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Cambridge's experience of road user charging: lessons learned

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In the early 1990s Cambridgeshire County Council considered the implementation of a road user charging scheme for the city of Cambridge, UK. This involved the trial of a congestion metering scheme, a form of road user charging. Cambridge presented an ideal opportunity for the implementation of a road user charging scheme not least in terms of its congestion problem, the free-standing nature of the city and the fact that at the time, the local authority in the form of the council was sympathetic to the objectives of road user charging. The scheme did not, however, proceed and many reasons have been put forward as to why this was the case—issues such as not all the alternatives having been exhausted, the level of sophistication of the proposed scheme and the lack of a similar scheme to consider elsewhere. Fifteen years later, Cambridgeshire is once again considering the whole issue of road user charging. As such, the aim of this paper is to assess how the authority is proceeding this time round: what type of technology is being considered; how the politicians are presenting the concept to the local population and what are they doing differently from the first time round, in terms of consultation; and most importantly, what provision for alternative means of transport will be made and how this relates to the potential success of any road user charging scheme? The paper aims to conclude on what lessons can be learnt in terms of other cities considering the implementation of a road user charging scheme.

1. INTRODUCTION

The continued economic success over several decades of the Cambridge sub-region which is focused on education, research and knowledge-based industry is of great significance to the wider regional and national economic well-being. That success, however, has brought a number of problems in the immediate Cambridge area, particularly that of traffic congestion.

The seeds for the Cambridge congestion problem were sown in the 1970s. Local planning policy, which continued until the 1990s, had the purpose of protecting the historic setting of Cambridge and so directed housing and other economic growth pressures away from Cambridge itself and into the surrounding area. This was despite the fact that Cambridge and especially Cambridge University was the very engine of growth. In the event the dispersal of housing was directed to the expansion of villages and market towns.¹ These lay beyond the tightly drawn

and fiercely defended green belt that encircled the city. This developed an imbalance between jobs and population in the city—the population was stable at around 114 000 for a number of years but with the number of jobs increasing significantly and to a level of 100 000 at the present time (Cambridgeshire County Council research group, personal communication).

This dispersal resulted in increased car travel from many small settlements into the city. Such movements often can not be catered for by public transport, and this position exacerbated the traffic pressure.

There was a recognition in the 1980s that the impact of traffic congestion was becoming unacceptable to a large number of people in the Cambridge area and this led to a belief that the introduction of a road user charging scheme might, as part of an all encompassing and comprehensive transport strategy, reduce the demand for car use. A road user charging scheme was also seen as a means of generating funds to provide for the capital cost of many of the transport measures, most notably a light rapid transit (LRT) scheme, within the strategy.

This period in the late 1980s also saw other cities recognising similar congestion problems and indeed some 40 cities were considering or seeking government funding towards local LRT or tram schemes. Given the inability of the public purse to fund so many projects, the Cambridgeshire view was that road user charging was worth exploring as a way of independently funding public transport projects within the area.

As part of transport policy development, experiments and field trials with potential technology for road pricing were undertaken in the city and these received widespread publicity at the time. However, the national transport policy context and the local planning policy background were insufficiently developed for the experiments to be any more than a local demonstration of technology.

Instead, local policy evolved with, by 1993/94, the abandonment of the road building elements of the transport package and a focus on the development of high-quality Park-and-Ride, bus priority, cycle schemes and physical restraint around the city centre. The desire to consider forms of fiscal demand management declined and the congestion metering scheme was formally abandoned in June 1993, but this did not stop pre-planned trials/demonstrations of congestion charging

equipment taking place. Since that point, the council has continued with its package approach with a significant degree of success, for example traffic levels in Cambridge are little unchanged over a period of 10 years.²

However, in parallel with this, by the turn of the century, regional planning guidance and the Cambridgeshire and Peterborough structure plan³ had turned and the focus of development pressure was on Cambridge as the most sustainable location for growth. In total, 47 000 new homes are planned for the Cambridge area and although many of these will be within, or on the edge of, the city, the existing flow of 184 000 vehicles entering and leaving Cambridge on a daily basis is likely to increase, worsening the problems of congestion and pollution.

