

Comparing Urban Road Pricing Implementation and Management Strategies from the UK and Norway

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Abstract

Traditional policies of road expansion involved a relatively simple system of actors and processes around which expertise, knowledge, and skills had built up over many decades. Some of the more radical Travel Demand Management (TDM) measures, including urban road pricing policies, involve a complicated set of institutions, processes, people and procedures. Road pricing schemes often get held up or discarded due to controversy, disagreements, unanticipated problems, and a whole host of other delaying factors. If they ever get implemented, they tend to be diluted and consequently less effective.

The paper uses an adaptation of Strategic Niche Management (SNM) to analyse road user charging case studies in the UK and Norway. SNM has previously been used to provide guidelines on the implementation of radical transport technologies (Hoogma *et al.*, 2002). For this paper, it is modified to cover a socio-technical approach (Ieromonachou *et al.*, 2004). A systems map is created of stakeholders involved in each road user charging scheme and of the relationships between them. A detailed SNM analysis is presented of the road user charging schemes in Bergen, Oslo, Durham and London. From this, key strategic aspects are identified, together with the processes involved in their management. These include:

- The project champion
- The role of stakeholders and users networks
- The motivations and expectations of stakeholders and users
- The change in perceptions associated with acceptance

Comparison between the four cases shows the different approaches of each country regarding the implementation and ‘marketing’ of the policies. This includes the purpose for introducing the policies, the involvement of users in the planning process and, the use of revenues for providing alternative transport modes or financing road infrastructure.

The results from this research suggest that the use of SNM for policy analysis can help identify critical information, processes and actors in the planning, introduction and implementation of behavioural change transport policies, the barriers faced during implementation (social, political, institutional, financial), and the different information needs for each step in the process.

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1. INTRODUCTION

This paper explores the planning and implementation processes that relate to urban road pricing. The aim of the paper therefore is to examine the reasons that allowed the successful introduction of these radical policies in the four cities under investigation. After presenting the cases, the paper will compare the different implementation techniques used in each city, to draw lessons of wider relevance.

Economic growth has put a tremendous strain on existing transport networks in recent years, and transport issues, as part of broader environmental and financial reasons, have risen sharply on the political agenda of most countries, especially in areas where population density is the highest. Car travel is the dominant regime of mobility for many countries. Congestion is widely acknowledged as becoming the critical issue regarding surface transport especially in urban areas (DfT, 2004). The UK and other European countries are gradually learning that economic growth and traffic congestion cannot be reconciled by simply building new road infrastructure, as car traffic expands to fill up new road capacity. *“All available road construction policies only differ at the speed at which the problem gets worse”* (Bruhns, 1997). In the face of rising car ownership, pricing instruments as part of an integrated package of measures are increasingly seen as an effective strategy to reduce traffic and raise revenue (EUROPRICE 1, 1998).

The successful implementation of an urban road user charging scheme in London two years ago has been followed by a renewed interest to the subject of road pricing both by practitioners and academics. In Europe, a number of trials of urban road user charging are underway (EUROPRICE 2, 1998). But, despite gaining attention and enjoying the support of economists and transport professionals that have shown the relatively great benefits of road pricing, the policy is not broadly implemented. Ison (2004, p1) stated that:

“There are however only a few schemes in existence world wide, which [...] could be the result of it [road user charging] being unacceptable politically. In fact, political issues are as real and important for a programme’s success as the economic and technical factors.”

It appears that it is not the technical design or the economic justification that is problematic with road pricing projects but the implementation processes and the difficulty in winning acceptance and support.

Four cases of successful road pricing projects are briefly presented within the paper. The first cities to introduce road pricing measures in Norway and the United Kingdom were Bergen and Durham respectively. The other two cases refer to the capital cities of these countries, Oslo and London. This paper draws upon a method that concentrates on the social learning processes that occur in the introduction of radical demand management policies like road user charging. The method, called Strategic Policy Niche Management (SPNM), was based on an earlier method used to introduce new transport technologies (Hoogma, 2002). Through an analysis using SPNM, the paper endeavours to structure the success factors into a consistent framework for comparing the different schemes and to explore the relationships existing between critical issues.

