Evaluation of the implementation process of urban road pricing schemes in the United Kingdom and Italy

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Abstract

This paper is based upon detailed research that has taken place in the UK and Italy, on the implementation strategies for urban road pricing schemes. In the UK, both in London and Durham, the Road User Charging schemes required new legislation, and were implemented rapidly. The time from announcement to implementation took three years and the schemes were introduced after short periods of intensive planning, consultations and stakeholder networking. In Italy, the situation has been very different. The road pricing schemes in Rome and Genoa were not introduced under specific legislation but rather evolved from access control zones originally implemented in historic urban centres. The incremental introduction of the Italian road pricing experiments has taken approximately ten years.

The paper undertakes a comparison of these different strategies to introduce urban road pricing and the lessons they contain for the development of similar measures elsewhere. The comparison of the different implementing experiences is undertaken using Strategic Policy Niche Management, a method designed to explore, among other factors, the dynamics of the stakeholder networks involved in planning, introducing, marketing and managing radical urban Travel Demand Management policies.

Keywords: Zone Access Control, Limited Traffic Zones, Road Pricing, Road User Charging, Strategic Policy Niche Management, Regime Shift.

1. CONGESTION AND ROAD PRICING

The car has evolved from an expensive luxury for a few to become an important tool for the everyday lives and employment for the majority of people, a status symbol and a leisure pursuit. Increased use of private vehicles has not only brought benefits. For many years congestion was little more than a localised problem. Today it has become endemic, not just for major cities but even in many rural regions. Associated with traffic congestion, are the related problems of air pollution, emissions of CO_2, together with more subtle lifestyle effects, such as contributing to less healthy lifestyles and transport poverty.

As early as the 1920's economists (Knight, 1924; Pigou, 1920) recognised road pricing as a simple way for taxing the external costs of transportation – congestion, accident risks, noise and emissions of pollutants (Maddison *et al*., 1996; Rietveld, 2001). Ramjerdi (1996) argued that road pricing requires road users to pay for their marginal social costs. Santos and Newbery (2001) suggested that "*the traditional approach to the economies of congestion rests on the standard welfare economic argument that the market failure of congestion requires a corrective charge to internalise the externality*".

Paulley (2002) identified that fiscal restraints, whether by road pricing or tax on environmental pollution, offer a method of clearly identifying to users the external costs of their actions. A wide literature has developed advocating that road access be subject to some form of marginal cost pricing (Button, 2004; Ison, 2004; Ramjerdi, 1996; Smeed, 1964; Vickery, 1963). The urban road user charging examples presented in this paper have been more pragmatic in practice, by seeking to achieve urban and transport goals rather than an idealised pricing system.

Although road user charges for motorways, bridges and tunnels are common in some countries, urban road pricing schemes are rare and have been the subject of much controversy. Despite the use of a variety of names, most urban road pricing examples operate as either cordon or area charge schemes.

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Cordon charging involves charging drivers for entering a specific area – usually the historical city centre or central business district. The charge can be levied using manual methods – either by manned toll booths or coin operated machines, and automatic methods – simple read/write tags or smart card technology. Successful examples of cordon charging (urban toll rings) are found mainly in Norway where seven cities adopted the measure to date (Ieromonachou *et al.*, 2004, Wærsted, 2005). Some Italian cities have adopted the cordon system that evolved from previously introduced access control schemes. Rome is also experimenting with smart card technology that would allow enforcement throughout the charged area not only for access but also for parking. Area-based schemes charge vehicles for being within a specified area. The first area-based charged scheme in the world began in Singapore in 1975. This scheme was based on a license system that allowed permit holders to access or travel within the charged area. The London 'congestion charging' scheme begun in 2003 operates as an area-based charging scheme.

This paper forms part of a wider project comparing the organisation and implementation of urban road pricing schemes. As examples, two UK and two Italian cities are presented and then analysed. The analysis is conducted with Strategic Policy Niche Management, an evolving method, developed to break-down and evaluate the factors utilised when introducing complex and radical transport policies.