This paper considers the trial of a road user charging scheme in Cambridge in the early 1990s. This scheme became known as 'congestion metering', but was not implemented. The paper seeks to assess what lessons have been learnt as Cambridge is again considering a road user charge, called 'congestion charging'—lessons in terms of the type of technology, presenting the concept to the general public and stakeholders, and what alternative transport provision will be in place. In essence what conclusions can be drawn that will be of use to other cities considering the implementation of a road user charging scheme.

2. THE FIRST ATTEMPT AT ROAD USER CHARGING IN CAMBRIDGE: THE 'CONGESTION METERING' SCHEME

It has been widely recognised that the supply and demand relationship for car travel is distorted when compared with other modes of travel because it is perceived by the motorist as being almost free at the point of use. Cars have high fixed costs: purchase costs, insurance charges and road tax (although in total these have been falling in real terms for many years) alongside relatively low marginal costs. Indeed many motorists only perceive the cost of travel as fuel and time costs. Neither do motorists recognise the congestion costs their presence imposes on other users of the road, nor on nearby residents. In saying this, the increase in the price of fuel in recent times may have changed the situation somewhat.

This contrasts markedly with the costs of using public transport where not only must marginal operational costs be paid for by the user but also a share of the fixed capital cost of the system at point of use. Add to this the cost of inconvenience, uncertainty and waiting times and the choice of public transport is often unattractive. Nationally, this is reflected by the fact that since the early 1950s there has been a long-term decline in the use of bus services in favour of the car. Ison⁴ presents further details of the economic theory underpinning marginal private cost and marginal social cost.

In recognition of this, the then government in 1964, commissioned a report, entitled *Road Pricing: the Economic and Technical Possibilities*, often called the Smeed report,⁵ after the report's chairman, Professor Smeed. He and his team examined the implications of road pricing and advocated charges being made and related closely to the amount of road utilised. Additionally, the report recommended that varying charges should be made for different areas, times of day, days of the week and vehicle type. The lack of any suitable technology,

however, to automatically measure and implement such charges meant that little progress had been made during the following decades in developing and turning road pricing into a workable measure of traffic or wider demand management.

By the late 1980s, however, technology was becoming available for roadside to vehicle communications and automatic electronic payment methods and this held the prospect of sophisticated systems being brought forward whereby individual vehicles could be charged in real time for the contribution that they made to congestion.

In this regard, the University of Newcastle transport operations research group, headed by the late Peter Hills and his assistant Phil (now Professor) Blythe, with additional collaborative work at Northumbria University, as part of the ADEPT⁶ project under the auspice of the EU Drive programmes, saw major advances in roadside to vehicle communications and by the early 1990s this work had produced viable microwave-based equipment which was ready for field trials in suitable transport systems.

Concurrently, the then Director of Transportation at Cambridgeshire County Council, Brian Oldridge and his associate Geoff Hunter, of Pell Frischman, but lately of West Yorkshire County Council devised and patented a system of road pricing which they titled 'congestion metering'. This innovation attempted to fulfil the Smeed ambitions of charging motorists in real time according to the level of congestion they were experiencing. In this instance this would be achieved by the individual monitoring of vehicles' speeds by themselves and deducting relevant charges from value stored in the then new medium of smartcards, which were incorporated as part of the in-vehicle equipment.

The collaboration of Oldridge/Hunter and Newcastle University produced a package of equipment that included an in-vehicle communications transponder, keyboard and display module and smartcard reader; additionally a sensor was connected to the car's odometer. This equipment was able to monitor the varying speed of the vehicle, calculate a charge and deduct value from the smartcard. The road side equipment comprised a 5.8 GHz microwave communication beacon, controlled by a personal computer with specially designed communication card and software. The beacon, which had associated vehicle presence and enforcement equipment, was used to trigger the initiation of the charging sequence within the vehicle, as would happen when a vehicle entered a charging zone and to detect non-compliant vehicles (Figs 1 and 2).