2. ROAD PRICING

It was from the 1920’s when economists (Knight, 1924; Pigou, 1920) recognised road pricing as a simple way for taxing transportation’s external costs – congestion, accident risks, noise and emissions of pollutants (Maddison *et al.*, 1996). The concept of road pricing was ‘revived’ in the early 1960’s both by American and British transport academics (Smeed: Ministry of Transport, 1964; Vickery, 1963) that saw it as one of the few solutions left to deal with the ever-growing problems associated with road congestion.

With the exemption of the Singapore scheme, it was not until two decades later that politicians started to recognise pricing in transport as a potential funding source and travel demand management measure. Another two decades have passed in order to reach the point when urban road pricing gradually became a reality – at least in Europe. Examples include the Norwegian urban toll schemes of the mid-eighties and early nineties and the two UK road user charge schemes that came into operation in the new millennium. Road pricing has an extensive economics literature that would be impossible and unnecessary to cover in this paper. This paper's focus is upon practice rather than an idealised pricing system. There are a variety of urban road pricing methods and sometimes a confusing variety of names. The following figure outlines the terms of road pricing examples presented in this paper.

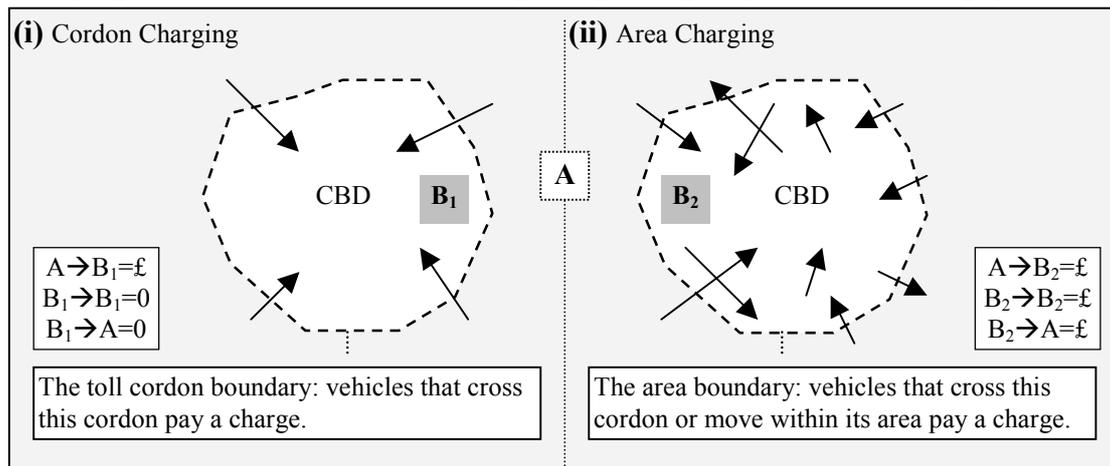


Figure 1: Cordon Charging Vs Area Charging

Cordon charging (Fig. 1(i)) involves charging drivers for entering a specific area – usually the city centre business district. Drivers are charged each time they pass through a specific point of the toll cordon. The fee can be levied using manual methods – either by manned toll booths or coin operated machines as well as electronic tags – simple read/write tags or smart card technology. Successful examples of cordon charging (urban tolls) are found mainly in Norway where the policy has developed into a niche after most major cities adopted the measure (Ieromonachou *et al.*, 2004). A similar system is proposed for Edinburgh.

Area-based charging (Fig. 1(ii)) charges vehicles for being within a specified area. The first area-based charged scheme in the world was in Singapore (1975). This scheme was based on a license system that allowed permit holders to access or travel within the charged area. The London scheme (2003) also operates as area-based charging. One exception to the Norwegian toll rings came from Trondheim. The Trondheim scheme started off as a cordon charging system. Seven years later, in 1998, it advanced to a 'proxy' area-based charging by dividing the initial area into several zones and introducing a charge for trips within zones (Ieromonachou *et al.*, 2004). There can be variations in the way an area-based scheme operates. For example, in London drivers are charged only once per day, allowing them to make several trips in and out of the cordoned area, whereas in Trondheim every pass is charged, each allowing one hour of free passes.

