Norway's urban toll rings: evolving towards congestion charging?

P. Ieromonachou*, Centre for Technology Strategy, Department of Design and Innovation, Faculty of Technology, The Open University, Milton Keynes, MK7 6AA, United Kingdom, email: P.Ieromonachou@open.ac.uk

S. Potter, Centre for Technology Strategy, Department of Design and Innovation, Faculty of Technology, The Open University, Milton Keynes, MK7 6AA, United Kingdom, email: S.Potter@open.ac.uk

J.P. Warren, Centre for Technology Strategy, Department of Design and Innovation, Faculty of Technology, The Open University in the East of England, Cintra House, 12 Hills Road, Cambridge CB2 1PF, United Kingdom, email: j.p.warren@open.ac.uk

Abstract

The role of various types of road user tolls has been an important part of Norwegian transport development for a number of years. There are now around 30 such projects in operation around the country. This paper examines the urban toll ring projects and presents results from new research into the schemes in Norway's three largest cities: Oslo, Bergen and Trondheim. All three projects have now matured and reached the stage where they have received 'life' extensions. The research indicates that key decisions are being debated as to whether the schemes will continue as toll rings, be stopped completely or transformed into more of a demand management style policy. Interviews with road and local authorities have shown that the feelings are mixed and that the decision will depend on various transport, social, organisational and political factors.

This paper reviews the cases of Bergen, Oslo and Trondheim and documents the latest developments in each scheme. The theory behind the application of the toll rings is explored through the case studies. Despite all the projects being implemented by similar networks, each scheme developed its own individual characteristics. These are laid alongside the economic and transport benefits with which they have been associated. The Strategic Policy Niche Management framework is used to analyse various aspects of the toll projects and identify key lessons and the effect they might have on future UK projects is discussed.

Keywords: Road User Charging, Toll Rings, Transport Policy, Strategic Niche Management

Introduction

The use of tolls as financial instruments for road construction has been successfully used in Norway for over 50 years. The use of urban tolling has increased considerably in Norway 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. On average, about 30% of the total annual state budget for road construction comes from toll revenue.

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 the scheme including: Oslo, Trondheim, Stavanger and Kristiansand. Both Oslo (1990) and Trondheim (1991) use automatic toll collection, made possible with modern electronic permits. In Trondheim the tolls are differentiated by time of day, thus resembling more of a congestion-pricing scheme. In this paper the toll ring projects of the three main cities of Norway will be presented.

This paper has been compiled with information from reports, articles and other grey literature and more importantly from a series of non-standardised interviews with Norwegian road and local authorities in Bergen, Oslo and Trondheim[1]. Unless otherwise stated, the information presented here is drawn from these interviews.

[1] See References and Acknowledgments for more information

* Corresponding author – for submission to Transport Policy (2004)

The Bergen Toll Ring

Introduction

Since the 1970s Bergen had been facing congestion, an escalating number of traffic accidents, as well as pollution from vehicle noise and exhaust fumes. The problem was worsened by traffic from the growing nearby regional centres travelling through the city centre towards other destinations. Town planners drafted a new masterplan for the city based on a mix of new main roads, priority for public transport, multi-storey car parks (to free-up land needed for road construction), as well as a campaign of pedestrianisation and environmentally improved central areas. The plan was first presented in 1983 but there was a shortfall between investment needed and government funding. By using conventional funding it could have taken up to 30 years for the plans to be implemented, and so it was proposed that supplementary funding should be obtained by means of road user charging which the local government simply termed 'tolls'. Traffic diversion or reduction was not considered as an objective of the scheme at that time (Herdlevær and Arnesen, 2003).

The Toll Ring

Arild Egen, then director of the local branch of the Norwegian Public Roads Administration (NPRA), devised the concept of urban toll rings. Through his natural entrepreneurship and good links with both major political parties, he managed to gain support for his idea (Karlsen and Strand, 2003). Permission from the central government for the operation of the toll ring scheme in Bergen was given in June 1985 and by the 2nd of January 1986 the system was completed. Toll stations were placed on all the main access roads leading to the centre. Initially there were six toll stations with one other 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 (£0.45) for cars and 10 NOK (£0.90) for trucks until 1999 when they were doubled. Prepaid tickets and monthly, bi-annual and annual permits were also available, at a slightly discounted rate.