The enforcement system included a presence detector with the ability to recognise that a vehicle passing it contained an in-vehicle unit along with a valid smartcard with appropriate value. If not, a photograph of the vehicle would be taken. An infra red lamp detector ensured the clarity of photography of 'offending' vehicles' registration number plates. The system thus maintained the privacy of compliant vehicles, but not non-compliant ones.

The council welcomed the opportunity to participate in the demonstration of the system which carried forward the Cambridge-based ideas and brought together the communications research work from the University of Newcastle with smartcard technology being developed by the banking sector.

Fig. 1. In-vehicle communications

The key feature of the system was that with suitable algorithms, it actually could charge motorists according to the level of congestion they were experiencing whenever it was occurring. This in principle was a very attractive feature and a major technical advance.

The system was demonstrated for a period of three months in the early 1990s and attracted international interest.

Although the main application was for real time variable charging, distance-based and open application algorithms were additionally demonstrated. The technology of the system was

Fig. 2. Congestion metering

adapted for an area-based regime, but could have been simplified for a cordon charge—more details are given by Ison.⁷

3. CAMBRIDGE PRESENTED THE IDEAL OPPORTUNITY FOR A ROAD USER CHARGING TRIAL

Why should Cambridge be the centre of interest in road user charging? The answer lies in its near unique combination of scale, free-standing city, geographic location detached from any competing centres, wealth of employment linked to the strong science-based university and the tightly drawn green belt. In essence the free-standing nature allowed the analysis of the impact of congestion metering independent of other factors.

The Cambridge sub-region has one of the most remarkable concentrations of high technology and research clusters in the UK with key sectors including computer sciences, telecommunications/information technology, bio-technology and bio-medical, medicine and other emergent technologies.

In addition, Cambridge was suffering from severe levels of congestion and, in the director of transportation, possessed a major road user charging protagonist who was willing to drive the congestion metering agenda and a council who were sympathetic to congestion metering, at least in terms of the trial.

4. FAILURE TO BE IMPLEMENTED

Despite these positive points, the scheme was never further developed and introduced. There are a number of reasons why the congestion metering system was not implemented in Cambridge following the ADEPT demonstrations.

The first was the lack of national policy guidance and suitable legislation to introduce charging locally and crucially the power to hypothecate the proceeds to local transport investment. This appears strange now as such powers have existed since the passing of the Transport Act 2000. At the time this meant that powers would have had to have been obtained via a private Act.

Linked to this, the focus of the demonstration of congestion metering, although academically 'pure', was technically complex and would have been difficult for many motorists to fully understand. This is not withstanding the fact that the Cambridge area has the highest proportion of resident university graduates in eastern England.

There were also a number of safety aspects of varying charging in real time which became apparent during the demonstrations. It was recognised that the varying of charging and displaying that information, as with a conventional taxi-meter, would undoubtedly have distracted the motorists' attention from the task of driving. It was clear that there would be a predisposition to speed through the charging area. It was concluded in any event that predetermined and fixed charges would be a requirement of any charging system, so that a motorist could take an information-based decision on their mode of travel before starting their journey.

It was also recognised that a congestion metering system would require a significant logistical process to compulsorily fit the meters to the large number of vehicles. Furthermore, during the

fitting of the demonstration meters to the test cars, it was found that there were potentially a wide variety of different types of odometers in the vehicle fleet, which would have provided technical problems with skilled fitting and warranties. The scheme as envisaged would have required the compulsory fitting of meters for which powers would have been necessary under the private Act. It is not clear today whether that would breach human rights legislation.

There was also little engagement with the general public in a systematic manner and publicity often focused on the negative aspects of the system rather than the positives, which a charging system would bring to the economy, environment and travel conditions of the city.