3. THE NORWEGIAN EXPERIENCE

The use of tolls to fund road construction has been used in Norway for over 50 years and their use has increased considerably in the last two decades. Funds from these projects form the main financial source of road, and to a certain extent, public transport investment programmes (Ødeck and Bråthen, 2002). Toll revenues are supplemented by additional governmental funds (Norwegian White Paper on Transport, 1996). On average, about 30% of the total

annual state budget for road construction comes from toll revenue – both urban and motorway tolls. The first Norwegian urban toll ring was established in Bergen in 1986 to raise finance to accelerate the implementation of a wide-ranging programme of transport investments. Since then, a number of other Norwegian cities have adopted urban toll charging including: Oslo, Trondheim, Stavanger and Kristiansand.

3.1 The Bergen Toll Ring

Bergen's charging system was unique not only because it was the first Norwegian urban toll scheme but it also involves the smallest in area, lowest number of toll booths and traditionally had the lowest gross revenue of the three biggest Norwegian urban toll schemes. It was the director of the local branch of the National Public Roads Administration (NPRA) that pioneered the initial idea for the urban toll ring in Bergen. Permission from the central government for the operation of the toll ring scheme was given in June 1985 and seven months later, the system was completed. Toll stations were placed on all the main access roads leading to the centre of the city; initially there were six, with another added later. All vehicles entering the tolled area between 6am to 10pm Monday to Friday, apart from buses, paid the fee. The fee was 5 NOK (\$0.8)⁴ for cars and 10 NOK (\$1.6) for trucks until 1999 when they were doubled. In 2004 the fee was increased to 15 NOK (\$2.4) for cars, and 30 NOK (\$4.8) for trucks, per crossing. Prepaid tickets and monthly, bi-annual and annual permits were also available, at a slightly discounted rate.

The toll fees were designed to raise 35 million NOK (\$5.5m) for 1986 traffic levels based on approximately 70,000 vehicles accessing the tolled area per day. Annual revenue proved to be far higher than expected and in 2000 it amounted to almost twice as much, around 70 million NOK (\$11m). Almost 70% of the income went towards road construction costs, 20% for operating costs and the remaining 10% was put aside in a fund, the use of which was regularly under heated political discussion. Operating costs in Bergen were higher than in other Norwegian cities because of the manned tollbooth system in operation. Enforcement was through digital video control, and offenders are fined 300 NOK (\$48). This manual system remained in place until 1st of February 2004, when a new electronic toll collection (EFC) system was introduced; EFC is carried out by using an on-board unit (OBU) which identifies each vehicle during movement into the charging area at a defined boundary. The system – called AutoPass and made by a company called Q-Free[®] – was already in place in Trondheim and Oslo since 1991.

The toll scheme was intended to cease in 2001 but Bergen developed a new programme for transportation and city development. To raise the money for the plan, the toll ring was retained. The new transport programme reflected a shift in transport planning. Of the 4 billion NOK (\$630K) budget; only 45% would be used for road infrastructure investment and the remaining 55% for city centre 'environmental' improvements. Funding public transport operations was one of the original intentions but there were legal restrictions on what tolls could fund at the time of introduction. However, new legislation that promoted the use of congestion pricing measures allowed the revenue to be used for wider purposes, such as building public transport projects (i.e. light rail) and subsidising tickets. The toll scheme was not intended to affect traffic levels, and although there was a small initial drop in traffic (\approx 6-7% overall), the infrastructure built with toll revenue facilitated traffic growth. Motorisation rates also grew rapidly. Traffic management was carried out by controlling the amount and cost of parking spaces in the city centre. Parking charges were 10-20 times as much as the toll fee. This helped lessen traffic within city boundaries over time, whilst overall traffic in the region was increasing 3-5% per year.

⁴ Exchange rate at time of writing 1 NOK \approx \$0.16 USD

3.2 The Oslo Toll Ring

In February 1990, Oslo followed Bergen's example and implemented a toll ring scheme. Again, the initial objective was mainly to provide funds to enlarge road capacity. Discussions for the introduction of the toll ring in Oslo started about 10 years before its implementation. During this time many issues concerning the planning phase were debated, in particular the balance between revenue generation and traffic reduction. Traffic reduction lost out, and this was ultimately reflected in the low toll price. Four years before implementation, Oslo City Council and Akershus County Council finally agreed and sought approval from parliament for some kind of toll, based on the principle of financing road construction projects, whilst having as little traffic consequences as possible. The toll fee started at 11 NOK (\$1.7) and currently is at 15 NOK (\$2.4) per pass, with an AutoPass season ticket being available. At the beginning it was operated manually but this lasted only a few months; since 1991 tolls have been collected electronically. Today over a quarter of a million vehicles drive through the toll cordon. Of these, more than 60% pay the tolls electronically through AutoPass tags. During rush hours, 85% of the traffic is recorded using the AutoPass system.