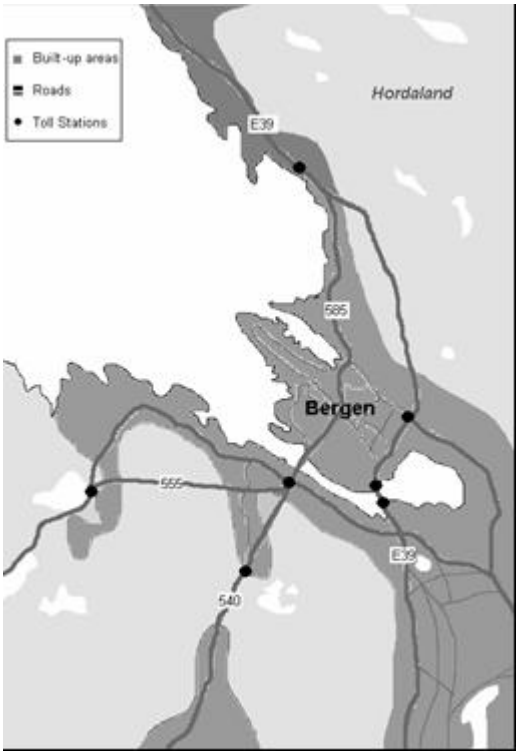

Figure 1: The city of Bergen

The toll fees were designed to raise 35 million NOK (£3.2 million) 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. 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 due to the higher costs of running the manned tollbooth system. Enforcement was via digital video control, and offenders are fined 300 NOK (£27). This manual system remained in place until 1st of February 2004, when the AutoPass system was introduced.

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 (£360 million) 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 promotes the use of congestion pricing measures allows the revenue to be used for wider purposes, such as building public transport projects (i.e. light rail) and subsidising tickets. Problems still exist at the local political level. For example, as a compromise, the conservative right wing party agreed on a new light rail project the left was favouring, but only if there was also a new 4-lane motorway linking the city centre with the airport and the other industrial areas around Bergen. Therefore, both car-centric and public transport projects would be approved.

The toll scheme was not intended to affect traffic levels, and although there was a small initial drop in traffic (by 6-7% overall), the infrastructure built with the revenues facilitated traffic growth. This was reflected in the fact that before 1986 Bergen had one of the lowest car ownership rates in Norway of 345 vehicles per 1000 inhabitants (Sørstrøm, 1999), whereas now it is similar to the national average of ~ 400/1000 (IRF, 2000). 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, yet overall traffic in the region is increasing 3-5% per year.

Bergen's charging system is unique not only because it was the first to start but it is also distinguished by it's features: smallest in area, lowest number of toll booths and has the lowest gross revenue. It was also the system that most recently implemented the electronic fee collection (EFC); EFC is carried out by using an on-board unit (OBU) which identifies every vehicle during movement into the charging area at a defined boundary point.

AutoPass System

From the 1st February 2004 a new £4.3m toll collection system, the AutoPass system, was implemented in Bergen. This system for electronic toll billing was developed by a company called Q-Free® and comprises 130 ETC (Electronic Toll Collection) lanes, along with 70 ACM (Automatic Coin Machines) lanes and 50 MTC (Manual Toll Collection) lanes. Q-Free® also installed around 850,000 OBUs (On-Board Units), approximately a third of the Norway's car fleet. The toll fee was increased to 15 NOK (£1.40) for cars, and 30 NOK (£2.80) for trucks, per crossing. The electronic tag is shown in Figure1 and is typically mounted on the windscreen.

Figure 2: The AutoPass electronic tag

Barriers to implementation

The biggest issue that the city of Bergen faced was to get the Toll Ring system approved at the beginning of the process. Norwegians already bore heavy taxes including those for road transport. Cars are expensive to purchase; there is road tax and high insurance costs as well as high taxes on fuels. This is a context not dissimilar to the UK. People argued that road building is a government responsibility, thus, they (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 (The Guardian, 2004).

Opinions started changing when the first results were apparent - new relief roads, motorways and tunnels. The toll price, having been kept at low levels (≈£0.45) 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, 2003).

The Oslo Toll Ring

Introduction

In February 1990, Oslo followed the example set by Bergen four years earlier, and implemented a toll ring scheme. Again, the objective was mainly to provide investment to enlarge the 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 (EGPIS, 1996). Traffic reduction lost out, and this is 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) and currently is at 15 NOK (£1.40) per pass, with season ticket AutoPasses being available. Initially 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 traffic uses AutoPasses.

