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ROAD PRICING: THE POTENTIAL FOR COMPARATIVE MONITORING A REPORT TO THE LONDON PLANNING ADVISORY COMMITTEE

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ABSTRACT

This study was designed to review the proposals for road user charging in the Randstad, Stockholm, Oslo and Singapore, to determine the intentions for monitoring of each of these proposed schemes, to assess the implications for the development of policy in London, and to identify any opportunities for obtaining experience which would help in clarifying the uncertainties associated with proposals for road pricing in London.

The study reviewed the objectives and operational requirements for road pricing in London and the criticisms levelled against such proposals. On this basis it developed a series of requirements for monitoring and information gathering to help clarify the outstanding uncertainties. These were used as a check list for a series of discussions with those responsible for proposals in the case study cities.

Discussions indicated that the proposals in most cities had changed markedly in the period since the study was commissioned. These changes, and the resulting nature of the proposals, meant that only the proposals for Stockholm were sufficiently similar to those in London to justify collaborative monitoring. The report recommends that such collaboration be developed. However, both the Randstad and Oslo schemes offer the opportunity for obtaining information on actual or predicted user response, while the Singapore proposals will provide valuable experience of new technology. It is recommended that all of these are pursued.

The discussions highlighted several lessons of direct relevance to the development of policy in London. In particular it is seen as important to keep the specification of the measures simple; to pursue extensive consultation with those who might be affected, and with all political parties and government bodies who might be involved in policy decisions; to provide clear guidance on the anticipated uses of the revenue; and to develop a system which is implemented flexibly, so that problems can be remedied as they arise.

In this context, the role of assessment and monitoring is limited. It should not be used to delay decisions; however, once a commitment is made to proceed, experience from elsewhere will be of value in informing the consultations. A carefully designed monitoring programme will be important in assessing and enhancing a scheme once implemented. It is recommended that the monitoring programme should be based on the requirements identified in this report.

1 STUDY OBJECTIVES AND STRUCTURE

1.1 Objectives

Several organisations, including LPAC, have proposed that road pricing be implemented in London as an element in a wider transport strategy. This proposal has generated some doubts, notably from the Department of Transport (DTp), about issues such as the area over which road pricing would be required, the likely level of price sensitivity, the equity aspects of the charging system particularly adjacent to charging boundaries, and the feasibility of enforcement.

Several other cities are considering implementing road pricing and, were they to do so, it should ideally be possible to help to resolve these doubts by careful monitoring of the schemes as introduced. The current study was designed to determine the feasibility of using the results from monitoring of other road pricing schemes as a means of clarifying policy in London. The schemes on which the study has been based are:-

(i) the proposals for road pricing in the Randstad;
(ii) the proposal for supplementary licensing in Stockholm;
(iii) the pricing cordon already implemented in Oslo (where, obviously, no new before data could be collected);
(iv) the proposed conversion of area licensing to road pricing in Singapore.

The objectives of the study were therefore:-

(i) to review progress on proposals for road pricing and other forms of traffic restraint in other countries;
(ii) to determine the intentions for monitoring of each of these proposed schemes;
(iii) to assess the implications for the development of transport policy in London and, specifically, to identify any additional monitoring requirements which would help to clarify uncertainties associated with the debate over road pricing in London.

1.2 Study Method

The study was conducted in four stages:-

(1) **An assessment of the objectives and criteria against which a road pricing scheme would need to be assessed in London, and the resulting data requirements.**

This initial assessment was based on experience with earlier work for LPAC, and on previous studies of traffic restraint policies in London and elsewhere. It resulted in a brief report to the client which, once approved, formed the basis for Stages 3 and 4.

(2) **A desk review of the current state of development of proposals in the selected cities.**

This work was conducted in parallel with Stage 1 and during the period in which

the Stage 1 report was being assessed. It was based largely on existing reports, reinforced by correspondence with those concerned.

(3) **Visits to the selected cities.**

Visits were then arranged to appropriate contacts in each of the cities to update the review in Stage 2, to obtain details of current and proposed monitoring proposals, and to assess these against the data requirements developed in Stage 1. Where gaps were identified, the feasibility of using local resources to fill them were discussed. The opportunity was also taken to review current plans for implementation, dealing with such issues as public acceptability, enforcement, provision of alternatives to car use, and integration with other policies.

(4) **A review of the implications for London, and recommendations.**

This stage, which summarised the findings of Stages 2 and 3, was designed to identify any new issues of potential concern to London, advise on any immediately resulting policy implications for London, assess the extent to which the results of monitoring exercises in the selected cities would assist in determining policy in London, and make recommendations for any additional monitoring which appeared to be needed, and the basis on which this could be financed and conducted.

1.3 Structure of the Report

The remainder of this report follows the sequence outlined above. Section 2 summarises the main information sources used. Section 3 outlines the objectives and criteria identified for the assessment of road pricing in London, and hence for the discussions on opportunities for monitoring in each of the case study cities. Sections 4 to 7 report in turn on each of the cities visited. Section 8 draws conclusions and recommendations.

Each of the four city reports is structured to cover, in turn:-

- a brief history of the proposal and its current status;
- the objectives of the scheme as currently proposed;
- any proposals for monitoring, and the extent to which these might assist in answering outstanding questions in London;
- a summary of the opportunities for monitoring, and of other issues which have arisen which are relevant to road pricing in London.

2 INFORMATION SOURCES

2.1 Studies of Road Pricing in London

The initial review of objectives and criteria was based on several studies for London, listed below.

(i) **Studies for LPAC.** The most recent studies for London are the series conducted for LPAC, which have included:

- (a) an analysis, using the London Area Model, of a range of transport strategies, which indicated the importance of traffic restraint as an element in any transport strategy for London - TASTE I (May et al, 1988; LPAC, 1988; May and Gardner, 1990);
- (b) a desk study of alternative options for traffic restraint which argued that cordon-based electronic road pricing represented the most promising means of imposing restraint - TASTE II (May and Gardner, 1989; LPAC, 1989);
- (c) a study, using the LTS model, of the performance of a number of strategies, including two which involved traffic restraint - TASTE III (May, Guest and Gardner, 1990;LPAC, 1990).

(ii) **Assessment Studies.** The series of four assessment studies for the DTp, investigating solutions to problems in four separate sectors of London, purported to investigate traffic restraint, but it is clear that in practice the assessment was rudimentary. However, the objectives against which the studies were conducted may be relevant. They are outlined in LPAC (1990).

(iii) **Studies for the GLC.** The GLC, in the 1970's, conducted three relevant studies:-

- (a) the supplementary licensing study (GLC, 1974; May, 1975a) which assessed a range of options in which prepaid licences were required in order to use vehicles in specified areas;
- (b) a review of options for the control of private non-residential parking (May, 1975b; GLC, 1976; DoE, 1976) which developed a number of proposals for restricting the use of PNR parking;
- (c) the area control study (Prestwood-Smith, 1979; GLC, 1979) which considered an alternative approach to the allocation of permits and pre-paid licences.