Currently there are 19 operating toll booths located in a ring around the city. Toll stations vary in size according to the corridor that they serve. The toll stations were geographically placed between 3 and 8 km from the city centre purely to maximise revenue. In the first year of operation of the Oslo toll ring scheme, the initial investment of 250million NOK (\$39.5m) was covered by revenue of 750million NOK (\$118.5m). Revenue reached 1,046million NOK (\$165.2m) in 2002, with operational costs only 10% of the total revenue. Both transport packages for Oslo (OsloPakke 1 & 2, 1990; 2002) dictated that toll funds must be used as investment in road construction and public transport infrastructure but not operating costs (e.g. bus subsidies, etc.). The difference with the second transport package (for 2001-2011) was that it dedicated almost all revenues to public transport investments.

4. UNITED KINGDOM

Legislation did not exist in the UK for road pricing measures until recent years. The UK Transport White paper '*A New Deal for Transport: Better for Everyone*' (DETR, 1998a) and the following daughter document – '*Breaking the Logjam*' (DETR, 1998b) supported the policy of road pricing. The 2000 Transport Act (HMG, 2000) contains powers for local authorities to introduce '*road user charging*' schemes provided they form part of an integrated transport plan. The legislation allowing for the implementation of congestion charging in Central London was made available under the Greater London Act (HMG, 1999).

4.1 The Durham Road Access Charge

As with the majority of transport projects, the background to the Durham scheme was very important. In Durham, the council had been trying to restrict traffic to the Peninsula since 1949, but it was only in 1975 that measures to manage traffic movement in the Peninsula were introduced. In 1988 a group was set up to review the situation and develop proposals for access restrictions. The group, consisting of Members and Officers of Durham County Council, agreed on a package of strict measures that included controlling access or setting pedestrian access priority to the area. This proposal was unsuccessful because it was viewed as unnecessarily radical by the major stakeholders on the Peninsula. In 1994 the council conducted a thorough public consultation followed by an experiment with less radical measures that included, parking restrictions, vehicle weight and length restrictions and commercial loading timetables. While successful, the new scheme required a greater enforcement effort than the local police and traffic wardens could handle. With the ineffectiveness of the conventional parking and traffic management scheme, 1997 saw the

creation of Durham's Transport Steering Group. This consisted of members of the City and County Council members and various representatives of the major stakeholders on the Peninsula, businesses and other establishments as well as the police and the Chamber of Trade. This group was responsible for implementing a new set of measures suggested by a 1997 transport study. Since that time, the agreed aim for the Peninsula was to significantly reduce the pedestrian and vehicular conflict by removing a substantial proportion of the existing traffic. Support for the road user charging scheme was strong both among the elected representatives and the officials of the Labour-controlled County Council.

The Durham Road Access Charge Scheme began operating in October 2002, the first to take advantage of powers granted in the Transport Act 2000. The charging zone included the Cathedral and Castle, the University of Durham, the Chorister school, the market place area, other trading and servicing establishments and a small number of private dwellings. Motorists pay a £2 (\$3.7)⁵ charge to exit the area on Monday to Saturday between 10am and 4pm (the busiest time for both car and pedestrian traffic) via the Peninsula's only access thoroughfare, Saddler Street. The exit is controlled during the charging period by an automatic rising bollard that is dropped upon payment (the machine accepts coins and cards, while annual permit holders can lower the bollard by using a transponder). The exit charge allows free flow of vehicles into the area, preventing traffic queues back to a nearby major road.

The area had particularly acute traffic problems. Of the 3000 vehicles that entered the area each day prior to the scheme being adopted, 50% used the road to as a mobile parking area thus contributing short-term to congestion by slowing down traffic. Congestion was high because of the sheer number of vehicles and pedestrians concentrated in a small street (13,000 each weekday, 17,000 on Saturdays). The situation in the area was untenable, threatening the viability of local businesses and damaging the appeal of the Durham Peninsula as a World Heritage site.

