation at Swansea rail station with a new interchange building across the section of High Street immediately adjacent to the railway station. This would require its closure to all motor traffic except buses, taxis, cycles and pick up / drop off cars. Redesigning the front-of-station front area and relocation of bus and taxi facilities would be required. This proposal was included in the original Swansea Bay City Deal application
Specified bus priority or bus only (potentially guided busway) routes are required between the railway station (High Street) and the central bus station via High Street and Kingsway / Princess Way or via Orchard Way to Kingsway. This could be compatible with plans for improved pedestrianised footways in 'lower' High Street.
There may be elements of bus infrastructure where the National Assembly and Welsh Government may set the legal or administrative framework. But local authorities either at county / county borough / city level are the appropriate public sector facilitator of bus infrastructure.

Source: Swansea Public Transport Hubs, Professor Stuart Cole CBE, for Welsh Government 2016; local bus operators.

5. IMPACT ON SUBSIDY

5.1 Generalised cost
The public authority interest lies in the comparative cost in terms of different elements comparing a journey by car to that by bus. Only by reducing the bus generalised cost can we begin to encourage a modal shift from car to bus.

Thus the role of the bus in itself reducing congestion, inherent in this inquiry, can be seen alongside the causes of car use in preference to bus use for commuter journeys. The generalised costs thus relate to two of the most important elements in modal choice – journey time and reliability.

Generalised Cost is an analytical tool in transport economics which avoids a purely financial analysis which is appropriate for private sector project evaluation but not as a means of measuring traveller benefits from public sector investment or revenue account expenditure.

The private company is interested in market success. This can (and seen by government authorities to) be achieved through:

- a professional approach to the management of the business
- achieving profitability so able to fund future investment
- customer care and satisfaction – this has to be a first priority; seen to be so; measured and the results published (as in the rail industry)
- high quality vehicles (as suggested above)

The elements of generalised cost are:
In vehicle time is the actual time travelling in the vehicle itself. It applies to bus and car but is longer by bus because of frequent stops, passenger time on and off the bus; driver time collecting fares; traffic congestion. Many passengers will allow extra time for possible road congestion.
Walking time for the car is zero. There is walking time at work / home end of the journey for the passenger to / from the bus stop / railway station
Waiting time for car is zero. For bus time at the stop can be disproportionate to the total journey time; passengers will often arrive early at the stop and have to face unpleasant elements (rain, wind, cold) with no shelter; uncertainty about the bus arrival as real time information is invariably lacking (Gwynedd and Cardiff at two ends of the population density range do provide electronic timetables at bus stops). Often there are no up to date timetables at stops. Walking time is high value as it is non – productive
Money cost for the car is petrol and parking and is divided by the number of occupants so cost per person can be reduced to down to 25%. Sunk costs for car purchase are rarely considered. Bus fares reflect the total operating cost
Crowding factor – none for car. Crowding; queuing and general hassle can be experienced by bus users. There is also often a poor perception of bus users and bus vehicles by others.

For example, the journey between Gorseinon and Swansea Railway Station is a distance of 6 miles and will require a bus journey time (uncongested off peak) of 30 minutes plus 3 minutes walking and 4 minutes waiting time – a total of 37 minutes. By car this same journey is15 minutes. The cost by bus using DfT values of time is £3.75 plus bus fare (£2.50); by car £1.52 (plus possible parking charges (£variable) and petrol (81p) which can be divided by occupants).

A reduction in generalised costs for bus users relative to car users could increase usage and:

- reduce wasted time (through robust bus priority schemes which improve reliability and reduce bus journey time) and increase labour productivity from scarce resources

- increase car costs through increased car parking charges. Future legislation could allow local authorities to set charges for privately owned car parks and workplace parking and top slice the excess for public transport investment
- create positive environmental and health effects if more people modal - switched to bus (or train or walking or cycling)
- improve the bus market image leading to a modal shift from the car
- reduce subsidy or obtain higher service levels for the same public funding
- improve commercial viability of non - subsidised services

6. CONCLUSION

6.1 Congestion is a major problem facing bus operations in cities and at some junctions in rural areas. For the operator it creates reduced reliability, increases travel times and pushes up operating costs.

6.2 For the traveller it makes bus travel less attractive than the car thus less demand, less revenue and either reduced service frequency/routes or increases fares to operate the same network.

Often the car and bus are in the same congested road but while the car continues to move the bus has to call at bus stops thus increasing its journey time. As an illustration, if the LDP proposals are achieved and travel demand increases a base journey time of 27 minutes could rise to 35 minutes with a defined road network improvement but rise only to 32 minutes if some public transport measures are introduced. Larger scale public transport improvements (e.g. as in Netherlands) can reduce this figure significantly.

Conversion to bus travel will never match that of the car so shorter journey times resulting from bus priority measures are a key to modal shift from the car.

The essential partnership is local authorities and bus operators working together for the benefit of travellers.

Professor Stuart Cole
May 2017