2.2 Reviews of Road Pricing Policy

In addition, use was made of a series of more general reviews of policy on road pricing, in particular:-

(i) the IPPR study: A Cleaner, Faster, London (IPPR, 1989) to which the Institute for Transport Studies contributed (Mackie and May, 1989);
(ii) the ICE study on congestion (ICE, 1989) which argued strongly that road pricing was needed;
(iii) the CIT study: Paying for Progress (CIT, 1990), which investigates specifically the role of road pricing;
(iv) a report for the London Boroughs Association (LBA, 1990);

(v) a review of the performance of alternative restraint mechanisms (May, 1986);
(vi) an assessment of road user charging for ECMT (Goodwin and Jones, 1989).

In addition the outcome of some recent reviews of public attitudes to restraint has been considered, including work by Jones for DTp, by MVA for the London Borough of Richmond, and by MTRU for five West London Boroughs and for LPAC and several North Eastern London Boroughs (Jones, 1990; MTRU, 1989, 1990).

2.3 Information on Case Study Cities

In advance of the actual visits, information on the proposals in each of the selected cities was obtained from three sources:-

(1) proposals, marketing information and reviews generated by the responsible authorities and their agents in each of the cities;
(2) more recent papers by those involved with the schemes, and the critical reviews of other interested parties;
(3) direct conversations and correspondence with those involved with the schemes.

For the Randstad, the main sources were the proposals under the Second Transport Structure Plan (Ministrie van Verkeer en Waterstaat, 1988a), further specification of the intentions for road pricing (Ministrie van Verkeer en Waterstaat, 1988b; Klijnhout et al, 1988) and a recent technical description of the intended system (Stoelhorst and Zandbergen, 1990).

For Stockholm, we had access to the report to the Swedish Ministry of Transport on traffic policy for Stockholm, Gothenburg and Malmo (Peterson, 1990), while for Oslo, papers were available describing the Oslo scheme and future plans for it (Larsen, 1990), together with information on its precursor in Bergen (Larsen, 1988).

The existing area licensing scheme in Singapore is much more fully documented, with a detailed review of its early performance by the World Bank (Watson and Holland, 1976; World Bank, 1976; Holland and Watson, 1978) and others (McGlynn and Roberts, 1977a,b), a later assessment of its distributional impact (Wilson, 1988) and a summary of recent changes and future proposals (Laconte, 1990).

2.4 Additional Information on Cambridge

During the study, information was also made available on proposals for congestion pricing in Cambridge. While the stage of development of the Cambridge proposals made it inappropriate to consider them as providing an opportunity for monitoring, the proposals raise some issues of relevance for London, and are summarised here.

Cambridge has experience a 47% growth in traffic over the past ten years. Cambridgeshire County Council has estimated that, unchecked, traffic growth in Cambridge in the next decade will rise by a further 37% to 59%. This is mainly due to the high rate of GDP growth in the region and a large expansion in housing in urban areas. The stated aim of the road pricing scheme planned for Cambridge is to restrict the level of traffic to 1990 levels.

The proposed road pricing system is based upon a smart card system similar to that

considered in the Randstad, but with a simpler mode of operation. Each car in the area will be provided with a meter which would be switched on automatically as the vehicle enters (and off as the vehicle leaves) Cambridge by a set of beacons around the perimeter of the city. The meter will operate by deducting units from a pre-paid card whenever the driver encounters congestion in the city, identified by the meter as a stop-start pattern of movement. Oldridge (1990) estimates that in 1995 a 5 km peak-hour urban journey will use between 4 and 8 units. Daily tickets will be available to other drivers at slightly above this rate.

Cambridgeshire County Council, in line with Singapore and the Randstad, have elected to set an acceptable level of congestion and to alter the charge to achieve this. It is hoped that the development of a light rail route, paid for in part from the proceeds of the road scheme, may provide an alternative travel mode to many commuters.

3 OBJECTIVES AND CRITERIA FOR ASSESSMENT

3.1 Approach Adopted

Three separate bases were developed for determining the objectives and criteria against which the performance of road pricing strategies should be assessed. The first involved identifying the policy objectives against which transport strategies involving road pricing have been developed. The second considered the operational requirements identified in such studies. The third reviewed the objections which have been levelled against road pricing as a strategy. There is inevitably some overlap between these lists. The main concern in the study must be with the last of these sources, since the aim is to identify information sources which can be used to assess the validity of the objections.

3.2 Policy Objectives

These have largely been based on concerns over:-

Economic growth and revitalisation in terms of improving the attractiveness of an area for investment;
Efficiency in the use of resources and relief of traffic congestion;
Accessibility in terms of time, or generalised cost, for journeys by different modes to different activities;
Environmental protection and improved quality of travel, particularly reduction of noise, pollution and pedestrian delay and reduced stress for drivers;
Revenue generation to finance public transport or highway improvements;
Safety in terms of reduction in the number of accidents;
Equity in terms of distribution of accessibility and environmental effects;
Practicability in terms of how well the public understand the purpose of traffic restraint and its responsiveness to new circumstances;
Sustainability in terms of reducing energy and resource consumption to levels which match the rate of substitution by other energy sources and resources;
Acceptability in terms of whether the public perceive the need for restraint.

It is argued in (May, 1986) that efficiency and environmental protection are the objectives for which restraint is most clearly justified.

It is worth noting that most studies have advocated traffic restraint as one element in a package of measures designed to achieve these objectives; thus the effects of restraint may be difficult to assess on their own without considering the contribution of rail investment, bus priorities, traffic management or traffic calming.

3.3 Operational Criteria

The operational requirements identified in the GLC Supplementary Licensing study (GLC, 1974) have been used in (May, 1986) to review a range of traffic restraint methods. They suggest that any restraint method should be:-

Effective in reducing congestion and/or environmental intrusion; this in turn implies that it must bear on all, or at least a substantial majority, of those journeys which contribute to these problems, and do so in such a way as to induce a significant response;

Flexible in its operation, enabling the restraint effect to be intensified or modified as necessary;
Selective in its impact, enabling it to bear most heavily on those who impose greatest cost, and to encourage them to make alternative decisions;
Simple from the point of view both of the user and the operator;
Contained in its effects, so that congestion and environmental intrusion are not simply transferred in time or space.

Other requirements identified in the literature include the need to be:-

Enforceable in being able to detect evaders accurately and recover outstanding payments;
Reliable in its operations in terms of speed and accuracy of debiting and trouble free performance;
Robust in terms of equipment being able to withstand vandalism or tampering and extremes of weather and traffic conditions;
Attractive in terms of its design and appearance;
Transparent in terms of making charges known to people prior to and while travelling.