A key part of introducing the congestion charge was the provision of alternative means of access to the Peninsula, and discussions with public transport users resulted in the launch of a new minibus service that began operating some two months before the congestion charge was introduced. Part-funded by the congestion charge, the 'Cathedral Bus' was selected to provide accessibility to the mobility impaired and links the Cathedral and Market Square with the Rail, Coach Stations and a Park and Ride Car Park every 20 minutes. Overall, the cost of the project to implementation including the operating systems, buses and pedestrian improvements was £250,000 (\$470K), and was funded entirely through the Council's Local Transport Plan (LTP) settlement.

4.2 The London Congestion Charge

Central London had long established and serious traffic congestion. Over the years, a number of measures had been implemented to tackle the problem but none managed to do so effectively. The Congestion Charge scheme was introduced on February 17 2003, following an intense planning and advertising campaign led by Mayor Ken Livingstone. A fee of £5 GBP (\$9.3) is charged to motorists entering a central zone of a 5km radius between the hours of 7 a.m. and 6.30 p.m. (TfL, 2003). The £5 charge was expected to deter 10-15% of vehicles entering the zone and reduce journey times by 25% but in reality reduced cars by around 20% and congestion by 30% compared with the last few weeks before charging (TfL, 2004) and by 38% compared with the equivalent period in 2002 (Pricing Urban Transport, 2003). This also reduced the revenue from an expected £130m (\$244.8m) to around £90m (\$169.5) (Ison, 2004).

⁵ Exchange rate at time of writing £1 GBP ≈ \$1.88 USD

London was not the first city to introduce road pricing but was certainly the largest to do so. The charged area represented only 1.3% of the total Greater London area but around 200,000 vehicles drive into the charging zone every day. From these, the charge applies to about 110,000. The remaining are exempt vehicles: 100% reduction to taxis, emergency vehicles, disabled badge holders as well as other groups and 90% reduction to residents of the zone (TfL, 2004). A network of 700 video cameras in 230 positions throughout the charging zone, 174 of which are on the inner ring road, enforce the scheme (TfL, 2003). There are also a number of mobile units with cameras patrol within the zone. There are two types of analogue cameras used: *colour* – for providing an image of the vehicle in the context of its surroundings and *mono* – for reading number plates. Video streams are transmitted to a data centre where computer systems equipped with character recognition software deduce the vehicle registrations. The information is then compared against the database of vehicles with exemptions and those that paid their charge. Payment can be made to any of the 9,500 Pay Points at various petrol stations and shops throughout the UK; 200 places are within the charging zone and 1,200 within the M25 orbital Motorway. Within the charging zone there are also 100 pay-machines in car parks and 112 BT internet kiosks. Payments can also be made by phone, SMS text, or the internet (TfL, 2003).

The traffic impact outside the congestion charging zone has, contrary to expectations, been minimal. To accommodate modal transfer, 300 additional buses, offering 11,000 places were added to the already extensive bus network of London increasing bus usage by more than 7%. Making radical improvements in bus services was one of the Mayor's ten priorities for transport in London (TfL, 2004). The scheme also generated net revenues to generally improve transport in London. There are now plans for a possible extension of the charging zone westwards.

5. STRATEGIC POLICY NICHE MANAGEMENT

Strategic Policy Niche Management has been developed from Strategic Niche Management (SNM), an organisational innovation diffusion theory that explores the processes and actors needed in shaping, and the application of, new technologies (Weber et al, 1999; Hoogma *et al*, 2002). SNM analyses experiments with new technology solutions within a dominant technological regime (such as an electric vehicle demonstration project). Such projects constitute a 'protected space' for technology shaping, which is called a 'niche', with niche protection usually involving financial and organisational support. Learning occurs within the protected niche and the goal is to eventually expose the new technology to real-world conditions where it will, or will not, survive. SNM analysis structures the processes, roles and relationships between partners involved in such experiments.

Strategic Niche Management was developed in the context of transport technology projects. However, behind these specific technologies has been some form of policy initiative Hoogma *et al*. (2002, p 202). A policy adaptation of SNM called Strategic Policy Niche Management (SPNM) (Ieromonachou *et al*. 2004) has been used to analyse more radical policies that are difficult to implement or to transfer between situations as they challenge the dominant regime. Examples include Urban Congestion Charging, Workplace Parking Charging mechanisms as well as employer-level TDM like travel plans. The use of SNM-type analysis would help identify critical information, processes and actors in the planning, introduction and implementation of the policies, the barriers that planners face during implementation (social, political, institutional, financial), and the different information needs for each step in the process. Experiments with new urban transport policy instruments do occur, but they are not used to systematically learn about possible new linkages between technology, information needs and issues of social and political acceptability. For example,

Parkhurst (2000) noted the way in which lessons for Park and Ride schemes were not transferred and each repeated mistakes of earlier schemes.