At the time there was no obvious source of the considerable sums of up-front funding that would have been needed to implement the charging system and initial investment in alternative public transport services to offer the choice that motorists who declined to pay the charges would require in order to undertake their journeys. At the time it was thought that the LRT scheme would cost about £68 million and that much of the introductory costs of the charging system would be met by public funding and from users although it was difficult to estimate how much this might be as the system required the use of then new technologies, which had not entered a mass production phase. For a local authority that decided to introduce a system, the only option would have been unsustainable debt against the local rates.

The scheme was seen as part of a bigger package of transport improvement, which included additional road building and bus priority measures in and around Cambridge. There was however opposition to both the road building and to some of the bus priority measures. The latter also included some physical widening of existing carriageways.

Such were the concerns that in 1993, they contributed to the change of political balance and thus control of the county council.

This change of council saw the abandonment of the road building proposals and the intention to give more priority to pedestrians, cyclists and buses. This involved imposing more physical restrictions on the use of the car and the introduction of a programme to develop and expand the then inadequate park-and-ride system. This is when the Cambridge transport strategy was replaced by the Cambridge transport package supported under the transport policies and programmes system that had a strong focus on cycling, bus services and bus priorities along radial routes.

The area still represents an obvious location for a road user charging scheme. It has been the subject of various transport strategies, which evolved to take account of the growing traffic pressures on the city and across the Cambridge sub-region. More strict regimes of non-fiscal demand management have been introduced into the city, with positive effects during the last 10 years but without road user charging, these measures may not be enough to address the challenges of further development. Hence road user charging is back on the agenda in Cambridge.

5. CURRENT SITUATION

With increasing levels of congestion nationally, the government has recently established the transport innovation fund (TIF). This is a dedicated stream of funding that has been established in order to support the introduction by local authorities of innovative packages of transport measures to tackle congestion. The TIF seeks to provide £1.4 billion nationally over the period 2008–2018. Authorities bid for the TIF, but in order to qualify, the package of measures must include not only large public transport improvements, walking and cycling facilities and potentially highway improvements, but also demand management measures most notably road user charging.

Two authorities have so far expressed a serious interest in TIF: Cambridgeshire and a consortium of Greater Manchester authorities. The Cambridgeshire TIF bid was submitted to government in October 2007 with the following objectives⁸

- (a) a 10% reduction in current traffic levels
- (b) a reduction in transport emissions, aimed at meeting air quality and climate change objectives
- (c) securing high quality sustainable alternatives to the car, in advance of congestion charging
- (d) improvements to the economy
- (e) creation of a scheme that is equitable.

The congestion charging scheme proposed for Cambridge as part of the TIF bid can be summarised in the following points.

- (a) An area licence charge around Cambridge city, extending into part of south Cambridgeshire, the surrounding district area, covering an area approximately 6 km by 6 km (Fig. 3).
- (b) A charge in operation between 0730 and 0930 h on Monday to Friday.
- (c) A daily charge in the region of £3 to £5, irrespective of the number of trips or distance travelled.
- (d) All travel into, out of or within the charging zone will be subject to the charge.
- (e) No exemptions.

The scheme objective is to reduce congestion by 10% below current levels in the morning peak period. The council make it clear that the scheme will be the subject of much debate both with stakeholders and through public engagement prior to any possible introduction.

Fig. 3. The proposed charging area

In terms of the technology, a tag-based scheme enforced by automatic number plate recognition (ANPR) is currently seen as the most attractive, not least given its reliability, accuracy and running cost. The proposed scheme includes a number of detection points within the city aimed at catching 'rat runners' as well as traffic on major routes. The charging points inside the boundary are expected to capture 95% of traffic using the network. Although the cost of introducing this scheme is not insignificant (estimated to be in the order of £18 million, it is certainly the case that with the advances in technology and mass production of key components, this will cost less than an equivalent system would have cost in the early 1990s when this was last considered by Cambridgeshire.

It is expected that many commuters will register for automatic payment with the scheme setting up an account with regular payment activated through an in-car tag. Cambridgeshire states that 'as far as possible, the most simple detection and payment structures would be preferred' with ANPR used to detect those who do not have the tag. It is intended that for regular users choosing to take advantage of the tag and beacon system a discount would be available. Alternative payment mechanisms will also be available for infrequent users and again, the objective is to make the required transactions as simple and cost-effective as possible. Unlike the London scheme, annual operating costs are envisaged not to exceed 24% of revenues and less if possible, thus maximising the revenue to be ploughed back into the transport system.