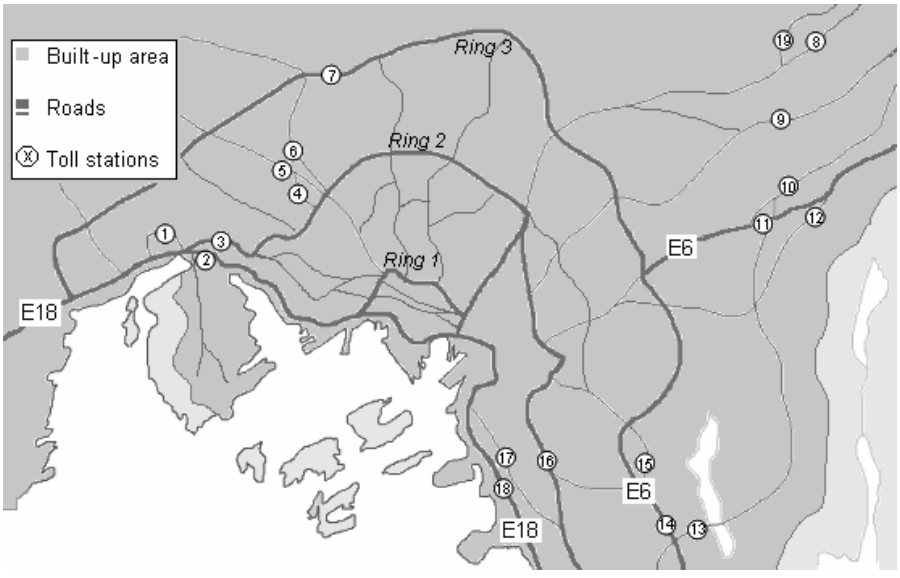

Figure 3: The capital city - Oslo

Figure 4 shows the historic trend of average daily traffic crossing into the Oslo ring for the years 1990 to 2003 (Fjellinjen, 2003). The toll operator has modelled various alternatives for traffic growth in Oslo in order to predict there future cash flows and net present values. One of the alternatives calculates a traffic growth level of 6% for 2007 again supporting the ideal that toll rings are designed to be revenue generators rather than 'reducing' systems for private car user.

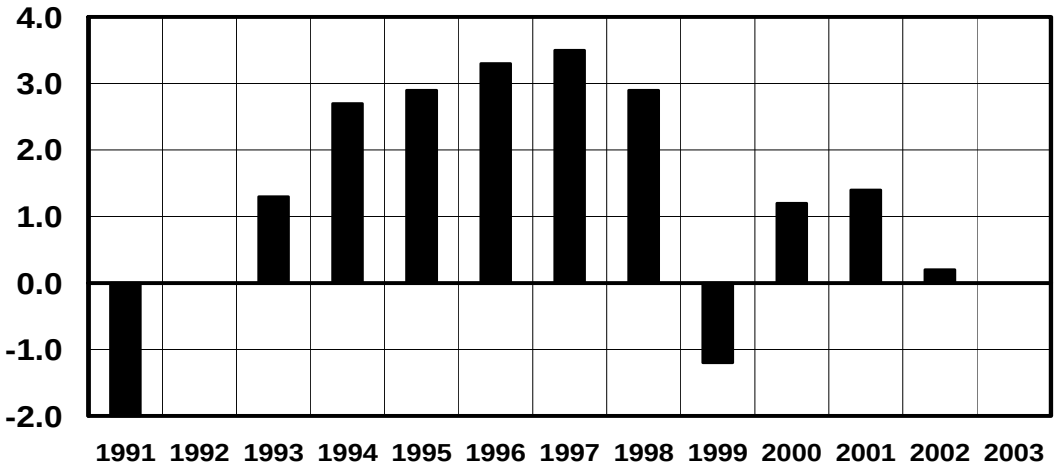

Figure 4: The change in traffic levels when compared to the preceding year (%) for total crossings into the Oslo charging area.

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 placed between 3 and 8 km from the city centre purely to maximise revenue. The toll pass lanes with blue *Abonnement* signs on the left can only be used by drivers who have an AutoPass fitted in their cars. *Mynt/Coin* lanes are for cash payment and the white *Manuell* lanes are used for people without the correct cash payment, large vehicles and visitors. In the first year of operation of the Oslo toll ring scheme, the initial investment of 250million NOK (£22.5m) was covered by revenue of 750million NOK (£67.5m). Revenue reached 1,046million NOK (£94m) in 2002. Operational costs are only 10% of the total revenue. Both transport packages for Oslo (*OsloPakke (1990) and OsloPakke (2002))* dictated that toll funds must be used as investment in road construction and public transport infrastructure but not operating costs. The difference with the second transport package for 2001-2011 was that it dedicated all revenues to public transport investments.

Barriers

In 1989/90 the majority of the public/road users were against the introduction of the ring. The high level of negative feeling came from people's opposition to paying extra taxes. The Norwegian Automobile Association, who wants to get rid of the Oslo toll ring, altogether, refers to the scheme as "just an extra tax" (BBC, 2003). As in Bergen, many of the Oslo residents felt the same way.

At the same time the political majority was supporting the scheme. Politicians knew the importance of funding for such large and costly projects like road construction on the Norwegian coastal fringe. Public media and opposition parties were predicting chaos once the scheme would go in operation, but as James Ødeck from NPRA in Oslo indicated, that threat did not materialise. Even though occasional acts of vandalism had been reported - a toll booth was set alight and others bore the marks of gun shots, there had not been a registered organisation against the scheme. There was little direct consideration of public opinion in

developing the scheme– "…negative feelings did not necessarily mean that people would drive less…" (Waerstad et al, 2003). Opinions shifted marginally with the completion of road projects. During the first year of operation, opposition dropped by 5% down to 65% (Ødeck and Bråthen, 2002). Since then, support levels for toll rings have been between 55% and 60%.