6. ANALYSING THE CASES

6.1 SPNM Analysis

Strategic Policy Niche Management is a method being developed by the authors to analyse social learning and project implementation processes. The following represent a short version of the SPNM framework that lists and explores the critical factors identified in the four cases of this paper that relate to the success of the road pricing schemes.

Partner-Actor Networks: The first stage of SPNM analysis is to identify the Partner-Actor network for developing and implementing a policy initiative. In SPNM, instead of the usual terms of stakeholders and end users it appeared that a distinction had to be made between groups: (a) those actively involved in the planning, implementation and operation of a scheme, the *partners* and (b) users and other groups that were indirectly involved in the decision making process, the *actors*. A network of partners and actors was apparent in all the investigated cases, but the level of involvement of each group differed in each project. SPNM examines how these networks are formed and how they hold together.

Expectations – Motivations: The next stage in SPNM analysis is to explore the motivations and the extent to which the different expectations of partners and actors come together. Many of the parties taking part bring their own notions, values and beliefs with them which may be summarised as their motivation. When examined, motivations help explain why each group became involved in a road pricing scheme in the first place. Sometimes this is very obvious and in some cases it develops or evolves during the various scheme phases. Motivations are intrinsically linked to the expected outcome of the scheme. These expectations of partners and actors are useful to analyse for many reasons. It is interesting to find how the expectations of different partners and actors gradually become aligned and, for this to happen, a shift in expectations would have occurred. One example was the case of Durham where groups that would otherwise be seen as actors in the scheme were brought in the network as partners. They were given responsibilities and thus were able to voice their concerns and have more control over their expectations while at the same time help the project overcome some of the barriers associated with them.

Learning: From SPNM theory, niche development depends on the local level of innovation processes and stakeholders behaviour. If the innovations (in this paper concerning road pricing policies) are successful, then the niche they create will become known and may be adopted more widely – proven in the case of the Norwegian urban toll rings and, promising in the UK as more cities outline plans for road user charging schemes. Niche development can be evaluated by the level of learning and the level of institutional embedding. Hoogma *et al.* (2002, p.28) appreciate the learning that occurs through a range of processes of articulating “*relevant technology, market and other properties*” but enhance this notion by suggesting that a second-order learning is required for niche development to result in a regime shift. This form of learning will involve a co-evolutionary learning (Wynne, 1995) that will draw in the partners and actors involved in the scheme but also third parties like governments that can help in the institutional and societal embedding. Learning processes need to extend beyond the immediate local network of stakeholders. This is where the wider issue arises of what contributes to acceptance of a policy measure.

Acceptance: The social and political acceptance of road pricing plays a central role in the feasibility of implementing a road-pricing programme. Levels of acceptance were traditionally very poor. Ison (2000) found that approximately 80% viewed urban road pricing as being publicly unacceptable. A number of studies took place in order to establish the social

aspects and acceptability of transport pricing policies both in the UK and Norway (Jones, 1998; Ødeck and Bråthen, 1997; Preston *et al*, 2000; Rajé, 2003). The studies showed the viability of road pricing depends upon perceived benefits and the justification given for the development of such a programme in the selected area. Other studies (Jones 1991, Schade & Schlag 2003a) indicated the acceptability of road pricing policies to be low and many factors contributing to this low acceptance had since been identified (Jones 1998, Schade & Schlag 2003b). Langmyhr (1999) confirmed that the general public (at least in Norway) seemed to favour and accept more easily charges for financing expanded road capacity as well as environmental and safety improvements rather than charges for managing demand.

It is clearly important to take into consideration at the design phase of the scheme the views that arise within the general public, and embed them within the future operating-plan. Acceptability needs to be considered seriously by implementers and government officials. Goodwin (1989) suggested that in an urban road pricing scheme the various actors' views should be included early in the design stage. He also noted the importance of different interest groups rather than the overall state of public opinion. Empirical literature shows that the public still has little knowledge of the possibilities of pricing policies as solutions to traffic congestion over other policies. Another negative factor can also be the lack of a political champion to spearhead the project.

