Transport Policy 18 (2011) 456–467

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Evaluating alternative concepts of bus-based park and ride

Stuart Meek, Stephen Ison*, Marcus Enoch

Transport Studies Group, Department of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE11 3TU, United Kingdom

ARTICLE INFO

Available online 8 October 2010

Keywords:
Park and Ride
Interchange
Bus
Integration

ABSTRACT

Whilst it has been used since the 1960s, the UK government have promoted bus-based Park and Ride (P&R) particularly heavily over the last 20 years as a tool to deal with traffic congestion and air pollution. There has long since been a view however that P&R in its current guise may actually be exacerbating the problems of traffic congestion, fuel use and emissions instead of mitigating them. This paper aims to reconsider this proposition whilst also testing a range of alternative forms of car–bus interchange in the context of traffic reduction, drawing on evidence from a large survey of P&R users in Cambridge, UK. Overall the results suggest that while current P&R significantly increases the vehicle miles travelled by its users, some of the alternative models presented potentially offer considerable improvements.

1. Introduction

For over 40 years, an inherently fixed model of bus-based P&R has been used in the UK. It consists of a dedicated car park with several hundred spaces, which is located on the edge of its host city, accessible from radial routes and served by frequent bus services to the urban core. Yet the policy goals to which it has been subjected have been fluid. Thus it was used originally by local authorities to add capacity to their urban parking stock, but as awareness of the environmental impacts of transport increased and the UK government moved away from building roads to meet higher levels of transport demand and towards encouraging alternative modes then P&R was instead encouraged through government policy as a traffic reduction and environmental policy (e.g. DoE, 1990; DETR, 1998, 2000). This resulted in increased take-up by local authorities, with over 50 UK P&R sites constructed during the 1990s (TAS Partnership, 2007). Thus, while the design of P&R systems has remained essentially the same, the policy goals to which it has been subjected have not. This of course infers that P&R is able to address both sets of policy goals, to boost local economies by adding parking capacity whilst also reducing overall levels of traffic, a view that some local authorities seem to support (Meek et al., 2010).

Economic and environmental or traffic reduction policy goals are often difficult to achieve simultaneously and as is detailed in the following section and is throughout this paper, considerable doubt was raised by some in the mid-1990s over the traffic reduction capabilities of P&R (notably Parkhurst, 1995). Indeed, it undoubtedly increases urban parking stocks but its role in traffic reduction is rather more complex than simply inducing a switch to the bus for the final part of users' trips. Since its use is not exclusive to motorists – it also tends to attract those who would not otherwise travel and users of conventional bus services (because of the price, quality and time benefits) – some degree of modal shift to the car for access to the P&R service is encouraged.

Thus, the UK government set about clarifying the role of P&R in transport policy (WSA, 1998), although the WSA report was revealed by Parkhurst (1999) to exclude important elements in the full traffic effects of P&R. This included the vehicle miles travelled (VMT) of the high-frequency P&R buses and the VMT of those who would alternatively use conventional public transport, travel elsewhere or make no trip. Unfortunately however, there has hitherto been a dearth of research to include these factors. Since the early-2000s however, explicit government support for P&R has waned (see Meek et al., 2008 for a full discussion of P&R policy). Yet national government funding remains for schemes through the Local Transport Plan (LTP) process and they remained popular in the second round of LTPs which cover the period 2006–2011.

Hence, while there is little doubt on the popularity side of P&R as a transport policy, the evidence (even though sparse and dated) on its traffic reduction effects is less favourable. This paper considers whether the current way in which P&R is designed – with a large site located on the fringe of its host city, supported by high-frequency buses – may be modified in order to induce more favourable results in terms of its traffic effects. Of course, given the lack of contemporary data, the paper also reopens the debate on the *current* effects of P&R by providing new evidence, which fully assesses the VMT effects of a scheme, as is necessary before looking at the alternative ways that car–bus interchange may be introduced.

* Corresponding author. Tel.: +44 0 1509 222605; fax: +44 0 1509 223981.
E-mail addresses: S.D.Meek@lboro.ac.uk (S. Meek), S.G.Ison@lboro.ac.uk (S. Ison), M.P.Enoch@lboro.ac.uk (M. Enoch).

0967-070X/$ - see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tranpol.2010.09.006

The following section outlines the current evidence base on the effects of P&R, after which the potential novel concepts of car–bus interchange are outlined and the method employed is detailed. The paper then turns to look at P&R in the particular context of the city of Cambridge, UK, where its current VMT effects are highlighted, followed by an estimate of the VMT effects of alternative concepts of car–bus interchange.

2. Evidence of traffic effects

While policymakers generally wish to intercept the motorist who would otherwise make their trip entirely by car to P&R, user surveys of P&R schemes (Table 1) have established that this is not always the case. In most cases and for the majority of users, it is using the car for the whole trip that is the alternative means of access to P&R host centres. Yet public transport is also the alternative for a significant proportion of users. These trips are of particular concern since a car trip is induced for access to P&R. The users who would not travel to the centre include both those who would make no trip (whose VMT is completely new) and those who would travel elsewhere (whose VMT change will depend on the alternative destination).