5.1. A package of measures

The congestion charge is seen as part of a package of measures identified as a way of dealing with the growth in traffic. These include improvements in public transport, walking and cycling provision, highway development where there is no alternative, in addition to demand management measures. With respect to public transport the aim is to deliver a fast, reliable and viable network along inter-urban corridors and at park-and-ride gateways to Cambridge. In this respect a high-quality public transport network is proposed serving the new developments and the expanded park-and-ride gateways of 11 000 additional spaces by 2021. A new guided busway will also form part of the improved network to tie in with the guided busway already under construction. Enhanced rail provision, most notably in terms of a new station at Chesterton to the north of Cambridge also forms part of the new package of measures.

In terms of walking the aim is to maintain and enhance the conditions for pedestrians, providing a high-quality network of direct, safe, comfortable routes. For cycling this requires a comprehensive network of off-road/quiet road routes linking all major residential areas within Cambridge as well as the surrounding villages. The highways strategy will involve measures such as the reallocation of road space on public transport priority corridors, with traffic flows consolidated on particular corridors away from specific public transport routes. In addition, a strategy of smarter choices via marketing and promoting alternatives will be developed—involving organisational travel planning, personalised travel planning, residential travel planning, car sharing, car club schemes and the like.

It is forecast that the implementation of this package of measures will lead to an absolute reduction in car trips of approximately 20% in comparison with current day levels by 2021 which, when taking account of growth, will result in the desired 10% reduction on current day levels.

Although the issue of the congestion charge is still being considered and debated fiercely, Cambridgeshire has made the following intentions clear.

- (a) Congestion charging will definitely not be introduced before real transport alternatives are in place (the package noted above), and available during the charging period.
- (b) Congestion charging will only operate at the times and in the places where congestion is the most severe.
- (c) The very earliest date at which it could be implemented along with the other proposals is likely to be 2014.

It is expected that £500 million will be required in order to enact the various parts of the package hence the TIF bid incorporating congestion charging. The £500 million would be spent on the congestion-alleviating transport measures noted above and in wider Cambridgeshire if appropriate.

The council is keen to state that the revenue-raising elements of the scheme are not a key aim and that all revenue, in accordance with the Transport Act will be ploughed back into the transport system. The amount of money raised by such a scheme is unclear at this stage but it is estimated that a charge of £4 per day for those travelling into Cambridge between 0730 and 0930 h would generate in the region of £30 million per annum, taking account of operating costs.

5.2. Public engagement and consultation

Over a period of time the council has undertaken a wide range of engagements with key partners (most notably local businesses, the universities, transport providers, key interest groups, district and neighbouring councils and parish councils), seeking to discuss the issues currently facing the county and the potential solutions. In terms of the general public, extensive countywide public consultation took place with 23 roadshows between November 2007 and February 2008, which afforded Cambridgeshire residents the opportunity to have their say on the transport package, including congestion charging. In addition, special meetings were held with organisations, interest groups, councils and businesses. The council has also made use of an online survey in order to ascertain the views of the general public, stakeholder breakfast briefings, stakeholder opinion polling forums, focus groups for hard-to-reach people, and councillor and member of parliament briefings. This is all sharply in contrast to the measures employed with the earlier scheme.

The results of this work are still emerging. The deliberative opinion polling that was undertaken has shown that 40% of the participants view congestion charging as desirable when the city experiences its worst congestion, with 64% viewing congestion charging as an effective measure. In terms of consultation with key stakeholders there is widespread understanding of the challenges transport poses and the need to consider more radical measures, but only if considered as part of a package of measures, and more specifically a package of measures to include improvements in public transport.