The Future

The NPRA are hopeful that the toll rings could develop into a Congestion Pricing scheme. At the very least the Toll Rings are expected to continue at minimum in their present form. Even though there is opposition in implementing a pricing scheme, without it there is insufficient money to complete planned transport schemes.

Those interviewed at TØI (Institute of Transport Economics) gave a less optimistic view. The researchers do not think that a Congestion Pricing project will follow the toll rings. They feel that the political process is not mature enough to face such a challenge. Even though TØI would prefer to see a Congestion Pricing project, as this would help fund public transport operations as well as take a step towards reducing traffic at peak times, currently it does not seem possible. The right wing parties are in favour of the road projects but are against Congestion Pricing to help fund them (Lerstang and Hanssen, 2003). Overall, although the Oslo toll ring has been successful, its development may have hit an impasse.

The Trondheim Toll Ring

Introduction

In 1991, just one year after the introduction of the scheme in Oslo, the third urban toll ring of Norway was implemented in Trondheim - the third largest city of Norway. The project in Trondheim was again primarily a road financing venture but with a different ring design, utilising constant scheme upgrades and the use of more advanced technology, it had a different character. A development plan was discussed for the city's future infrastructure that included not only roads but also pedestrian and cyclist networks and improved public transport. Toll collection was based on a new electronic system and the toll fees were designed to vary for different times of the day with higher fees during rush hours and free entries during the evenings (after 5pm) and at weekends (EGPIS, 1998).

The system came in to operation in October 1991 when Trondheim installed the world's first fully automated toll ring using the Q-Free® AutoPass system. The variable fees for cars and other light vehicles were collected electronically from 12 toll gates around the city centre. A signal, sent by radar equipment placed in these 'gates' detects the AutoPass electronic tag mounted on the windshield of passing cars and deducts the appropriate fee from a pre paid account. During rush hours, especially during the morning and afternoon, as the demand for road space increases, so does the price (Hoven, 1995).

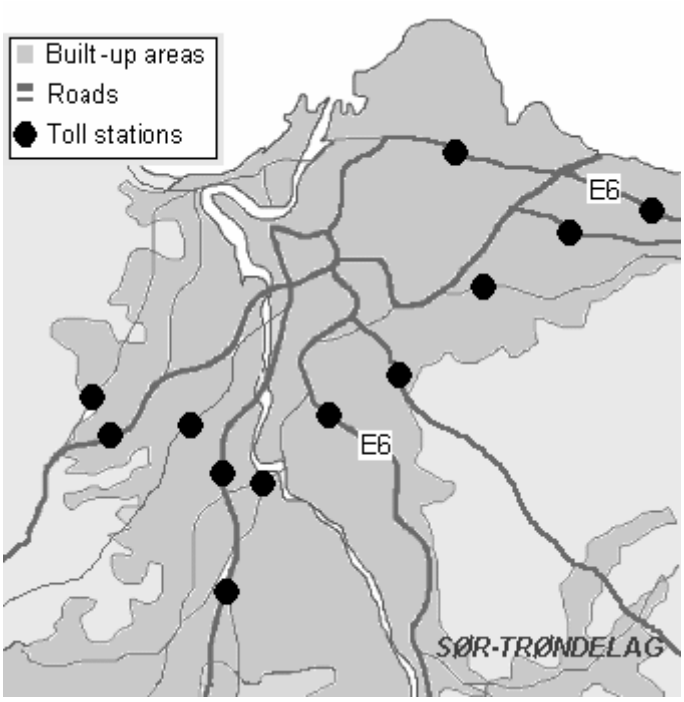

Figure 5: The 1991 Trondheim Toll Ring

In Trondheim it was also possible to pay in advance, not in time periods as in the other cities, but as 'lump-sum' payment groups (i.e., 500, 2500, 5000 NOK) which provide a discount when compared to the normal gate price. For non-users of the electronic system there were also options for credit card or coin payment at machines located in a side road near the toll stations.

A "between-zones" charge was introduced in 1998 and in November 2003 more changes took place as 10 new toll stations divided the city centre for fairer charging of the city centre population (who had always paid reduced fees) as well as to increase income. There are currently a total of 24 toll stations in Trondheim. At the time of the interviews for this research, there were only two years left for the toll ring to run (to 2005) but the 16 million NOK invested in the six new stations was justified by an expected return of 60 million revenue.