Project champion: Project champions are charismatic individuals that spearhead projects. A project champion can stimulate the learning and acceptance process. Support of politicians is vital to the introduction of any road-pricing scheme whether a charismatic project champion exists or not. The project champion emerges as a critical part of the process of getting the charging system into place. All projects have some type of champion figure whether this is an individual (London, Bergen) or a coalition (Oslo) or community group (Durham). In some places (like London) the champions held special places (such as a government office) and their personal motivation could have linked to motives beyond the scope of transport policy.

6.2 Key Factors from the Cases

The pioneering niche of Bergen emerged due to particular circumstances, the most important of which was resource constraint – the need to raise revenue to accelerate the building of much needed road infrastructure. This was linked to an increase in traffic congestion in the city streets. The niche was not for a demand management mechanism but has now actually started to evolve in this direction. This suggests the need for flexibility and the ability to evolve when considering niches. Evolution in the case of the Norwegian tolls included both a changing purpose and technology with the move towards an electronic toll collection system, which in itself paved the way for further road user pricing schemes. Planning for Road User Charging was inspired by the Bergen scheme, but developed in different directions (Langmyhr, 1999).

The biggest issue that the city of Bergen faced was obtaining approval for the Toll Ring system, as Norwegians already bore heavy taxes including those for road transport. Cars were expensive to purchase; there was high road taxes and insurance costs as well as high fuel taxes. This is a context not dissimilar to the UK. People argued that road building was a government responsibility, thus, the government should provide the funds for it. The public was overwhelmingly against the toll scheme at the start of the project. Again this similarity in opinion was also voiced by residents in London when faced with the congestion charge. Opinions started changing when the first results were apparent - new relief roads, motorways and tunnels. The toll price, having been kept at low levels until the toll project was renewed, also helped. At the time that the toll ring was introduced in Bergen, the most important factor was to win over the local politicians and not the public. This is still reflected at the fact that

public opposition towards the scheme is still quite high after so many years and so many completed road projects. This is different to the London case where public opinion has shifted in favour towards the charge system and the system looks set to expand (Potter, 2004).

The Durham congestion-charging scheme appears remarkably successful since it achieved its major objective of reducing traffic levels in the Peninsula area while satisfying the concerns of all major stakeholders. Although it is a modest project, how this has been achieved, contains lessons that could apply elsewhere. Perhaps most importantly were the presence of strong political leadership from both the elected representatives and the officials of the County Council who campaigned many years for the scheme. Secondly, the traffic problem in the area was well recognised by most people in the city, who were thus easy to convince that serious action was needed. This was helped by the nature of the site (with the World Heritage site of the Cathedral and Castle) which provided an added incentive for action to restrict traffic. Thirdly, the access charge was proposed as an alternative to a total ban on vehicular access, and can thus be seen as a relatively benign measure in comparison. Milder measures had been attempted and had clearly not worked⁶. The access charge ended up being just the latest in a whole series of measures aimed at gradually restricting traffic access to the Peninsula. The small size and scope of the scheme (with the charge only applying to a single road) made the scheme technically simple to introduce with relatively few people directly affected. Fourthly, the charging policy was preceded by improvements to public transport access to the area that have been clearly linked to the implementation of the scheme. Finally, the active involvement, and empowerment of a number of project partners, once again over a number of years, combined with a widespread consultation process and publicity campaign ultimately helped the County Council achieve consensus and support for charging.

In the case of London there were several elements necessary for success already in place, not least a very committed political champion, an almost unanimous acceptance of the transport problem, and a list of well-known and suitable objectives. In addition, there was also a relatively broad coalition of support for the scheme itself from some of the key players – in particular from business. However, there remained strong opposition to Congestion Charging in London from some groups, and the local media adopted a very negative stance (LTT, 2004; 2005) – as it does to almost any transport issue (Ryley, 2004).

Providing alternative public transport in London with buses proved a more successful solution than expected. The boost in bus use helped the scheme's acceptance levels and kept costs down. Buses were a cheaper solution than for example new rail projects, as Oslo preferred to introduce. A similar issue arose with the charging system. The camera system was criticised as costly and not 100% accurate as well as being visually obtrusive. But it constituted tested technology that could easily and quickly be put in place in time for the proposed start date. In the end it proved remarkably versatile and relatively trouble free. At the early implementation stages, the technology was not critical. An incremental evolution in the technology path could easily follow a successful scheme, a similar situation like the one observed in Norway, with the substitution of manual toll booths with the electronic AutoPass system.