The feedback from the various consultations has been used in order to refine the package of measures. A statistically stratified survey of opinion taken across Cambridgeshire has shown that if attractive alternatives to the private car are in place before the introduction of road user charging, then 59% of people tend to support or strongly support, 18% neither support nor oppose and 24% tend to oppose or strongly oppose the innovative.

The survey also revealed a similar level of support if the revenues were spent on improving transport in Cambridgeshire. With neither of these provisions in place support for road user charging falls to only 31%.⁹

6. LESSONS LEARNT FROM THE PREVIOUS EXPERIENCES OF ROAD USER CHARGING

With the passage of time, certain lessons can in retrospect be learnt from the earlier experience of the congestion metering demonstrations.

Most notably, the congestion metering technology used was regarded as reliable, robust and could be deployed flexibly in charging systems, although the actual exploitation had a number of weaknesses, which became apparent. The simpler use of the technology in a system which did not try to be so sophisticated would be potentially more effective and deliverable, hence a tag-based system enforced by ANPR features in the current proposals.

Presenting the system to the public needs to be better planned and the engagement needs to explain the key role of charging in the demand management tool kit. This is currently high on the council's agenda as detailed in the previous section.

The requirement for the provision of alternative transport measures to cater for those choosing to change mode needs to be carefully planned and programmed.

Since the publication of the 1998 UK government Transport White Paper¹⁰ and its daughter paper *Breaking the Logjam*,¹¹ there has been renewed interest in road user charging and successive government reports, including the Eddington study¹² have reflected that interest and policy thrust. Furthermore, the introduction of the TIF by central government means that the financial means to deliver road user charging schemes are now available for those needing to explore the benefits.

Furthermore, motorists will need only simple pricing structures and need to know what the cost will be before setting off on their journey, in many cases perhaps a week or several days ahead. Elements of the congestion metering system could be adapted to do just that, but that would not require the potentially expensive linkage to the odometer of the car. With the tag-based ANPR scheme currently proposed for Cambridge, motorists will be aware of the daily charge before they undertake their journey and will make a decision accordingly.

There is a need for alternatives to be available to road users displaced by the road user charge. There would appear to be limits to the level of demand management which can be

achieved through physical or non-fiscal measures to limit car use. Alongside this are alternatives which can be provided to offer choice to the motorist. Much has been achieved in the containment of traffic levels entering and leaving Cambridge, and the major reductions in the central area. It has been found that the programme of significant extensions to the scale and quality of park-and-ride have been successful in reducing car levels when combined with restrictions on the entry into the city.

Further, the development of the Cambridgeshire guided busway, providing 25 km of segregated busway within 40 km of bus routes will with their associated park-and-ride facilities and high-quality service be a very attractive alternative option for travel in two main corridors running into the city. Further bus corridors will need to be provided as part of the growth agenda in the city.

7. CONCLUSIONS

Although a congestion charging system has yet to be introduced in Cambridge, a number of important conclusions can be drawn from the earlier experience and local debate about road user charging at the time of the demonstrations of congestion metering. These conclusions can be supplemented by experience from elsewhere.

- (a) There needs to be a widely experienced travel and traffic problem that will grow and needs to be addressed. In the case of Cambridge it is widely recognised that there is severe congestion on a daily basis and that this problem is likely to get worse without more radical demand management measures.
- (b) There needs to be one or perhaps two clear objectives for the introduction of any system of charging. If there are too many this will cause confusion and obstruct taking forward the charging policy. There could be various reasons for introducing a congestion charging regime, including
 - (i) reducing traffic congestion
 - (ii) rationing road space
 - (iii) improvements to the local environment
 - (iv) linkage to climate change mitigation
 - (v) social inclusion, social equity
 - (vi) raising funding
 - (vii) manage inevitable growth in activity, namely growth agendas.

It was unclear as to the exact objective of congestion metering in the early 1990s—was it to reduce congestion, improve the environment, raise revenue for the proposed LRT scheme or simply to trial the technology? The current congestion charging proposals are much simpler in terms of their objective, namely one of reducing congestion, with the hypothecation of revenue raised for improving transport facilities. This is supported by the recent Cambridgeshire-wide survey.