3.4 Objections to Traffic Restraint

The main objections identified can be classified as follows:-

(i) restraint would be ineffective; ie, in the case of road pricing, either the response to price would be too low, or the reduction in traffic, from those who did respond, would be offset by a growth in other traffic unless the initial charges were sufficiently high to shock individual travellers and lead to significant changes in travel behaviour;
(ii) restraint would simply transfer the problem to other locations, or times of day; particular concerns are the growth of orbital traffic and congestion outside the high charge periods which could lead to rat-running in new areas;
(iii) restraint would create new problems such as parking on the fringes of charging points and ploys to evade or avoid payment;
(iv) restraint would impose undue burdens on public transport, since there is perceived to be insufficient capacity on bus and train services which in turn could lead to longer wait times, queues and overcrowded travelling conditions;
(v) restraint would be administratively impractical; this has been a criticism particularly of licence and permit-based systems, and is probably not valid for electronic road pricing; however, there is a question over the feasibility of equipping all vehicles in the area affected;
(vi) restraint would be administratively complex and expensive both in terms of the institutional arrangements required to set up and operate the system, the collection and distribution of revenues and dealing with complaints and claims for concessions and exemptions;
(vii) restraint would be difficult to enforce; that is violations could not be detected, or there would be too many to be effectively processed;
(viii) restraint would be unfair; this is perhaps the widest ranging criticism, and includes concerns over income-related inequities, the impact of car use subsidies, the effects on people with particular needs (eg disabled drivers; service engineers) and the boundary effects near to pricing cordons or to temporal changes in

charging level;

(ix) restraint would be an infringement of privacy; this is a particular concern with electronic systems based on automatic vehicle identification (AVI) which can trace individual vehicles;

(x) restraint would contravene a freedom to use public roads;

(xi) restraint would induce longer term relocation of land use, and hence potentially exacerbate transport problems; the most noticeable and immediate effects are expected to be in retail distribution, retail centres and the office based employment sector.

3.5 Resulting Monitoring Requirements

In the light of this review, the following information requirements were identified for the assessment of road pricing in London. This checklist was agreed with LPAC officers and used as a basis for assessing the potential contribution of monitoring plans in the case study cities.

(a) The scale of traveller response

This can be considered in terms of changes for individual travellers in:-

- the amount of travel
- the origin and destination of travel
- the time of travel
- the mode used
- number and composition of vehicle occupants
- the route used
- the time spent at the destination
- the parking location.

(b) General public and media attitude/perception

This could be assessed on the basis of reactions by:-

- motorists affected
- other motorists
- public transport users
- pedestrians and cyclists
- freight operators

These will need to be considered for:-

- different groups of user
- different trip purposes
- different trip locations.

In addition, the views of residents and commercial activities, and more general reactions of the media will be relevant.

(c) The scale of employers' response

This can be considered in terms of a number of possible changes introduced by employers to offset individuals' costs:-

- changes in tax allowances
- direct payment for employees' costs
- changes in flexi-time, work from home arrangements
- change of location
- changes in work practices; eg fewer business trips.

(d) The scale of freight operators' response

Many of these responses will be the same as for other travellers but need to be considered as a separate category as time savings for freight operators are particularly valuable; the following changes are likely to be significant:

- time of travel
- amount of travel
- route used.

(e) The scale of land-use response

This will to an extent influence the level, origin and destination of travel in (a); however, the effect will be a longer term one, and hence more difficult to determine; land-use effects need to be examined separately for retail, business, industrial and housing sectors.

(f) The systems implications of (a) and, in the longer term, (e); this will concern the level of transfer of congestion, overloading on public transport, environmental, safety and accessibility impacts. These will to a considerable extent depend upon the characteristics of the city and its transport system, as well as on how the benefits of restraint are used; and what other measures (eg public transport investment) accompany road pricing. Criteria which will be particularly important to monitor, for different areas and times of day, are:-

- average journey speeds
- total travel times (door to door and link based)
- wait/delay times
- probabilities of getting a seat, getting aboard
- total vehicle kilometres
- total person kilometres by mode.

(g) The equity implications

These will depend on the responses in (a), and the resulting changes in costs, as a result of (e); they will thus in part depend on local characteristics, and the way in which restraint is applied, and the benefits and revenues used. These in turn will depend on the precise charging structures introduced and location of debiting points.

(h) The practical considerations

In particular these will concern the ways in which the system is introduced, perceived, administered and enforced. This will be affected by the charging structure and distribution of debiting points but also by the level and quality of information explaining the system and its outputs.

(i) Implications for the environment

A number of changes in environmental conditions will be implied by changes in total vehicle kilometres, traffic composition and speed. However it will be necessary to make separate assessments of a number of environmental attributes, in particular:-

- air pollution
- noise levels
- pedestrian delay
- severance.

4 THE RANDSTAD

4.1 History and Current Status

In response to a projected 72% increase in car kilometres travelled in the Randstad area between 1986 and 2010 and a 300% rise in congestion costs, the Dutch Ministry of Transport and Public Works launched a three-pronged attack on congestion comprising road widening and the removal of bottlenecks, extensions to public transport and electronic road pricing on all inter-urban roads, "Rekening Rijden". All of these are subsumed under the Second Transport Structure Plan (Ministerie van Verkeer en Waterstaat, 1988a).

The original proposal for road-pricing envisaged an increase in the variable cost of motoring of 50%. The revenue was intended to cover the cost of operating the system, meet the interest and repayment charges on privately funded tunnels, improve public transport and influence land use and work/home interractions. The original proposals envisaged charging points every 10km based upon peak hour charges of £1 and off-peak charges of 10p per charging point. The motorist would know in advance what the actual charges would be. The road pricing system proposed for the Randstad was to have been based on development in SMART card technology, high speed data transmission using infra-red or microwave communications and encryption technology. The card is given value by inserting it with a form of payment, at a filling point. The card is then inserted into a unit in the car.

The Dutch plan was by far the most comprehensive of those envisaged to date and were it to go ahead would be the most technologically advanced of the systems. It was proposed that the road pricing system should be based on state of the art smart card technology and allow for different charging rates depending on travel time, route, direction, and vehicle type.

In November, 1990, the road pricing proposals were rejected, and replaced by a plan to install some 20 to 25 toll stations on interurban roads. The proposals for the tolling system were announced in December 1990 as a government response to the original Transport Structure Plan. This response was based upon extensive consultation with the public groups, motorist organisations and inter-governmental think-tanks. The statement included the following:

Tolls
Tolls, conventional or electronic, are to be introduced in mid 1994 on a number of access roads, tunnels and bridges in and around the Randstad. In this way resources will be gathered for use in implementing policy while at the same time achieving some measure of traffic restraint.

Peak-hour surcharge
If tolls cannot be implemented quickly enough the Government intends introducing an interim measure in the form of a peak-hour surcharge on the annual vehicle tax for cars used in the morning rush hour, coupled with a discount for those not so used. Ways are being examined of making the surcharge as flexible as possible, i.e. payable by the motorist in respect of periods determined by him or her (one month, one week, even one day).

The purpose of these various pricing measures is to adjust the relative cost to the user of public transport and the private car in public transport's favour. They are not intended to affect freight transport and ways are being considered of achieving this. An investigation is also underway into the extent to which those who make little use of the car can be spared the effect of the price measures.

4.2 Objectives

The current proposals for tolling in the Randstad, as set out in the Second Transport Structure Plan, are set within a broad range of policy measures. The objectives for the toll system, conventional or electronic, are set out in policy category 2, managing and restraining mobility, policy area 12, pricing policy. The toll system is regarded primarily as a means of raising revenue from 1994 onwards to finance access roads, tunnels and bridges in and around the Randstad and also a means of achieving some measure of traffic restraint. There are no specific target reductions for the toll system, rather a general target reduction for car use in 2010 from 70% above 1986 levels to 50% above, and subsequently to 35% above, which will require a package of policy measures. This differs from the 1988 structure plan which defined specific target reductions for electronic road pricing.