2. 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 (e.g. 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 there has been some form of policy initiative (Hoogma *et al.,* 2002, p 202). 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 new project repeated mistakes of earlier schemes. A policy adaptation of SNM called Strategic Policy Niche Management (SPNM) has been used to analyse more radical policies that are difficult to implement or to transfer between situations as they challenge the dominant regime (Ieromonachou *et al.* 2004; 2005). Examples of these policies include urban road pricing, workplace parking charging mechanisms as well as employer-level Travel Demand Management (TDM), like travel plans.

SPNM helps in identifying 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. Use of SPNM can help transport planners understand how various 'regimes' change from one set of local conditions to another. It can also find ways of expressing strong similarities for niches which seem to have striking differences, yet may be very similar in their core motivation (e.g. road pricing and travel plans).

3. UNITED KINGDOM

The following two cases provide information on two existing road user charging schemes in the UK, namely London and Durham. The concept of road pricing was 'revived' in the early 1960s both by British and American transport academics (Smeed, 1964; Vickery, 1963) that saw it as one of the few solutions left to deal with the ever-growing problems associated with road congestion. Road user charging (RUC) had been proposed in the UK several times since the Smeed report, but there were no serious attempts to practically introduce the policy, with exception a trial in the city of Cambridge in the early 1990s. For a number of reasons, most notably the lack of political support, the Cambridge scheme failed to progress beyond the field trial (Ison, 2004). Legislation for road pricing measures in the UK has been encouraged in recent years through 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). 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 earlier under the Greater London Act (HMG, 1999).

3.1 London's 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 (€7.3)[1] was initially[2] 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 (€190m) to around £90m (€131m) (Ison, 2004).

London was not the first city to introduce road pricing in the UK but was certainly the largest to do so. The charged area represents 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 that patrol within the zone (*see Figure 1*). 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 UK-wide 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).

Figure 1: A mobile camera unit (SP)

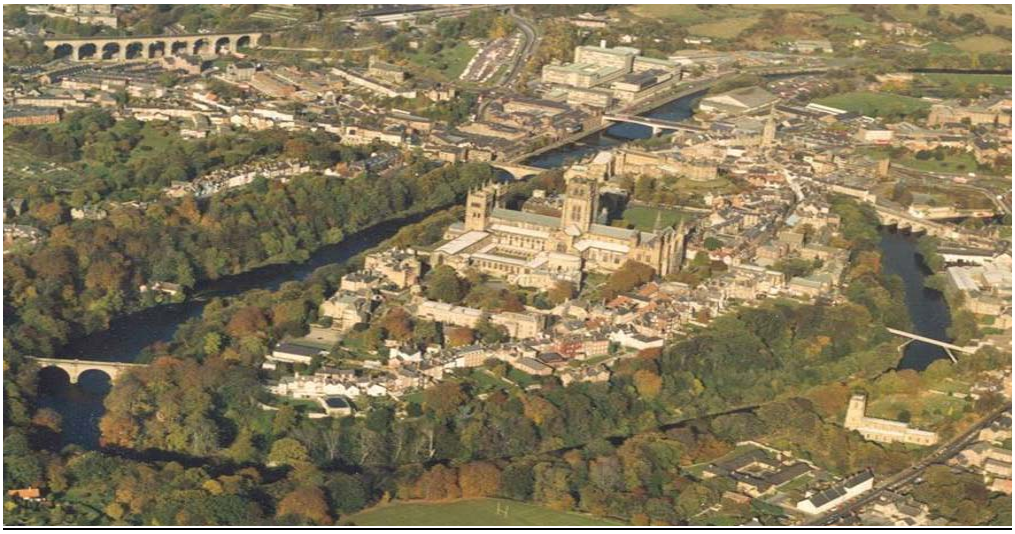
The traffic impact outside the congestion charging zone has, contrary to expectations, been minimal. To accommodate modal transfer, 300 additional buses, offering 11,000 places were added to the already extensive bus network of London increasing bus usage by more than 7%. Making radical improvements 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. Plans for a possible extension of

the charging zone westwards have been approved by the Mayor of London and are expected to become operational on 19 February 2007 (TfL, 2005).