7. CONCLUSION

The use of the SPNM framework has helped to identify a number of key issues involved in the development of a radical transport policy measure like urban road user charging. It was possible to compare the case studies by looking at these factors. Overall there are general similarities between the UK and Norwegian schemes despite the very different root motivations (congestion reduction versus raising revenue). These include the importance of a

⁶ For more information refer to Ieromonachou *et al.* (2003).

champion figure or champion body, the role of ongoing education for both users and other actors, and the value of the root motivation(s) being met, or at least to be perceived as being met.

The partner networks in Norway and the UK reflect the different starting points and objectives of the RUC schemes. The initial purpose of the Norwegian schemes was to finance additional roads and road users were familiar with tolling schemes. This helps to explain why the Norwegian networks concentrated on political and technical authorities. The UK schemes started with no user familiarity with road user charges and also sought to cut traffic flows. This combination required a wider partner/actor network and project planning system. Durham identified and empowered a wide range of community stakeholders and London had all vital partners grouped under the aegis of one 'lead player' TfL (Transport for London).

One important lesson is that all these successful schemes have used an incremental approach with flexibility to experiment and adapt. Each of the four cities presented in the paper used incremental processes but in different ways. As noted in the above case study, Durham had a long history of attempted solutions (that generally failed) until it reached the successful access charge system. London had also tried various traffic management options but as these were insufficient, the congestion charge emerged as the only solution. The congestion charging scheme itself is incremental, in that it uses a basic technology that can be upgraded once the scheme is established. Bergen opted initially for a simple manual toll collection system and retained it until the end of 2003. The move to an electronic system might symbolise another change - of that to a scheme with new objectives. Oslo had an incremental change in its project aims from funding road building to predominantly funding public transport. Radical policies with eventually large scale changes can be planned and introduced incrementally. This is consistent with SNM theory that identifies the need for experimentation and adaptation. As the process unfolds, many of the barriers would be (or in effect seen) as less dramatic. Radical policies require a relatively un-complicated start and a pre-defined 'test' phase that would allow for problems like political and public acceptability to gradually normalise.

Incremental approaches permit learning and enhance understanding and acceptance. The UK and Norwegian schemes started from different user experiences. In Norway, urban road tolling, even though still opposed, was an extension of previous accepted practices. Since they had experience of road pricing, there was a potential for motorists to accept an urban road pricing scheme without significantly increased resentment. Public opinion concerning the tolls in Norway has improved during the years but not dramatically. This suggests that more emphasis should have been placed on educating and informing road users of the benefits that the schemes would bring in the long term. Initially, outputs focused on road building (something that in theory should have pleased drivers), and not on alternative modes of travel. The gradual acceptance of the need to support public transport modes verified the evolution (or shift) of perceived benefits. In the UK there was little experience of road charges, which meant that the London and Durham schemes involved something entirely new. In all cases, acceptance of road pricing required a widespread acceptance that it was needed to address an accepted problem. In London and Durham it was congestion; in Norway, this was initially road financing, and later financing public transport and other environmental improvements. It is essential that the charging scheme is seen as a solution to an accepted problem.

Protection measures to support the road pricing policies were needed most where demand management was involved. These were therefore an inherent part of the London and Durham schemes. A major part of protection in London was enhancing public transport services and the London experience shows how much can be accomplished in a relatively short amount of time and with relatively low capital (i.e. extra 300 buses). Protection

measures only emerged in Norway as the policy focus shifted from road building to funding alternative modes. Some protection measures for particular key groups (like retail) could also be crucial in winning widespread support, rather than reluctant acceptance, yet early indications show very little retail displacement beyond London. Ødeck and Bråthen (2002) noted that other key acceptability points should include higher levels of information and marketing to the public, a strong link between the revenue use and transport upgrade (while making sure that the public perceives things happening as soon as charges are collected), and ensuring that the information is transformed into stronger public confidence.

SPNM is an evolving methodology and this study indicates that it can be useful in analysing key factors in the introduction of demand management transport policies. It also shows that the lessons from Norway and UK require a detailed understanding of the cultural context in which the road pricing schemes took place.

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