4.3 Monitoring Proposals

As part of the original road pricing proposals for the Randstad a number of assessment studies were carried out to assess a range of possible effects. Some of these assessment studies are relevant to the tolling system, although further studies and repeat work are to be carried out as part of the proposals. The majority of the monitoring/assessment work has been related to individual traveller response. The assessment studies have included direct observation of traffic diversion in situations where toll-charges have been introduced for new tunnel schemes and stated preference studies where travellers are presented with a range of levels of charge and resulting conditions to assess possible reactions to a range of hypothetical charging scenarios.

A survey to assess public attitudes to alternative ways of specifying a user-charging system was completed in December 1990. Discussions are underway to extend this work. Whilst there has been no formal monitoring of media reaction, it has been found over the period between 1988-1990 that the media have in general objected to measures to restrict car-usage and have publicised the adverse effects which would be imposed on particular types of traveller, eg the infrequent traveller.

An attempt has been made to model the effects of a road-user charge scheme on employment using data from the National Travel Survey and the National Bureau of Statistics. There were many analytical problems encountered with this study, and the results found little evidence for effects on employment. Interview surveys to assess the possible effects on freight operators have been carried out although the questions posed were found to be too vague and remote to the operators. A second series of interviews involving questions about specific routes and charges is being considered.

Work on the effects of road user charges on residential location in the Rotterdam area has been undertaken as part of on-going work by the Dutch Economic Institute. There is a proposal to extend this work further. The initial evidence suggested that road user charges would have some effect on residential location.

Alongside the modelling of effects on employment, some analysis on the distributional effects of road user charges across income groups was tested. Here too the analysis was troubled by a number of data problems, and produced counter-intuitive findings with lower income groups apparently being willing to pay as much as higher income groups.

A task force has been set up to continue to assess the technical and practical aspects of the tolling-system proposals including location of toll-booths, administration of the system and enforcement.

Finally the possible effects of toll charges on overall traffic levels, the environment and safety have been examined. The National Travel Model has been run with a two-level pricing structure to assess overall traffic effects. Attempts have been made to find out the safety record of tolled-roads and non-tolled roads in other countries - notably France and the USA but without much success.

The original proposals for road pricing were assessed for their effects on a range of pollution emissions from cars and from heavy goods vehicles including carbon dioxide and nitrogen oxides.

In sum the proposals for user-charges in the Randstad have been assessed, to varying degrees of detail and success, against all of the major headings (a) - (i) outlined in Section 3.5.

4.4 Summary

The Dutch have done more work than others to predict and analyse the effects of road pricing, and it may well be of value to LPAC to have access to the results of this work, much of which is currently only available in Dutch and some of which is as yet incomplete. In particular, the stated preference work conducted by The MVA Consultancy could usefully complement that which NEDO plan to collect.

However, the abrupt change in policy in December 1990 makes future work in the Randstad less relevant to London. The system now proposed is both simpler than any scheme envisaged for London, and located away from the urban centres, where impacts on mode and time of day choice, and on congestion patterns, will be markedly different.

The experience leading up to this policy change may well be of direct relevance in determining the acceptability of road pricing in London. It is clear that, rather as in Hong Kong, technological development had outstripped the process of opinion-forming. Public attitudes were inadequately understood, and the individual political parties had differing preferences among the possible measures. It is interesting to note that none of the main political parties was arguing against some form of charging for car use, but even this consensus was insufficient. It may be that a more detailed assessment of the relative merits of alternative charging systems would have helped.

5 STOCKHOLM

5.1 History and Current Status

A traffic bill outlining proposals for traffic and environmental management in Stockholm was signed by the major political parties governing the Stockholm area in January 1991. The proposal included a fee system for vehicles entering the city. The system proposed would require all motorists to purchase a tagged licence which allows a vehicle to enter the central area of Stockholm. Violation of the scheme triggers a video monitoring structure, mounted on an overhead gantry which records the number plate at the rear of the vehicle. Detected vehicles are fined £25. The location of the gantries and the fee structure has yet to be decided. The fee system is intended to vary by time of day and by type of vehicle.

This system, similar in many respects to the current operation in Oslo, follows extensive discussion of alternative approaches to dealing with traffic congestion in Stockholm. An earlier system based on prepurchased licences, as used in Singapore, which was tested on a trial basis, and had the initial support of the committee of politicians looking at alternative solutions, was found to work well in terms of the ability to detect vehicles violating the system. The proposed system of area tolls would have consisted of the area within the old city walls (the so-called inner traffic area) extending approximately 5-6 km. from the city centre, with a number of exceptions relating in the main to strategic through access and exit routes. Tolls would have operated Mon-Thursday from 7am-6pm and on Fridays from 7am to 4pm. No tolls would be payable in July. Two types of card would have been available - an individual monthly card (£30), coupled with a right to use the Regional Public Transport System, and a daily card (£2.50). Registered disabled drivers, emergency service vehicles and electric and other environmentally acceptable vehicles would have been exempt. Politicians outside the committee however opposed the system on a variety of grounds including possible forgery of licences and the costs and practicalities of monitoring a city-wide licensing scheme.

The current agreement has been reached as a result of a decision by the government in April 1990 to appoint a negotiator for each Metropolitan Region to present proposals for significantly improved traffic systems. The team of negotiators helped to minimise the conflict between political representatives and to educate politicians about the range of solutions available and the benefits of different sets of solutions.

The timetable for the introduction of the system is unknown, though the agreement on the overall traffic strategy for Stockholm covers the period 1991-2005. The agreement includes specification of investments in both public and private transport, some of which would be paid for from revenues generated from the fee system. These have been calculated at 13,900 million SOK (£1390m), from 1997 if agreement on the fee system is reached in 1992, and the necessary legislation is then forthcoming.

5.2 Objectives

The original proposals for road pricing were part of an overall transport strategy for the Metropolitan area of Stockholm which was designed to achieve a reduction in air pollution and traffic noise and to reduce road congestion. The strategy, including a combination of public transport investments, car tolls and road improvements, was predicted to be able to reduce vehicle mileage by 30-40% and increase public transport speeds by 30%.

There are however no clearly stated objectives or targets, either for traffic restraint or environmental improvements, in the licensing agreement reached. Rather the primary objective now for the licensing system is revenue-generation, the revenue generated being essential to the development of new private and public transport investment necessary to improve the city's transport system and to gain the support of the different political parties. However in contrast to the schemes in Norway, the Swedish government has made it clear that it will not sanction road pricing to generate funds for road building unless it can be shown that these will improve the environment.

5.3 Monitoring Proposals

Discussions and proposals for some form of traffic restraint involving user charges have taken place in Stockholm since the mid-1970s. A number of investigations have been conducted to assess the overall costs and benefits of an area licensing scheme. Since then the main assessment work has been on individual traveller response using a revealed preference model based upon data from the 1986/87 National Travel Survey. The results of this analysis, of which little has been written up, indicated little or no reduction in the number of work trips but some effect on shopping trip destinations. There have been a range of figures quoted on the possible overall traffic reduction at different charging levels. Based on the 1986/87 data for example it has been predicted that a daily charge of £2.50/day would reduce traffic by 10%. Other calculations have suggested a licence of £30/month would reduce overall traffic by between 6-8% per day. Simple studies, based upon the net traffic reduction figures above, have been carried out in the past to assess the energy, environmental and financial implications of the licensing scheme.