The following additional points should be considered.

- (a) There needs to be clear policy development and locally driven political support.
- (b) The prospective charging system needs to be simple to comprehend, the charging regime's operation from a user's perspective needs to be as near as possible foolproof and/or tamper-proof and the payment mechanisms automatically executed.

- (c) The privacy of individual users needs to be respected and protected.
- (d) To undertake a provincial congestion charging system requires significant investment in the charging system itself and alternative public transport and other modal facilities. This obviously needs to be in place ahead of the introduction of the charging system, as shown in the recent Cambridgeshire-wide survey. This investment is likely to be beyond the ability of either local authorities or local transport operators to provide and given the current state of development of charging schemes there is risk unless underwritten by central government. Thus a sympathetic government pursuing a sustainable travel approach and prepared to provide guidance and the significant preliminary costs to provide the alternatives is likely to be essential. Certainly for early schemes full underwriting of an improved public transport system would appear to also be important.
- (e) There needs to be engagement at an early stage with major stakeholders and then with the general public. Few members of the general public or stakeholder groups have an overall appreciation of the all-embracing issues raised and the engagement process has to be greater than the conventional consultation undertaken for planning and transport projects. A key part of that engagement process requires the identification of the benefits of the system to particular groups.
- (f) In the Cambridgeshire situation it could be argued that physical demand management measures have been exploited to their fullest.
- (g) There are likely to be many direct gainers and some losers with the introduction of a congestion charging system. Much is down to perception and personal expectations. People's attitudes change just as lifestyles change and people adjust their expectations through time in response to external changes. As such, the delivery of a congestion charging system will need to focus on the positives and prospective benefits to the wider public.

REFERENCES

1. CAMBRIDGESHIRE COUNTY COUNCIL. *Cambridgeshire Structure Plans*. Cambridgeshire County Council, Cambridge, 1980, 1989 and 1995.
2. CAMBRIDGESHIRE COUNTY COUNCIL. *Cambridgeshire Local Transport Plan, 2006–2011*. Cambridgeshire County Council, Cambridge, 2006.
3. CAMBRIDGESHIRE COUNTY COUNCIL and PETERBOROUGH COUNTY COUNCIL. *The Cambridgeshire and Peterborough Structure Plan*. Cambridgeshire County Council, Cambridge, 2003.
4. ISON S. G. Congestion charging: selling the concept. *Proceedings of the Institution of Civil Engineers, Civil Engineering*, 2005, 158, No. 1, 19–25.
5. SMEED R. *The 'Smeed Report'—Road Pricing: The Economic and Technical Possibilities*. Ministry of Transport, London, 1964.
6. CLARK D. J., BLYTHE P. T., THORPE N. and ROURKE A. The ADEPT Project 'Automatic Debiting and Electronic Payment for Transport', Congestion Metering—the Cambridge Trial. *Traffic Engineering and Control*, 1994, 35, No. 4, 256–263.
7. ISON S. G. Pricing road space: back to the future? The Cambridge experience. *Transport Reviews*, 1996, 16, No. 1, 109–126.
8. CAMBRIDGESHIRE COUNTY COUNCIL. *Cambridgeshire Transport Innovation Fund, the Package Outline Proposal for Funding*. Cambridgeshire County Council, Cambridge, 2007.
9. MRUK. *Attitudes Towards Congestion*. Report of independent survey by MRUK for Cambridgeshire County Council, May 2008.
10. DEPARTMENT OF THE ENVIRONMENT, TRANSPORT AND THE REGIONS. *A New Deal for Transport: Better for Everyone*. HM Stationery Office, London, 1998, The Government's White Paper on the Future of Transport, Cm 3950.
11. DEPARTMENT OF THE ENVIRONMENT, TRANSPORT AND THE REGIONS. *Breaking the Logjam*. HM Stationery Office, London, 1998.
12. EDDINGTON R. *The Eddington Transport Study: the Case for Action*. HM Treasury/DfT, London, 2006, Report 12/06.

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