When the project was first announced, 70% of the general public opposed the scheme but this has now dropped to around 50%. A substantial share of opposition came from local retailers in the city centre claiming that the toll ring would drive customers away (a not dissimilar response to that of retailers in London in the wake of the Congestion Charge's introduction). The environment of the city centre was rejuvenated, making it more pleasant and thus attracting visitors and improving sales. Tore Langmyhr of the Trondheim kommune (2003), pointed out that "when the public sees where and how the money is used, this helps winning acceptance for a project". It also makes drivers understand the real cost of environmental and social expenses of heavy traffic. The City council in Trondheim also followed the policy of improving existing retail and commercial centres instead of building new areas at the edge of the town; this also helped preserve the character and economic vitality of the old town.

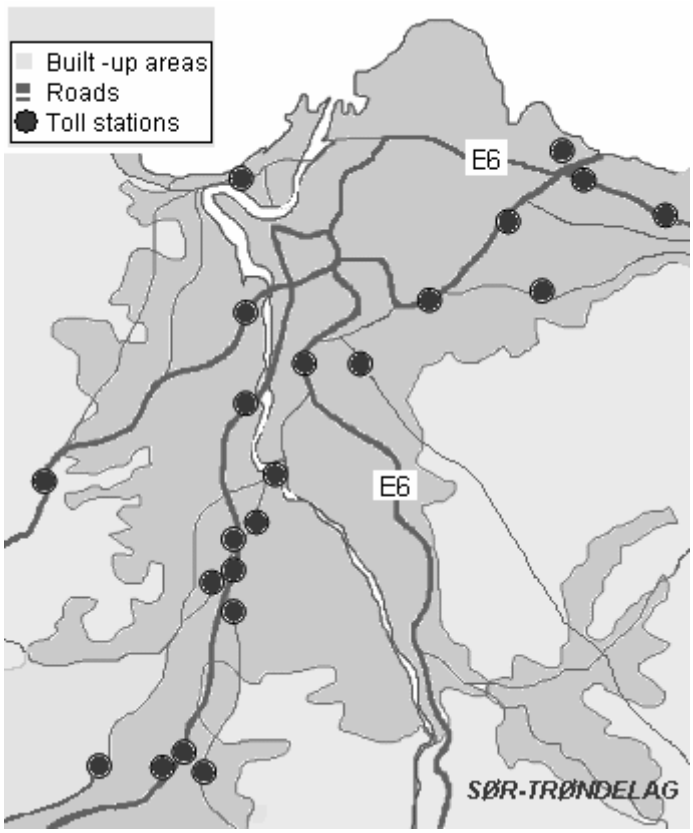

Figure 6: The 1998 Trondheim Toll Ring

The Future

According to Langmyhr, (2003), the Trondheim tolls already act as a demand management scheme as there are different charges for different hours of the day. It ranges from high charges during peak hours and low charges during low traffic hours to free access during evenings and weekends.

The toll scheme is scheduled to finish in 2005, but other Norwegian cities have extended their schemes, like in Oslo and Bergen. Politicians had promised the end of the scheme but there are possibilities that it could evolve into a congestion pricing system. Another option under consideration is to remove some far-away toll booths and use only the inner city ones for demand management charging. The decision on what may happen also depends on who controls the city council. The left-wing Party has traditionally opposed more road building, but they understood the need for income for roads, whilst the right-wing party has objected to tolling altogether. It is expected that whatever the outcome, tolling schemes will evolve towards some form of congestion pricing and that revenues should also be earmarked for transport investment and public transport operating costs. The reasons for this are further explained in the following sections of the paper.

Summary

Table 1 below, represents the authors efforts to obtain the latest information about the three largest toll schemes in Norway based on Tretvik's earlier work (2003). In some cases, current data was not obtainable and thus, the most recent values have been used. In other cases, for example the number of toll stations in Trondheim, different sources gave contradicting values due to the number of times changes were introduced within the scheme.

Table 1: Comparative characteristics of the current Norwegian toll rings

	Bergen	Oslo	Trondheim
City population	227 000	456 000	147 000
Percentage living inside toll ring	10	50	40
Starting date	Jan 1986	Feb 1990	Oct 1990
Toll Ring Area (km^2)	18 (estimate)	64	50 (originally 24)
Number of toll stations	7	19	24*
Entry charge for a small vehicle (NOK)	10	20	15
Charging period	Mon - Fri 6am – 10pm	All days, all hours	Mon - Fri 6am – 5pm ***
Average daily crossings during toll hours	73 000	243 800	71 000
Annual gross revenue (NOK millions)**	70	880	126

Notes for Table 1:

* In 1991, 11 toll booths came into operation. In addition there was an existing booth on a motorway to the east. In 1996 one new station was added. In 1998, 10 new stations were added, while 4 existing were removed. In 2003, one peripheral station was removed, while 6 new stations were added, 5 of them being quite close to the city centre.