A sum of £200,000 had been set aside to monitor the effects of the earlier proposals for a manual 'pay and display' scheme. The main aspect of this monitoring was to have been zonal traffic flow counts within the central area. Some monitoring of public transport patronage was to have taken place, although the details of what form this would have taken were never advanced. The study was to have included comparisons with other metropolitan areas without traffic restraint. Stockholm University was to have conducted a separate study examining the effects of the scheme on retail activity in the city.

The monitoring proposals for the latest area licensing scheme are unclear. It is not clear whether the £200,000 from the previous proposal will be made available for the current proposal. A view expressed during the visit was that monitoring the physical effects of the system would be less important than monitoring public and political attitudes towards the system. Compared to our list of monitoring requirements outlined in Section 3.5, Stockholm has tended to focus on the scale of traveller response, mainly through observed counts of vehicular flows. There has been considerable debate and discussion about the proposals to work out a proposal which people could agree on including discussions with retailers, employers and freight operators. The impacts of the proposals on these sectors have not however been formally quantified or appraised.

5.4 Summary

The proposals for Stockholm are gradually becoming firmer, but there is still no definite date for implementation, and the precise definition of the scheme, including charging levels and locations, still has to be finalised. Implementation seems unlikely before 1993 at the earliest.

There is, however, an interest in the issues of concern in London, and a commitment to conduct a monitoring exercise, for which a budget had been allocated. There was a positive reaction to the suggestion of using Stockholm as a test-bed for further assessment studies of interest to the London proposals. It does appear, therefore, that the opportunity could be taken to develop a joint monitoring programme in Stockholm which would help to answer outstanding issues in London.

6 OSLO

6.1 History and Current Status

A toll ring was introduced around Oslo on 1 February 1990 comprising a watertight cordon of 17 toll gates some 8-10 km from the central area, (Figure 1), where inbound traffic is charged at all times. A similar ring has been in operation around Bergen since 1 January 1986 but with tolls restricted to the working day between 6am - 10pm. The location of the toll gates in both cities is based on practical and political considerations. Both systems were introduced with the sole aim of generating funds for major road investment without affecting the amount of traffic entering the city. For this reason toll charges were set at a relatively low level; 10 Kroner (£1) for cars, 20 Kroner for trucks. Seasonal passes may be purchased which allow an unlimited number of trips to be made, at 2200 Kroner per year, or 200 Kroner per month for cars. These charges rose by 30% in February 1991. Since December 1990 an electronic toll system has operated. The possibility of introducing a charging structure which varies by time of day is being discussed.

6.2 Objectives

The Oslo and Bergen toll rings were introduced with the sole objective of raising revenue to finance new roads and, to a lesser extent, public transport.

6.3 Monitoring Proposals

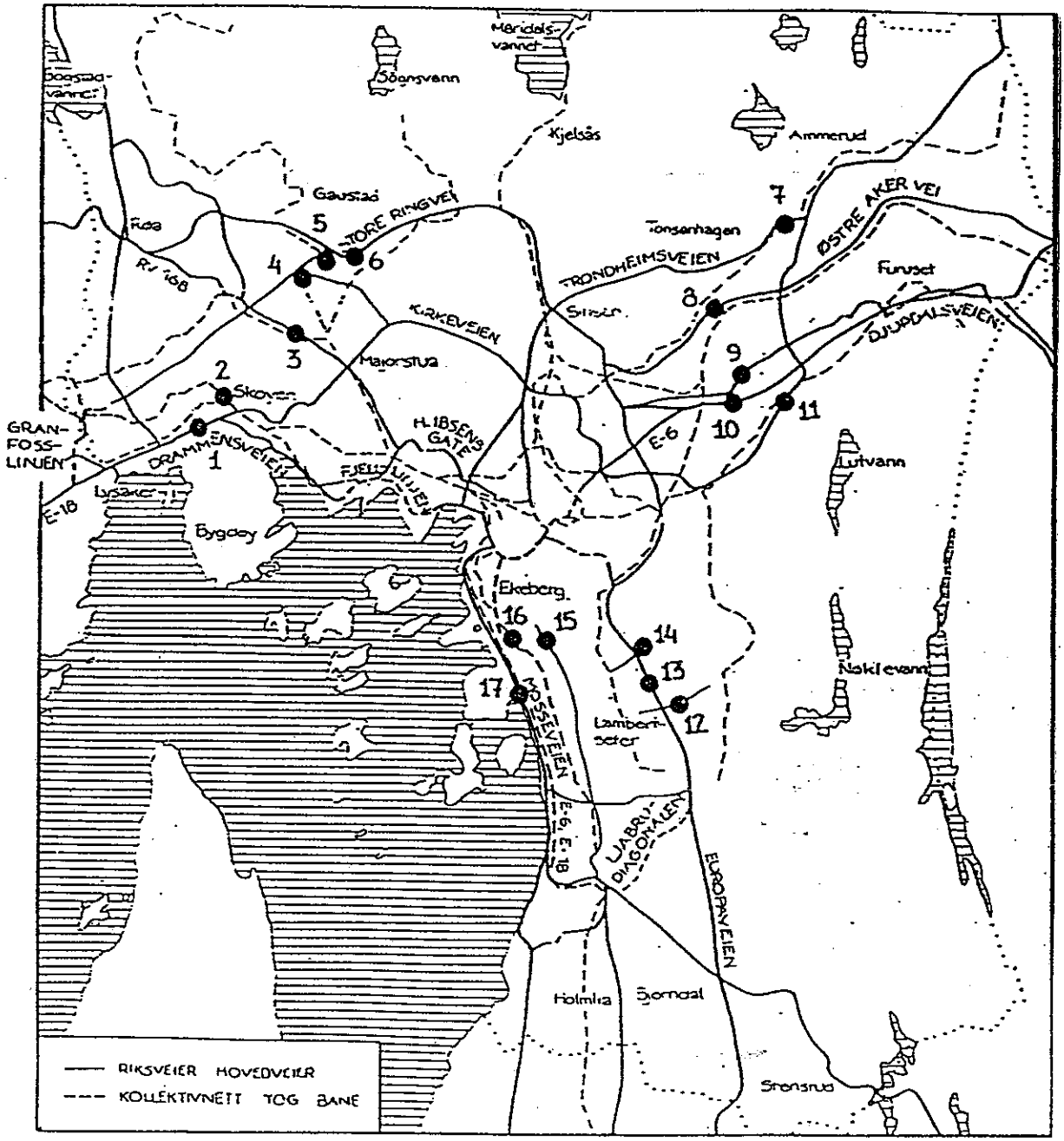
An extensive monitoring of the effects of the Oslo toll-ring system is currently underway. This work is being carried out through the Oslo Institute of Transport Economics. A total of around £600,000 has been made available to monitor the effects of the system. The majority of the work being carried out, and which will be reported by the end of the summer, is concerned with individual traveller response and overall traffic levels.