3.2 Durham's Road Access Charge

As with the majority of transport projects, the background to the Durham scheme was very important to the outcome of the implementation process. Durham is in the North East of England and here the council had being trying to restrict city centre traffic to the 'Peninsula' area since 1949. This area has been designated as a UNESCO World Heritage Site[3] because of its religious and architectural significance (*see Figure 2*) and protecting it from traffic pollution was important. 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 the major stakeholders on the Peninsula – namely the Dean and Chapter of the Cathedral and Castle and the University – viewed it as unnecessarily radical.

Figure 2: A panoramic view of the Durham Peninsula, bounded by the river Wear. (DCC, 2002b)



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 access charging scheme was strong both among the elected representatives and the officials of the Labour-controlled County Council. It was estimated before the implementation that there would be a 50% reduction in vehicle access to the area. For the remaining traffic, a very generous 70% would have permits and 30% would be liable to pay. The first evaluation of the scheme (DCC, 2003) showed the reduction of vehicles to be around 85% so the permit allocation, despite the fact that it seemed generous, has not affected the scheme's traffic reduction impact.

The Durham Road Access Charge Scheme began operating in October 2002, the first to take advantage of road user charging powers granted in the Transport Act 2000 (HMG, 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 (€2.95) charge to exit the area on Monday to Saturday between 10am and 4pm (the busiest time for

both car and pedestrian traffic) via Saddler Street, the Peninsula's only access thoroughfare (DCC, 2003). The exit (*see Figure 3*) 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.

Figure 3: The exit charge point from the Durham Peninsula. (PI)

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 – around 13,000 each weekday and 17,000 on Saturdays (DCC, 2000). 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 (DCC, 2002a). 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 (€365,000), and was funded entirely through the Council's Local Transport Plan (LTP) settlement.

4. ITALY

Contrary to the UK, Italy has a long tradition of toll roads (motorways, tunnels and bridges) even though this did not extent to the urban road network. Among growing efforts to reduce the serious pollution caused by congested traffic, some Italian municipalities explored access control in *Limited Traffic Zones* (*LTZ*)[4]. These controlled zones usually cover the historic city centres. Only residents of the area and a limited number of permit holders are allowed to access the zones. The city of Bologna pioneered the policy in the mid/late 1980's, and despite initial difficulties, this prompted a widespread adoption of the measure. In other towns and cities the policy is gradually evolving to a hybrid form of road pricing by requesting LTZ permit holders to pay an annual fee. To achieve this, a directive (known as "D.L. 285/92" in Italy) was introduced that allows Municipalities to charge motor vehicles a fee when entering or circulating inside the LTZ. A presidential decree 250/99 approved the installation and operation of automatic access control systems in historic centres and LTZs. The following cases of Rome and Genoa record the experiments carried out in these two cities in order to establish the political and public acceptability required to implement a full-scale scheme and the technological advances from the early manual access control to the modern electronic on-board transponders.

4.1 Rome

High car growth rates and unbearable levels of atmospheric pollution that endangered not only residents but also the cultural heritage of historic buildings in the city centre, has forced Rome to revise its transport strategy. For years, development was centred on accommodating the private car but in the mid 1980s, the municipality decided on a series of measures to reduce the negative externalities of car use (Comune di Roma, 2000). The measures focused on increasing the sustainable modes of transport and on raising awareness of the negative impacts of the car among citizens. Among the most important measures were:

- Access restrictions and integrated pricing strategies,
- Collective passenger transport, new forms of vehicle use,
- New concepts for the distribution of goods,
- Innovative soft measures, and
- Integration of transport management systems and clean technology public and private fleets.

The most radical and difficult to implement were the first two, which concerned the implementation of an *Access Control* system followed by experiments for a *Road Pricing* scheme. To address acceptability issues and provide a fall back, the municipality proceeded to implement the schemes in incremental steps. The historic centre of Rome was classified as a Limited Traffic Zone (LTZ) in 1989. A manual system was implemented at that time that would only allow residents and permit holders to enter. The measures were not enforced very strictly for a number of years, and occurred with many violations but no action taken against offenders (Forestieri and Tomassini, 1999). In some way, both users and the police knew that the restrictions were not followed in a systematic way. This dramatically changed in 1994 when concrete blocks were used to prevent entry into the LTZ, physically and visually reinforcing the policy of access control. Permission for entry was given to residents and few other exceptions such as emergency services.