** In 2002 1,7 billion NOK (approximately 0,22 billion Euros) or almost 27% of the total annual state road construction budget came from toll fees collected from road users in more than 35 urban and extra urban projects and 120 toll plazas throughout the country.

*** At the time of writing the system had changed and now a variable rate of charge based on the specific time of day had been implemented.

Strategic Niche Management

The interviews and data gathering for the Norwegian case studies were structured for analysis utilising a Strategic Niche Management (SNM) framework. This has been previously been used to analyse the development of transport policy in the case of charging in Durham (England) (see Ieromonachou et al. 2004). Strategic Niche Management is rooted in organisational innovation diffusion theory that has explored the processes and actors needed in shaping, and the application of, new technologies (Weber et al., 1999; Hoogma et al, 2002). Central to the concept of Strategic Niche Management is the view that technology policy must contribute to the creation and development of niches (spaces) for promising new technologies through experimentation.

This research has adapted SNM to explore not just particular technologies, but the formation of spaces that allow difficult policy concepts like Travel Demand Management policies to develop and gain acceptance. In SNM, a 'technological niche' comprises of the individual projects (called 'experiments' in SNM theory) for a particular technology or policy – in this case the series of road user charging schemes. The SNM framework maps how actors learn about the design of the scheme, user needs, cultural and political acceptability, environmental impact and other aspects (Schot and Rip 1996; Hoogma et al 2002).

A crucial factor about SNM is the focus upon learning by all parties involved and the extent to which the transport policy development permits all actors to influence, explore it, and come to a view as to its role. Central to this learning is an acknowledgement and discussion of the expectations held by different actors. The government and NPRA expectations for

reductions in the national transportation budget would not be seen as interfering with further growth of the much needed road network that some regional councils had anticipated. Such discussions are important in that they reflect the cultural values underlying the transport policy experiment (and the niche). They also reveal assumptions made which may subsequently undermine or advance the innovation at the diffusion stage. This process occurs within the protected space of the experiments within the dominant regime. In this case the individual 'experiments' are the city ring toll schemes and the dominant regime is uncharged road use. If successful, the use of SNM can indicate key factors in managing the transition from niche to its wider application.

The application of SNM requires the design and introduction of appropriate levels of niche 'protection'. This involves measures that support the policy. For transport technologies, protection measures often involve financial measures (e.g. subsidising alternative fuel vehicles). For policy measures, protection often takes a different form, such as temporary concessions to win acceptance for road user charging. To be complete, a definition of the niche needs to include a description of the protection measures used and the regulatory framework within which the experiment is situated.

SNM analysis should show how to successfully introduce a new concept and, after a period of financial and organisational niche protection, expose it to real-world conditions where it should be able to survive. It is important to note that, once the protected space has performed its function, SNM demands the dismantling of the protecting factors in order that the new technology or policy can become mainstream.

An Analysis using SPNM

Niche Formation

The process of policy implementation of the Toll Rings in Norway contains a number of factors that can be analysed using an adaptation of SNM to policy development (Ieromonachou et al. 2004). This is called the Strategic Policy Niche Management (SPNM) policy framework. These three toll ring schemes represent the cases to be examined and in the case of Bergen itself, the pioneering niche for this policy in not only Norway but in Europe as well. In SPNM theory, a policy niche is characterised by a policy, a specific application for the policy, a specific site for the implementation of the policy, a network of partners and actors involved in managing the introduction, protecting it from opposition and providing the technology if this is required. In this case, the policy concerned was Road User Charging in the form of the Bergen, Oslo and Trondheim toll rings.

The network involved with these policy applications was similar in each case. It consisted of the Norwegian Public Roads Administration, NPRA, who managed the whole project, the city and county councils that provided political support, a number of partners, who provided services and technologies, as well as groups who were consulted during the planning process. Each city had some differences in the network of partners/actors involved but for this analysis a generic form is used. The toll ring schemes took place under the authority of the Kommunes (City councils) that cooperated with the Statens Vegvesen Vegdiktoratet (NPRA) who had the main responsibility for the design and implementation. In the case of electronic toll collection, Q-Free® was assigned to resolve the provision of technology and companies, owned by the City and County Councils, to manage that technology. A network of promoters and users that wanted a solution of the problem that existed in the area was therefore protecting the scheme. Obviously those parties who were competing to supply hardware, software and people-power had a strong interest in ensuring the success of the project.