Two surveys have been carried out to identify the response of individual travellers to the toll charges. The first is a postal return questionnaire involving 20,000 sets of responses to a long list of questions including amount of travel, method of travel, trip destination and time of travel. A second survey based upon a telephone questionnaire has been carried out involving 3,500 respondents. This survey is part of a longitudinal study (previous survey data 1977, 1985) to examine mainly patterns of work trips and mode choice. In addition an interview survey has been carried out on 1,000 respondents prior to and after the system introduction to ascertain general attitudes to the system of charges. The after survey has found little change in attitudes to the toll-system; in both surveys 66% of respondents were opposed to the system. The survey results will assess the distributional effects of the changes.

Compared against the list of monitoring requirements in para Section 3.5, there has been no investigation of the effects of the system on freight operators, residential location, retail turnover, other land-use effects or environmental implications.

The early findings from the traffic count data, before and after the toll system was introduced, indicate the somewhat surprising result that traffic flows have increased at all but three of the toll sites, with no effect on vehicle occupancies.

Figure 1: Toll sites in Oslo.



6.4 Summary

The Oslo scheme is unusual in that it involves a single cordon on the outskirts of the city, with a low charge which does not vary throughout the 24 hour day (although discussions are underway to introduce variable charging). It can be expected to have little impact on congestion and, becuase it is designed to raise revenue, offers few alternatives to the motorist. As such it will provide only limited experience of relevance to London. However, discussions are underway on the possibility of introducing time-dependent charges.

Having said this, the scheme has the largest monitoring budget of any of the schemes studied. It should be possible at least to learn from this something of the distributional effects of the charge and the differences in level of response for different types of journey purpose, at different times of day.

7 SINGAPORE

7.1 History and Current Status

In 1975 the government introduced an area licensing scheme (ALS) in Singapore with the aim of changing the travel habits of the private motorist. The intention was to reduce the inefficient use of private cars in the city centre during peak hours, but without damaging the economic health of the central area. A cordon was drawn around the central business district and commercial area of the city, and car entry was restricted during peak hours to those vehicles displaying a special licence on their windscreen. Initially the restriction applied between 0730-0930, but was quickly extended to 1015 when it was seen that a large number of drivers were delaying their journey until just after the 0930 deadline. In June 1989 the scheme was extended to include the evening peak period between 1700-1900. Daily or monthly licences may be purchased from a variety of outlets. Initial cost was S$3 a day (approximately £2).

The scheme was designed to reduce congestion without reducing the vital activity of the city. Most goods vehicles were exempt from the licence, as were cars carrying 4 or more passengers (including the driver). At the same time company cars were charged twice the private car rate, and taxis 40% of the private rate. Since vehicles are not required to stop when entering the restricted zone, traffic flow is not impeded. Enforcement of the schemes comes from roadside surveillance by police, and manned booths on each of the 25 road entrances into the zone where the number plate of licence violators is recorded and a fine later sent by post.

There have been eight sets of changes made since the ALS started on 2 June 1975, relating to exempt vehicles, periods of operation, charges and extensions of the ALS area. The last package of changes was announced in May 1989 and was implemented between 1 June and 1 December 1989. The area was extended again, exemptions reduced and car fees reduced. All vehicles except publicly-owned buses, must now pay as follows (daily charge): cars S$3 (down from S$5), taxis S$3 (up from S$2), company cars S$6 (S$10). Motorcycles and other vehicles, including trucks, now pay S$1 and S$3 respectively. Monthly licences are also available. Car pools are no longer exempt because of concern over abuse. A day licence is valid for the whole of the day, so a car could enter on it in the morning and again in the evening. The reduction in charges for cars was not as a prelude to electronic road pricing (ERP) but because, when exemptions were eliminated, the government did not want to appear to be doing it to make money, which has never been an objective of ALS. Petrol prices and car parking charges were raised in May and August 1990 respectively.

The periods of operation of ALS are now Monday to Saturday 0730 to 1015 and Monday to Friday 1630 to 1830. Licences are required inbound in both morning and evening. Evening hours were originally 1630 to 1900 but a parliamentary hearing changed this to the present hours. The extension of the hours and vehicle classes is said to be a result of increasing affluence and vehicle ownership and the more concentrated nature of the evening peak.

A vehicle quota system was introduced on 1 May 1990. Potential buyers of new vehicles bid for a Certificate of Entitlement (CoE). All bids in a particular month are compared with the government's "allowance" for that month (n). The n highest bidders receive COEs and all pay a cost equal to the lowest successful bid (the "quota premium"). A CoE

is valid for 10 years from a vehicle's registration. The CoE is sold with the vehicle. When the CoE expires, the owner may buy a new one, without having to bid, at the prevailing quota premium.

Car purchase is expensive: the Customs Department determines market value and to this is added a 45% import duty. There is also a S$1000 registration fee and a further 150% registration fee of the price (plus import duty). The buyer must also pay the quota premium.

Though motorists do not like paying, they now generally accept ALS but dislike the controls on ownership through quotas and taxes. Generally, only the most senior people get any company help towards restraint costs, so they fall on the individual. The government has always maintained that it is only interested in controlling vehicle use when and where congestion occurs. Though congestion is not great at the peaks by normal standards, it does occur. However, lack of off-peak congestion appears to underly the dislike of the quotas and taxes on ownership. This has led to the Weekend Car Scheme to be introduced probably in May 1991. Cars used only at the weekend will be around S$15000 cheaper than normal cars, with 30% less road tax.

Despite the growing demand for vehicles, the government feels able to maintain restraint and road pricing because:-

(a) public transport is good, with frequent bus services, bus priorities and the mass rapid transit (MRT);
(b) it has never been linked to revenue generation;
(c) its beneficial results can be seen;
(d) transport policy for 15-20 years has presented the same mixed package and the benefits of the whole are also visible;
(e) the government's apparent willingness to respond to public concern (the introduction of the Weekend Car scheme and some changes to the ALS are cited as examples of this);
(f) the greater amount of control possible in a small city state.

An upgrading to electronic road pricing is now seen as a natural progression from ALS with the benefits of being more flexible and less labour intensive. Bids are currently being evaluated. Detector loops will register the electronic identity of a "box" on the vehicle. The motorist will buy the vehicle box, for about S$50. All vehicles which use the ALS area including motorcycles must have one. They will be billed. Publicly-owned buses will have boxes (they might help bus operations) but will not be billed. Violators will be photographed automatically and fined (if they have no "box"). Illegally changing the vehicle's electronic ID will be detected by the emergence of large bills or because two vehicles with the same ID could be detected by time and place of crossing the loops.

Initially, the scheme will have 25 loop stations, one at each entrance to the ALS area, and will operate roughly as ALS does now. Later it is likely to be modified perhaps to vary charges more progressively with time of day: for example to help reduce the "mini-peaks" now occuring just before and after ALS periods.

It is likely that it will be extended later in area: an island-wide scheme appears to be under general consideration though it is not yet policy.

A demonstration project (say, two points) should be operating by the end of 1991. A further 18 months will then be needed to complete the 25 points. The ERP will probably initially operate in parallel with the ALS, mainly to test it, without sending out bills.

The charge is as yet unknown, but may initially be similar to ALS. Elasticities have been looked at without success, so trial and error will feature. Public Works will have the results of a speed/flow study commissioned from Nanyang Institute of Technology which will at least allow them to relate desired speeds to the volumes to be allowed into the area.