After uncertainty over the effects of P&R, the UK government commissioned a study looking in detail at the VMT impacts of eight schemes (WSA, 1998). This estimated the distance that would be travelled by users in the absence of P&R and that travelled to access the P&R service and compared the two. It found that, as shown in column i of Table 1, the schemes studied reduced the VMT of users in all cases. Yet the study had its shortcomings. Specifically, the VMT estimates were based on the users that both arrived at the site by car and would otherwise use the car to access their destination. Furthermore, the VMT of P&R buses was not included which is, of course, not benign. Parkhurst (1999) thus revaluated the findings of the study by including in the VMT estimates of P&R buses. A scaling factor is applied to bus VMT to reflect the greater size, weight and emissions of the bus and enable its comparison and integration with car VMT. After considering a range of options and sources, Parkhurst (1999, pp.13–14) uses a factor of 2.5. Even without the VMT of the non-motorist (those who accessed the site by means other than the car or would, in the absence of P&R, not use the car), he showed that in three out of the eight cases, P&R resulted in a VMT increase, as shown in column j of Table 1.

It should be noted that the aforementioned studies by WSA (1998) and Parkhurst (1999), and indeed this paper, look at the effect of P&R on the overall amount of mileage travelled. The VMT unit is linear and is thus not weighted to reflect spatial congestion effects, such as that resulting from the shift of traffic out of the town centre to the hinterland as a result of P&R.

3. Alternative concepts of interchange

As outlined above, the evidence has suggested that some current P&R schemes may have a counter-productive effect in terms of VMT. Yet the model of P&R that currently predominates in the UK has changed very little since the first uses of P&R over 40 years ago. Nevertheless, by changing the way in which P&R is designed, it may be possible to propose new concepts of car–bus interchange. The characteristics of relevance include such things as the frequency of bus services, the distance between the P&R site and the host city and the provision of on-site facilities. The alternative concepts of interchange are shown in Fig. 1 and are derived from the literature (namely Parkhurst (2000) for the Link and Ride concept), a scoping

Table 1
Evidence on alternative mode of P&R users and VMT effects.

a	b	c	d	e	f	g	h	i	j
Source	**Centre**	**Day**	**Sample**	**Alternative behaviour (%)**				**VMT change (miles)**	
				Public transport	Car	Other P&R	Would not travel	Per parker who would drive[a]	Change minus car-equivalent bus VMT[b]
WSA (1998)	Brighton	Mon–Fri	220	41	26	-	28	−2.5	−1.38
Hewett and Davis (1996)	Bristol	Thurs	674	40	54	-	3	-	-
		Sat	902	18	70	-	12	-	-
EHTF (2000)	Bristol	Mon–Fri	651	22	71	-	4	-	-
		Sat	1211	14	80	-	5	-	-
WSA (1998)	Cambridge	Mon–Fri	204	24	39	-	12	−0.93	0.63
Jones (1994)	Chester	Mon/Sat	124	14	60	15	12	-	-
WSA (1998)	Coventry	Mon–Fri	208	21	50	-	21	−1.03	1.09
Pickett and Gray (1996)	Maidstone	Mon–Sat	1000	15	66	-	10	-	-
Pickett and Gray (1996)	Norwich	Mon–Sat	1000	12	78	-	5	-	-
WSA (1998)	Norwich	Mon–Fri	204	29	53	-	12	−2.15	0.14
Pickett and Gray (1996)	Nottingham	Mon–Sat	1000	25	59	-	10	-	-
Parkhurst and Stokes (1994)	Oxford	Fri	741	31	33	8	7	-	-
		Sat	1000	20	43	4	21	-	-
White (1977)	Oxford	Tues/Thurs	208	30	57	14	2	-	-
		Sat	207	22	68	16	6	-	-
WSA (1998)	Plymouth	Mon–Fri	208	32	47	-	11	−2.92	−1.58
WSA (1998)	Reading	Mon–Fri	220	31	43	-	18	−5.31	−4.05
SYPTE (1995)	Sheffield	Thurs/Sat	176	-	-	8	-	-	-
Pickett and Gray (1996)	Shrewsbury	Mon–Sat	1000	11	67	-	17	-	-
WSA (1998)	Shrewsbury	Mon–Fri	205	18	53	-	14	−3.18	−2.34
Cooper (1993)	York	N/A[3]	154	35	59	-	1	-	-
Parkhurst and Stokes (1994)	York	Fri	288	26	54	-	11	-	-
		Sat	310	9	65	-	15	-	-
WSA (1998)	York	Mon–Fri	221	26	57	-	7	−2.03	−0.67

[a] WSA (1998).
[b] Parkhurst (1999).