SPNM analysis concentrates on the development and maintenance of a protected environment around new radical transport policies. Road tolls were not new to Norway, but the urban toll schemes were and there had not been any similar projects before these – at least in the Northern Hemisphere. When the projects started it was not the intention to initiate

a transformation of the existing road charging regime, nor were they intended as experiments for learning. Their planning and introduction was conducted like any other transport project. From the first niche 'experiment' at Bergen the toll ring concept has spread with new niches in other cities. Bergen's experiment was not simply copied. Every city experimented, for example with cordon design, toll collection systems and operating times. Indeed, the overall result is that urban tolling in Norway is probably the best available case of niche development and adoption of a radical transport policy. Free urban roads in Norway may soon be scarce and if this comes about, one could conclude that a regime transformation will have taken place successfully.

The Q-Free® AutoPass tag was in a sense a technological project within the policy project at Trondheim. The AutoPass project was at the time this research was conducted, the biggest electronic road fee collection system in Northern Europe. It developed a niche of electronic tolling and marketed it through partnerships with the local Tolling Companies. Judging from their performance indicators (low operating cost, high efficiency, etc), it seems that this system will become the expected practice in Norwegian toll schemes. They also have a strong chance of marketing their product in for other Scandinavian and European Road User Charging schemes if and when the opportunity arises.

Network of Partners

The success of the Norwegian road toll systems requires a careful consideration of its organisational framework. The Norwegian Public Roads Administration was responsible for the planning and building of the toll collection infrastructure, which is their property. They were also in charge for the planning, construction and maintenance of road projects financed by toll revenue. In each scheme, a dedicated public limited toll company was established through the local authorities and other local private interests. This could be contrasted, for example, with the outsourced private operator of London's Congestion Charging scheme. The main objective of the toll company was to operate the road toll system and to administer the toll revenues. In order to create a company not motivated by profit, operating regulations were established by the Ministry of Transport and Communications (Ødeck and Bråthen, 2002). Figure 7 represents a generalised network of the main partners that took part in the introduction of the toll ring schemes.

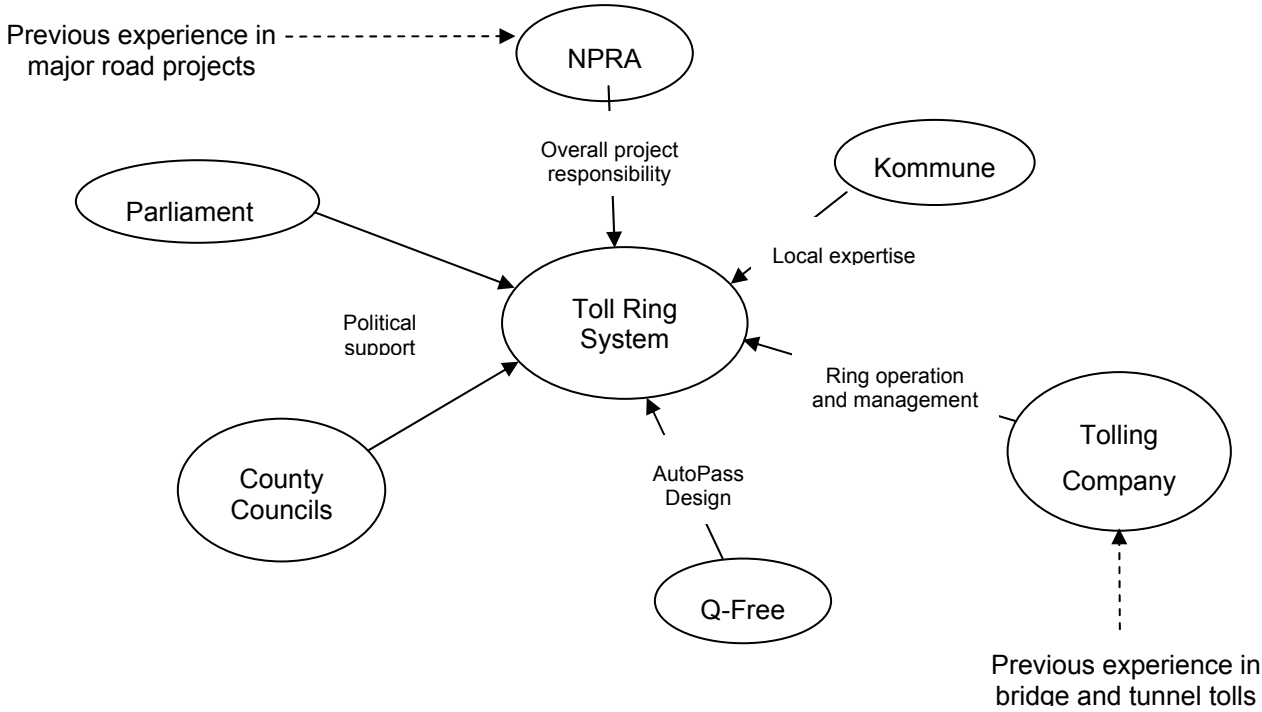

Figure 7: Main actors in implementing tolling strategies in Norway

Expectations - Motivations

An important part of SPNM is the analysis of partner expectations and motivations. The partners involved in the planning, implementation and management of the toll ring schemes in Norway had individual interests that encouraged them to work for the success of the project. The Norwegian Public Roads Administration needed the money to improve and complete various road projects in the wake of reductions in funds from the government.