7.2 Objectives

In the early 1970s Singapore was trying to attract investment. Early signs of congestion had appeared and congestion was seen as a potential deterrent to investment and growth, by ruling politicians. A working group was set up about 1973 to propose effective alternative proposals. An area licensing scheme (ALS) was one of the several and potentially the most effective. It was presented to the prime minister, who canvassed political views before requesting its implementation. About a year was allowed for prior publicity and discussion. It was thus not a scheme to reduce congestion per se, concerned at the same time not to damage the economic health of the central area, but had as its underlying goal the creation of growth. Since 1975, employment is said to have risen by about one third in the ALS area.

Policy is founded on the 1967-71 Land Use Transport Study; all other plans have been developed within this. Policy has been to make areas of development as self-contained as possible, to reduce travel. Transport policy has been composed consistently of four equally important components:

1 Moderate road building: a network of high capacity roads to link main areas and to provide a basic network within them, and to complete "missing links". Most new city roads in the current 10 year roads programme will be underground, due to lack of space;
2 Traffic management;
3 Public transport improvement: more buses, bus lanes, MRT;
4 Traffic restraint.

This has always been presented as a mixed package: there is no reliance solely on any one element. Revenues from transport (including S$33 million from ALS) go to the general exchequer and are not earmarked for transport schemes.

Control (not ownership) of the entire parking system has recently come under Public Works and is now being linked more with other policy areas.

About S$200 million will be spent in the next 3 years on the pedestrian system, including better surfaces, disabled facilities and tree planting.

7.3 Monitoring Proposals

The Singapore government, the World Bank, the United Nations Environmental Program and the United States Department of Transportation were all involved in monitoring the effects of the area licensing scheme in Singapore. The year long run-up to the introduction

of the scheme allowed a variety of measures to be taken before implementation and ensured a substantial database against which to monitor the impact of the scheme. Data recorded both before and at several points after the introduction of the scheme have included (Watson and Holland 1976):

a) Vehicle flows - types of vehicle, time of day, location and car occupancy levels.

b) Vehicle speeds - while vehicle flow data allowed an "at a glance" statement on the changes in the number of vehicles entering the restricted zone, vehicle speed measurements provided a better indication of level of congestion.

c) Household and business interviews - over 2000 households (1500 of whom were car owners) were interviewed both before and 4-6 months after the introduction of the scheme. From these data general changes in travel mode were assessed. A smaller sample of 719 households were used to examine changes in home to work trips. Business interviews appear to have comprised an unspecified number of interviews with local businessmen concerning the impact of the scheme on local trade.

In addition, a series of surveys of conditions for pedestrians and of public opinion were conducted (McGlynn and Roberts, 1977a,b; Roberts, 1977).

In addition to this monitoring work, the Public Works Department carries out 6-monthly traffic flow counts, mainly at the ALS area boundary and some journey time/speed surveys in the ALS area in order to monitor congestion. The results are for internal use and are not published. Apart from the work described below no further collection of information on the ALS is contemplated. The equity problems near the boundary and the transfer of congestion to routes outside are acknowledged and "lived with". Some land use effects were noted, but were considered to be comparatively minor.

What monitoring has taken place suggests speeds have increased in ALS hours, there is more congestion on the ring-road outside the ALS area and there has been a shift to public transport. But this was in a period of public transport improvement, too. In the late 1980's speeds were:

	morning peak	afternoon peak
In ALS area	33 km/h	24 km/h
Outside ALS area	45 km/h	45 km/h

A 6000 household Household Interview survey was carried out in 1988 to calibrate the UTPS land use transport model. A further survey (of 6000 households) will be carried out in 1991, including 1000 of the previous households. The 1991 survey will be undertaken with the assistance of Peter Jones of Oxford and an Australian individual consultant. They are interested in the vehicle ownership/vehicle use relationship in the context of the restraint policies. The 1988 survey can be used as a base against which to set the 1991 survey. Between these dates the quota system, weekend cars and evening ALS will have been introduced. The survey will be complete in May or June 1991. The proposed questionnaire is mostly standard except:

(a) it covers two days of travel and

(b) it has additional questions on restraint, including the effect of evening ALS, the impact of the quota system, the demand for weekend cars and whether the change from ALS to ERP will cause a change in habits.

No monitoring of items other those those currently monitored for the ALS is envisaged at this stage for the Electronic Road Pricing proposals, and no monitoring team exists as such. Monitoring of speeds and flows will continue, presumably linked to any changes in the fee. Flows can presumably be continously monitored, at least during "billable" times, by vehicle class, using the loops.

The Public Works Department are aware of all the issues and main objections relating to ERP which are listed in Section 3, and all have been voiced to some degree in Singapore. However to study or survey them, would, they argue, draw undue public attention to them. The ERP will be appropriately packaged by a PR company when presented to the public, as is increasingly common with Singapore transport policies.

Given the prior existence of the ALS, its general acceptance (albeit grudging) by the public and the initial similarity of ERP to it, major problems of acceptance are not anticipated.

7.4 Summary

The Singapore ALS scheme has already provided substantial information on the effects of road pricing. It appears that the electronic road pricing scheme will not be sufficiently different in its impact to provide significant new information on the overall effects of road pricing. The main interest, for London, would lie in obtaining answers to some of the more detailed issues raised in Section 3, but it is clear that the Public Works Department, while aware of these issues, consider it potentially counter-productive to investigate them pubicly. It must also be borne in mind that the nature of the Singapore society and economy would make such results difficult to transfer. On this basis, it appears that developments in Singapore will be more interesting for the experience gained with the technology than with user response and travel patterns.

8 SUMMARY AND CONCLUSIONS

8.1 Current Status of Road Pricing Proposals

In the six months since this study was commissioned, the status of two of the proposals has changed significantly. The proposals for ERP in the Randstadt have been abandoned, and replaced by a simpler toll system on interurban roads. The original area licensing proposals for Stockholm have been replaced by a less fully specified proposal for semi-automated toll points. In both cases, the changes have resulted from political differences over the best way of charging road users, rather than from any basic reluctance to charge for the use of congested road space.

The Oslo system of semi-automated tolls was already in operation at the time that the study was commissioned, but there have since been suggestions that the charging structure might be modified to one which varies by time of day. The Singapore area licensing scheme was last changed in 1989, but has since been accompanied by increased taxes on car ownership. Plans to replace ALS by an ERP system are well advanced.

While not within the original brief, the opportunity was taken briefly to review the new proposals for congestion pricing in Cambridge, which will involve an in-vehicle congestion meter, which imposes a charge only when pre-specified levels of congestion are experienced.

This rapid rate of change in both existing and proposed road user charging systems indicates the high level of interest in the subject currently, but also the considerable political sensitivity of the subject. This concern over political issues coloured all of our discussions on opportunities for monitoring.

8.2 Objectives of the Proposals

It was clear in our discussions that the objectives of some of the proposals had changed or, at least, that the objectives were now being less firmly stated, with fewer specific achievement targets. This change, too, appears to have been a response to the heightened political sensitivity of the measures. Table 8.1 summarises our best understanding of the current objectives of the exisitng schemes and proposals.