Evolution from access control to road pricing was seen as a natural progression (€UROPRICE, 2001). The introduction of automated enforcement in 1998, paved the way for a road pricing scheme. After some years of planning and consultations, an experiment began in 2001 in the LTZ (Muso and Corazza, 2003). The period 1998 to 2001 also served to develop and install the electronic system of on-board charging units and gantries. The system in Rome, based on existing motorway tolling technology (Pasquali, 2001), became operational in August 2001 but enforcement started later, in October 2001. The system initially targeted specific categories (e.g. commercial vehicles) and gradually was applied to all road users. From Monday through Friday (6.30 am to 6 pm) and Saturday (2 pm to 6 pm) only permit holders are allowed to enter the restricted zone in Rome. There are a total of 135,000 permit holders that include residents, disabled people, taxi drivers and city services, which can access the zone free of charge. Access to the Limited Traffic Zone for the 20,000 authorised individuals allowed to pay the annual fee to enter the zone (€UROPRICE, 2000), is based on an annual permit which is the equivalent cost of a 12-month public transport card namely €340 (£233). Electronic access detection equipment that recorded illegal access of vehicles were placed in 23 'gates' leading to the restricted zone. The electronic system 'reads' the vehicles number plates and reports offenders who are then fined. The total number of plates permitted to access the LTZ represents about 8.5% of the total vehicles in the city (€UROPRICE, 2002b). Research is underway by STA into reading the small-sized number plates of motorcycles; this could lead to including them in future access restrictions.

Between 2003 and 2004, two other smaller restricted access experiments took place in areas adjacent to the central LTZ in Rome. The difference was that they operated at night (*see Figure 4*). The first 'nocturnal' LTZ concerned San Lorenzo, an area nearby the University of Rome associated with student clubs and other youth oriented entertainment – activities that resulted in atmospheric and noise pollution from misuse and overcrowding of vehicles. The *San Lorenzo* experiment took place between 4 June and 31 October of 2003, excluding August[5], for five nights a week from Wednesday until Sunday, from 8 pm until 3 am (Comune di Roma, 2003). The other experiment concerned the 'gastronomic' area of Rome, *Trastevere*, a favourite area for dining, where from 7 May until 9 October 2004, for two nights of the week – Friday and Saturday, entrance to cars was forbidden from 9 pm until 3 am (Comune di Roma, 2004).

Figure 4: An overhead VMS (Variable Message Sign) warning of the 'nocturnal' access control scheme in *Trastevere* in May 2004. (PI).

The main objectives of both experiments were to provide a more enjoyable and safer environment for pedestrians accessing the two areas and test if the traffic limiting measures had a positive effect on business. Access to the areas was complemented with extra night bus and tram services – two for Trastevere and one for San Lorenzo – that provided access to and from nearby parking areas. In addition to the road pricing scheme, Rome introduced 'spatial' parking charges based on the principle that parking gets more expensive the closer it is to the city centre. The idea is to encourage parking at the periphery in order to reduce inner city congestion.

4.2 Genoa

The city of Genoa is situated in a narrow strip of land between the Apennine Mountains in the north and the Ligurian Sea. The city extends along 30km of coast and two valleys spreading northwards. Genoa's distinctive geographical characteristics resulted in the way in which the urban structure of the city developed. Average population density is 2,600/km^2 but rises to 10,150/km^2 within the city centre (Comune di Genova, 2003). Combined with a perception of inadequate road infrastructure, these factors can be greatly held responsible for the existing environmental problems caused from traffic congestion. One of the worst affected areas in Genoa is the centre of the city, which includes the main retail and historic areas. The municipality of Genoa responded to the growing traffic related environmental problems with proposals for various measures that included the introduction of road pricing measures in the centre (€UROPRICE, 2000).

A new Urban Traffic Plan (Comune di Genova, 2000) formed part of a civic regeneration that included plans to limit traffic related pollution and annoyance in the historic city centre and to revitalise the commercial centre of the city. Various measures proposed by the municipality of Genoa in their plan included:

- Optimising parking zones according to the surrounding land use,
- Constructing an elevated relief road ("*supraelevata"*) that bypasses the centre to improve the main Traffic flow from the harbour,
- Favouring public transport,
- Improving the connections between different travel modes,
- Regulating and reducing traffic in the centre through the creation of a series of one-way roads, and
- Introducing an area-based pricing scheme.