The City and County councils were interested in solving various traffic problems. New projects, including tunnels that carry traffic to and from the centres relieved surface roads from cars and at the same time helped reduce environmental effects like local air pollution and noise. Q-Free®, (previously called Micro-Design), was a Norwegian electronics company that saw a market in products for automatic toll fee collection. In 1999 Q-Free® and the NPRA signed the contract for the AutoPass and it was agreed that all future toll schemes in Norway would use the system. Today the AutoPass is used in many projects around Norway and almost a third of Norway's cars have an On-Board Unit. AutoPass has become the largest and most successful toll system in Europe.

It could be claimed that the road tolls in Norway do not constitute demand management but simply a road investment funding mechanism. But from 1991, when introduction of the tolls in Trondheim took place, there was a shift that allowed several other stakeholders (public transport operators, environmental organisations, etc) to enter into the niche network. Thus the actors in Figure 7 have since been modified. Since Trondheim's scheme started, 20% of the income has been used for non-road building transport-related operations such as funding public transport, free bicycles in the city, building bicycle lanes etc. Expectations appeared to have been modified with time, when compared to the initial goals.

Learning

An important aspect of SNM is the protection of the scheme (the niche) with fiscal, political and other measures that would mainly promote the acceptance of the idea until the niche could be mature enough to survive by itself. In the case of the Norwegian toll rings, no concessions or benefits were available. The dominant (and substantial) idea used to convince people to support the schemes was the prospect of rapid road improvements. This has won a reluctant acceptance from the people of the cities concerned. However, it should be noted that some other more subtle protection aspects did emerge. For example retail interests within the toll rings were provided protection by some toll monies being used to improve the urban environment and planning policies to control and subdue out of town retail competition. Such protection measures did not receive much emphasis in the development of the toll rings. The projects were prepared and carried through in a very professional way especially within the policy and technology areas. What was missing was consultation and involvement of other affected groups and the public. If different opinions were evaluated prior to the planning process then a number of different approaches could have been used that could well have had a positive effect on support for the tolls. This is illustrated by a SNM analysis of the Durham congestion charge, where a more inclusive policy development network produced a wider consensus of support from all involved (Ieromonachou et al., 2004).

Key lessons for elsewhere

Niche Formation

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 same situation applied in the other cities that implemented the toll schemes.

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 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). Oslo, and in particular Trondheim, went on to introduce improved cordon design for income maximisation and reduced toll queues by installing electronic automatic toll collection. Trondheim, the newest of the schemes, has made changes twice in its toll ring operation and nearly doubled the original toll gates by separating the city centre in different zones as well as introducing differentiated toll fees, thus resembling more of a congestion pricing measure than a simple cordon charge which initially defined the toll rings.

Network of Partners and their Expectations/Motivations

Partners, and especially the managers of the projects, were very aware of strong opposition, but had a network of political muscle with strong motivations for achieving success. The "Kommunes" needed the income for improving the local road network as well as carrying through environmental developments to the urban centre. The Roads Administration saw this as an opportunity to increase road capacity as well as boosting their political influence with new independent funding. They basically stuck to the policy because they realised that they had to use a tough measure to achieve anything meaningful. This has a particular lesson for the UK, where perhaps large claims have been made for weak policy measures leading ultimately to disillusionment. In Norway, they started viewing the toll rings as a mechanism to raise money for road building but over time came to recognise that the mechanism could and should evolve into a demand management tool. Other RUC proposals are starting at the end of this learning curve and so have to learn more quickly about being realistic and recognising hard choices for what they are.

Societal Embedding

An important difference to the UK and some other countries is that Norway had a tradition of road tolling. Urban road tolling, even though still opposed, was an extension of previous accepted practices. Since they had experience of urban toll rings that resemble an RUC scheme there was a potential for motorists to accept one 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. They also focused on road building (something that in theory should have pleased drivers), and not on alternative modes of travel.

Overall 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. The UK cannot follow the same path of road tolling to Road User Charging as Norway, especially now that it already has two working and successful road user charging projects in Durham and London. It can learn from Norway in the way that, for such radical policies, while strong political commitment is needed, there also need to be an emphasis on the full range benefits it can bring to the national and local economy and environment as well as the obvious transport improvements. Some protection measures for particular key groups (like retail) could also be crucial in winning widespread support, rather than reluctant acceptance. Odeck and Brathen (2002) note 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. Each of these factors should be actively considered when attempting to form strategic niches within transport policy in order to facilitate new types of road user charging systems.

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