The Randstadt proposals still focus on congestion relief, environmental protection and sustainability, and on revenue generation. However, the emphasis on revenue raising appears to have increased, particularly in response to the need to obtain the support of motorists. At the same time, there has been an increased emphasis on the practicability of the system and, in response to public criticism, on public acceptability.

The Stockholm proposals are still primarily focused on environmental protection and issues of sustainability. However, here too revenue raising has become a more dominant issue, as have concerns over practicability and acceptability.

The Oslo system was introduced specifically to raise revenue for new infrastructure, and was established as a simple, practical system which could be later enhanced. It was introduced in the expectation, based on experience in Bergen, that it would be broadly accepted. Public concern at the inequities which it introduces has, however, increased the emphasis on ensuring that any modifications increase public acceptability.

The Singapore system was primarily designed to relieve congestion, improve accessibility, and hence foster economic growth. These objectives remain, although there has been some increase in concern over environmental issues. The proposed change to ERP is primarily justified in terms of practical concerns over enforcement and administration.

Table 8.1
Policy Objectives for Road Pricing in Randstadt, Stockholm, Oslo and Singapore

	Randstadt	Stockholm	Oslo	Singapore
Economic growth/revitalisation				*
Efficiency/congestion relief	*			*
Accessibility				*
Environmental protection and improved quality of travel	*	*		
Revenue generation	*	*	*	
Safety				
Equity				
Practicability	*	*	*	*
Sustainability	*	*		
Acceptability	*	*	*	

The different objectives and scheme characteristics have immediate implications for the relevance of experience with them to London. The revised Randstadt proposals, involving toll points on interurban roads, have little relevance to London, even though their objectives are close to those of policy in London. Similarly, the Oslo system, which is designed primarily to raise revenue, and uses toll points on the periphery of the city, with little opportunity for toll avoidance, is not closely comparable, even though it may produce some relevant experience on user response.

The systems which are closest in design to that proposed for London are those in Stockholm and Singapore. Of these, the Stockholm proposals have the more directly comparable objectives, and are to be implemented in a city in which the mix of modes is more similar.

8.3 Opportunities for Monitoring and Assessment

In reviewing the requirements for monitoring and assessment of road user charging proposals in London, we identified the following information needs:

(a) The scale of traveller response
(b) General public and media attitude/perception
(c) The scale of employers' response

(d) The scale of freight operators' response
(e) The scale of land-use response
(f) The systems implications
(g) The equity implications
(h) The practical considerations
(i) Implications for the environment

Further details are given in Section 3.5.

We used this list as a basis for our discussions in the case study cities. Table 8.2 summarises the information which we gleaned on issues already assessed or to be monitored in each city.

In the Randstad, virtually all the items of interest have been assessed predictively, with the exception of employers' response. Some difficulty was experienced, however, with the prediction of land use effects. It can be expected that most of these issues will be considered also in the monitoring of any system which is eventually implemented. While, as noted above, the measures proposed are likely to be very different from those envisaged for London, they should still provide useful experience generally on user response. Those responsible are enthusiastic to share their experience, and it would be well worth maintaining contact as their proposals for monitoring develop. More immediately, it would be valuable to gain access to the predictive work which they have already conducted.

In Stockholm, less detailed predictive work has been conducted, and the intentions for monitoring are less clear. However, a budget has been allocated, and those responsible are very willing to collaborate in any monitoring proposals. Moreover, as noted above, the scheme proposed is the most similar in nature, objectives and context to that for London. Stockholm therefore offers the best opportunity for collaborative development of the monitoring and assessment of road user charges. At the time of our visit, those responsible were uncertain of their precise monitoring plans, so we did not judge it appropriate to discuss funding and management of such a collaborative exercise in detail. However, we recommend that such discussions be held in the near future.

In Oslo, the assessment and monitoring has focused on user response, public attitudes and overall traffic levels. There has been little study as yet of organisational or land use responses, or of equity or environmental issues. The project has a substantial monitoring budget, most of which has been allocated. Those responsible would however welcome an input of additional finance which could be directed to issues of concern to London. However, the scheme is markedly different in nature, and it is probably only the information on user response and attitudes which will be of direct relevance.

In Singapore, virtually all of the issues of concern have been addressed in the past 15 years, as part of the worldwide interest in what was until recently the only operational road pricing system. The ERP proposals are likely to be very similar in their impact to the current ALS system, and will therefore produce little new information, except on the technological performance of the new system. Moreover, those responsible judge that it will not be necessary to conduct significant further monitoring; while they appreciate the importance of the issues raised in our report they judge it better not to explore them in detail in a city which has broadly accepted the ALS measures. There is thus little opportunity for further lessons from Singapore, except on the technology as it develops.

Table 8.2
Monitoring and Assessment of Road Pricing
Randstad, Stockholm, Oslo and Singapore

	Randstad	Stockholm	Oslo	Singapore
Scale of traveller response				
- amount of travel	*	*	*	*
- origin and destination of travel		*	*	
- time of travel	*		*	*
- mode used	*	*	*	*
- number and composition of vehicle occupants	*		*	*
- route used	*			*
- time spent at destination				
- parking location				
General public and media attitude				
- motorists affected	*	*	*	*
- other motorists	*		*	*
- non-motorists affected	*	*	*	*
Scale of employers' response				*
Freight operators response	*			
Scale of land-use response	*	*		*
System implications				*
- average journey speeds				*
- total travel times				*
- wait/delay times				*
- total vehicle km	*	*	*	*
Equity implications	*			*
Practical considerations	*	*		*
Implications for the environment	*	*		*

* = effect assessed or monitored

8.4 Other Lessons for London

Discussions with others who were directly involved in the task of implementing road user charging proved useful in highlighting lessons for the introduction of similar measures in London.

The first message was the need to keep the specification of the objectives and of the measures themselves simple and straightforward. This included concern not to overspecify

the likely benefits of road user charging, while at the same time emphasising the benefits, and the positive rather than negative attributes of the proposals.

The second was the importance of continued consultation with all of those who might be affected, both positively and negatively, by the proposals, as well as with all the political parties and central and local government bodies who might be involved in decision making. It was generally recognised that this would be a lengthy and demanding process.

The third was the need, despite the general requirement for simplicity, to specify precisely how the revenue would be used. It is clear, as others have argued (Goodwin, 1989), that being able to offer some contribution to residents, some to public transport users and some to motorists themselves helped to make potentially unattractive meaures more palatable.

The final message was the importance of retaining flexibility in the scheme once implemented, so that it could be easily implemented, and later adjusted to overcome unpredicted problems. This is an approach which, more than any other, has explained the success of the Singapore scheme.

Within this context, the role of assessment and monitoring is perhaps somewhat limited. There is a danger that further analysis is used as an excuse for not making progress on the implementation of the measure. Once a commitment has been made to proceed, predictive assessment, or experience from elsewhere, is particularly valuable in answering questions, allaying concerns and modifying the proposals. However, it should not be used as a basis for delaying progress, since it is clear that the most direct experience is gained from implementation, and that that experience is likely to differ from scheme to scheme and from city to city. Once an initial scheme has been implemented, a monitoring programme will be of greater benefit in enabling adverse side effects to be identified and eliminated. Such a programme for London, and the pre-implementation data against which it will be compared, should be based on the information requirements listed in Section 3.5.

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