The municipality of Genoa intended to implement a full scale RUC scheme in the historic and retail areas in the centre mainly to reduce transit traffic. But difficulties relating to the general management of the project, the political and public acceptability as well as resistance from some stakeholders made it necessary to perform a demonstration beforehand (€UROPRICE, 2002a). An experimental road pricing scheme was tested in 2003 in part of the existing LTZ (Limited Traffic Zone) that covers the historic

centre of Genoa. The full cordon was planned to be 2.5 km^2 whereas the trial zone was about 1 km^2. This 'trial' scheme was designed to evaluate the effectiveness of a road pricing scheme in the area including traffic volume reduction, the use of alternative modes in accessing the area and the general environmental benefits. Another important aim was to test the technological equipment. Genoa, like Rome, favours a system of gates based on plate recognition and central software data processing.
The six month road pricing trial in Genoa took place in 2 three-month phases (Mastretta, 2003). The first phase between March and May 2003 was conducted with a €2 charge and the second (June – August 2003) with a €1 (£0.7) charge. Genoa installed optical character recognition (OCR) equipment at seven entry gates. The gates were also equipped with video cameras (see *Figure 5*) that linked each gate with the traffic control centre. Two hundred volunteers were selected as a representative sample of car drivers that frequently accessed the centre. The volunteers were assigned a 'virtual budget' to use during the trial. From the initial sample of volunteers, 159 completed the demonstration. From the statistical analysis of the trial results and a modelling study, a 38% reduction of entrances to the zone was found to correspond to a €1.5 (£1.03) charge (Contursi, 2004). A lower charge resulted in more crossings and vice versa.

Figure 5: One of the entry gates in Genoa with similar type cameras and OCR equipment enlarged on the right. (PI)

The future for Genoa's Access Control scheme evolution to road pricing depends on a number of objectives and work packages associated with achieving the overall aims. The following, constitute a brief summary of the objectives set by the Municipality of Genoa (Comune di Genova, 2004) in their projected activities towards a system of tariff-based access control. The report also includes a detailed list of complex and interrelated work packages (approximately 23) covering all aspects of the system. It was evident that this project was more than just an 'experiment' and that there was a strong focus in defining the entire focus of the system through analysis. The depth of consideration shows that the municipality is earnest about advancing the policy to a full-scale implementation.
Overall, the project attempts to make the system easy to understand for all parties involved. It also addressed all the social, economical, environmental, technological and organisational issues for the stakeholders in the network. These issues are broken down into the major work themes which are to: encompass the public and political acceptability, allow for a good level of mobility, aim to reduce private traffic, address parking, account for the cost and structure of public transport, support integrated transport modes, explore innovative and alternative forms of transport, conduct a study of potential infrastructure work (such as the gantries shown in *Figure 5*), analyse different charging scenarios and investigate user payment options.

5. CASE COMPARISONS AND SPNM ANALYSIS

The four case studies discussed in this paper include the two capital cities from each country as well as two smaller cities. All the examples have been introduced in a roughly similar timeline and demonstrate the shift in European policy in the last few years towards stronger traffic demand management than has been evident in the past. *Table 1* summarises the key aspects of the road pricing schemes in the four cities.

The comparison of the design of the schemes, although useful, says little about the processes involved in how the designs evolved and became implemented. The main challenge faced by demand management policies, and road pricing schemes in particular, is not in their design, but their effective implementation and support. It is these aspects that are the focus of the SPNM framework. This maps the factors such as the network of stakeholders involved, their motivations and expectations of a scheme, how they provided support and 'protection' for the scheme and how learning occurs.

Table 1: Summary of main characteristics of the cities in this study.

Characteristic	London	Durham	Rome	Genoa
City population	7 500 000	85 000	2 800 000	622 000
Percentage living inside charging area (%)	2	< 0.1	1.5	-
Charging Area (km^2)	21	0.35	5.5	1 (test area)
Number of charge points	174	1	22	6
Average daily crossings during toll hours	205 000	239	70 000	47 000
Daily entry charge for a small vehicle	£5 GBP (€7.3)	£2 GBP (€2.95)	€340 (Annual) (£233)	€1.5 (£1.03)
Annual gross revenue (millions)	£90 GBP (€131)	£0.05 GBP (€0.07)	€8.5 (£5.8 GBP)	€1.72 (£1.18)
Charging period	Mon - Fri 7am – 6.30 pm	Mon – Sat 10 am – 4 pm	Mon – Fri 6.30 am – 6 pm Sat 2 pm – 6 pm	Mon – Fri 6.30 am – 6 pm
Starting/Trial date	Feb 2003	Oct 2002	Oct 2001	March-August 2003

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. SPNM is used for analysing the cases and at the same time uses the results to further develop its analytical capability, as SPNM is still a method under development.

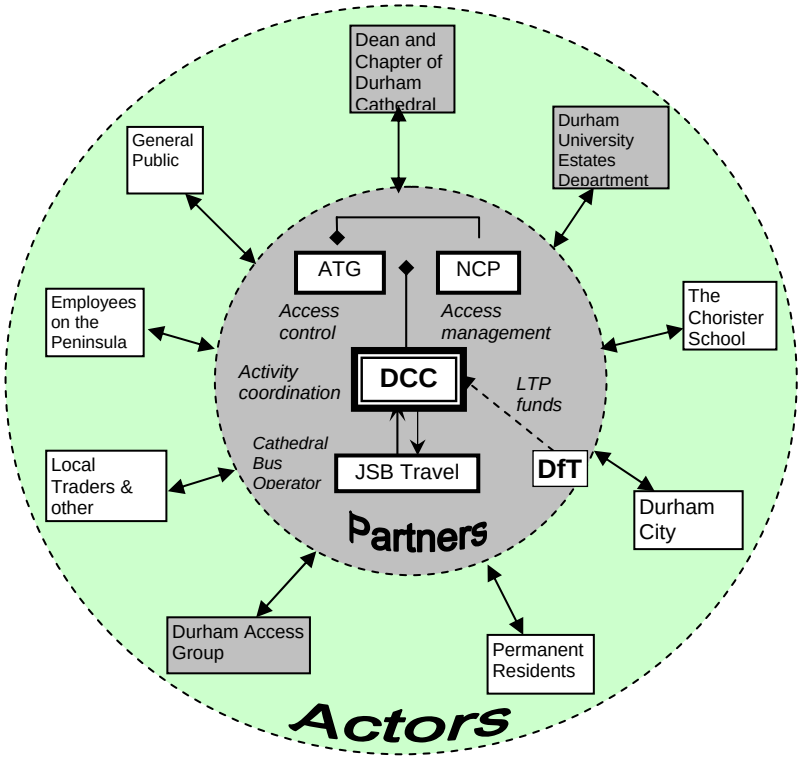
Partner-Actor Networks

The first stage of SPNM analysis is to identify the Partner-Actor network for developing and implementing a policy initiative. In SPNM, a distinction is made between two 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*. Thus partners are those who together implement the road pricing scheme, whereas the actors are those affected by it and whose support is needed to win acceptance. 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.

All cities required a wide partner network to implement their respective schemes and this involved a complex project planning system. The Italian schemes had an initial network in place. The networks were partly established since the introduction of the Access Control schemes. For the UK cases, the networks had to be largely created anew. Durham did try initially to introduce Access Control using a very restricted network but that failed (DCC, 2000). Later, Durham identified and empowered a wide range of community stakeholders by developing relationships with actors and drawing them in to

become partners (see *Figure 6,* Adapted from Ieromonachou *et al.*, 2004.). London had all vital partners grouped under the aegis of one 'lead player', Transport for London (TfL) which was headed by the champion of the scheme, the Mayor of London.

Figure 6: Combined diagram of Network of Partners and Actors in the Durham Road Access Charge scheme (Ieromonachou, 2005).



Project champion

Where projects involve complex systems of partners and actors, the management process usually needs a mechanism to provide focus and drive. This is particularly so for innovative projects involving the creation of new networks. This role is one that can be filled by *project champions* - 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 examined had some type of champion figure but this varied, with the role being an individual (London) or a coalition (Rome, Genoa) 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.

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. These may be summarised as their motivations. When examined, motivations help explain why each group originally became involved in a road pricing scheme and the amount of commitment they have towards it. Sometimes motivations are very obvious and in some cases they develop or evolve as the scheme progresses. 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 critical to find out how the expectations of different partners and actors gradually become aligned and, for this to happen, a shift in expectations would have occurred. A potential danger

sign is where a scheme involves partner and actors who have very different expectations and conflicting motivations.
It is notable that behind the transport reasons for the road pricing schemes, there were deeper motivations. For example, protection of historical buildings was of great importance in Rome, and Genoa as well as Durham. Historical heritage is a sensitive issue for many cities in Italy, more so in Rome where the LTZ covers most of the ancient city and therefore protection of the built environment from pollution becomes necessary. In London, although the transport policies of which road pricing was part, did produce some benefits to historical areas (e.g. in Trafalgar Square), the main motivation was the economic cost of congestion and the direct transport benefits. Tapping into the core motivation of key actor groups is therefore important. In Durham, 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 input into the scheme by working through their motivations and exploring expectations.

Protection measures

These are complementary actions benefiting users to support road pricing policies. These can take two forms: (a) *Enhancement Protection,* which are actions that complement the effect of road pricing (like the provision of extra public transport capacity to facilitate modal shift from car, subsidies to reduce public transport ticket prices, reallocating road space for pedestrians and bicycles etc.); (b) *Compensation Protection*, where there are full or part exemptions from charges for certain groups of users, for social or transport policy reasons. Typically the latter include buses, taxis, disabled drivers and local residents.
Both types of protection measures are particularly needed for innovative or unfamiliar policy measures and link into the level of acceptance achieved (considered below). Enhancement Protection measures featured strongly in 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. an extra 300 buses). Durham also introduced the 'Cathedral Bus' service to provide alternative access to the charging area. Subsidy and service improvement was more important in the UK because there was little alternative available or the capacity was not adequate and fares were high. One contrast with the Italian road pricing schemes is a lesser emphasis on Enhancement Protection measures. This seems to be because they did not have to further enhance their public transport system as it was already highly developed and under heavy subsidy. They did, however, introduce electric scooter hire. For Compensation Protection, actions were more similar. In both Italy and the UK there were exemptions for buses, taxis, residents, accessibility groups and services.

Network 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. 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. 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 not deemed effective, 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. Radical policies with eventually large scale changes can be planned and

introduced incrementally. Genoa has experimented with road pricing to facilitate learning. It was felt that this pre-implementation stage was needed as there was insufficient political support to go for immediate implementation. A key point that SPNM analysis seeks to identify is that experimentation, adaptation and even failure are inherent in learning. An SPNM approach cannot be about the mechanistic implementation of a pre-defined solution, but about experimentation and learning. The lessons might be that a policy is wrong or unacceptable and a different measure is needed. At this point, Genoa is still debating whether to go ahead with a full-scale road pricing scheme or not.
All the successful schemes have used an incremental approach with flexibility to experiment and adapt. As noted above, this is consistent with SPNM 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. An important part of learning by the network of partners and actors involves understanding user needs and attitudes towards policy measures such as road pricing. The actor/partner network's assessment of user attitudes has, of course, already influenced them through the factors of expectations/motivations and has been reflected in the design of protection measures. However, this is indirect and therefore a separate category is viewed as necessary taking the user perspective of the policy.

User Learning/Acceptance

The social and political acceptance of road pricing by users plays a central role in the feasibility of implementing a road-pricing programme. In the UK, 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 in the UK (Jones, 1998; Preston *et al*, 2000; Rajé, 2003). Other studies showed the acceptability of road pricing depends upon perceived benefits and the justification given for the development of such a programme in the selected area (Jones 1998, Schade & Schlag 2003). This links in to the SPNM factors of motivation/expectation and protection measures. It is clearly important to take into consideration both in the design and implementation of the scheme the views that arise within the general public. Acceptability needs to be considered seriously by implementers and government officials. Empirical literature shows that the public still has little knowledge of the possibilities of pricing policies as solutions to traffic congestion over other policies.
Incremental approaches permit learning and enhance understanding and acceptance. The UK and Italian schemes started from different user experiences. In Italy, road pricing existed in the form of tolled motorways and urban road pricing is an extension of an accepted practice, city centre access control. In the UK there was little experience of road charges or even city centre access control zones, 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 Italy, this was linked with the protection of the architectural heritage of the historical centres and other environmental improvements. It is essential that the charging scheme is seen as a solution to an accepted problem. A road pricing policy needs to be introduced incrementally to facilitate learning, with complementary protection measures that support the learning process. The policy needs to be flexible, so that it can then be adapted and, if failing, rejected.

6. CONCLUDING DISCUSSION

Using the SPNM framework helps to identify key factors that contributed to the success, or were a weakness, in the road pricing cases covered in this paper. The SPNM framework also helps to show where there are common lessons, despite the clear differences in the scale and context of the four UK and Italian schemes discussed in this paper.
The small Durham congestion-charging scheme appears remarkably successful in that it reduced 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 worked (Ieromonachou *et al.* 2004). 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. Overall there were strong motivations and learning and acceptance of road pricing was well advanced before the scheme went into place. Fourthly, the charging policy was preceded by improvements to public transport access, coupled with extensive compensation protection measures. Finally, there was the active involvement and empowerment, not only of partners but also of actor groups which ultimately helped the County Council achieve consensus in expectations 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 actor stakeholders – 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). This suggests that learning processes are incomplete.

Providing alternative public transport in London with buses (enhancement protection) proved a more successful solution than possibly expected. The boost in bus use helped the scheme's acceptance levels and kept costs down. 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.

One of the main factors emerging from the Rome case is the importance of the community and the protection of the cities' architectural heritage, and there are examples of this force working for or against the transport policy of 'access control'. For example although the control of traffic through the access control schemes was important to protect the ancient city structures in both Roma and Genoa, there was the opposing motivation of the negative impact of the roadside hardware (posts, concrete curbs, cameras). This might be thought of as a 'tactical' problem compared to the 'strategic'-level of the traffic restraint policy as a whole. However, such tactical details can seriously affect acceptance and support for a policy measure such as road pricing.

This presented a serious dilemma for planners who had to work with expert groups to ensure the entry gate system was appropriate for Rome. Models were created using computer generated images (Forestieri and Tomassini, 1999) to ensure conservation of the urban fabric. In Durham too, architectural heritage was an important motivation (being an UNESCO World Heritage Site), but here the much simpler scheme meant that there was just a small barrier at the exit point from the site. In London, visual intrusion has been less of an issue – maybe because there already is an overload of *street furniture* in the capital city, or maybe perhaps London's architecture is not viewed in the same way as the other locations.

Overall, the use of the SPNM framework to analyse the UK and Italian road pricing schemes has helped to go beyond simply identifying basic similarities and contrasts. The above discussion has highlighted a number of key issues in the process leading up to and implementing this radical traffic control measure. Where there have been differences, the SPNM framework has helped us to identify why they have occurred and how they have contributed to the success (or not) of each city's scheme. Possibly the key factors to consider are:

- Managing the partner network for implementing a road pricing scheme can be a complex task. This can involve new skills and tasks than are normally involved in more traditional local transport measures;
- Identify and understand core motivations of actors that the measure could support - these may only be indirectly related to transport (e.g. cultural image, economic impacts, prestige, well being etc.;

- It is important to extend beyond the partner network to the actor network that provides support for a road pricing scheme. Understanding, informing and empowering actor groups is important for winning widespread acceptability;
- Radical policies need a 'champion' to spearhead their implementation, but champions can take many forms;
- Learning occurs at many levels and in many ways. However, it is important for a new scheme to build on existing processes and measures to promote learning. If possible, build on what you know already, in terms of understanding, motivations and experience, rather than trying to get people and organisations to do something totally new. Incremental advances can be made in many different ways.

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[1] Exchange rate at time of writing was £1 GBP ≈ €1.46 Euro.
[2] The charge was increased to £8 (€11.7) in July 2005.
[3] There are 26 World Heritage Sites in the UK. For more details visit: *http://www.culture.gov.uk/ historic_ environment/World_ Heritage.htm.*
[4] In Italian*: ZTL (Zona a Traffico Limitato)*
[5] August is traditionally considered a month reserved for holidays and as such was not included. Traffic levels were expected to be lower.