



Competitive and Sustainable Growth Programme

PRoGR_SS Project 2000-CM.10390

PRICING ROAD USE FOR GREATER RESPONSIBILITY, EFFICIENCY AND SUSTAINABILITY IN CITIES

Bristol • Copenhagen • Edinburgh • Genoa • Gothenburg • Helsinki • Rome • Trondheim



WP2 - Scheme Design and Development Deliverable D3.2 Final Specifications

**Version 2.0
June 2002**

EXECUTIVE SUMMARY

The PRoGRESS WP2 (Scheme Design and Development) main objective is:

“To develop integrated urban transport pricing schemes based on the concept of marginal-cost pricing, in the real urban situations of the cities of Bristol, Copenhagen, Edinburgh, Genoa, Gothenburg, Helsinki, Rome, and Trondheim.”

Deliverable D3.2 (Final Demonstration Scheme Specification) includes the descriptions of the various types of Road Pricing (RP) feasible full-size schemes to be adopted in the 8 different urban real contexts, their models, and all information related to the design process performed in order to develop the 8 PRoGRESS demonstration systems. The aspects related to urban context and road network layout, mobility database, modelling, mobility simulation, tolling technology and software, system integration, pricing scheme development, system testing and validation planning, and demonstration organisation are also treated.

Additional objective of Deliverable D3.2 are therefore to define the design parameters for feasible full-size real-life RP schemes, and to prepare the design basis for the implementation of the PRoGRESS demonstration systems and the development of the demonstration sessions, and to provide these data in an almost uniform manner in order to facilitate the ex-post evaluation phase. This deliverable updates the previous draft deliverable D3.1, produced in July 2001.

Overview of Demonstrations

The eight city projects described in this deliverable have different aspirations for their pricing schemes though participation in the PRoGRESS project, and reflect the different levels of development in the introduction of road pricing schemes in four distinct groups:

- A) Modelling demonstration only: Helsinki is not going to implement a pricing scheme or trial, but is testing a number of scenarios to feed into the national debate.
- B) Demonstration trial: Copenhagen and Gothenburg are running demonstration trials of road pricing with volunteer motorists. Neither Denmark nor Sweden has primary legislation as yet and the results of the trial will input to the national debate.
- C) Development of real schemes and demonstration trial: Bristol, Edinburgh, and Genoa are all working towards the introduction of full real pricing schemes, but due to timescale constraints will be running demonstration trials as part of PRoGRESS. For the three cities, both the PRoGRESS demonstrator and the proposed full scheme are described in this deliverable.
- D) Demonstration trials based on real schemes: Trondheim is implementing changes to a real road pricing scheme, while Rome is evaluating extension to the evening period and holidays to be implemented, if supported by the modelling.

Key Characteristics of Schemes

Helsinki The Helsinki Metropolitan Area includes four cities, and has a total population of almost 1 million. There are approximately 3 million trips made every weekday, around 44% by car and 27% by public transport, although trips to the city centre to work in the AM peak have a 70% share of public transport (comprising buses, trams, trains, and underground). The current Transport Plan (PLJ) dates from 1998, with a new one to be ratified late in 2002.

Road pricing proposals for demand management have been made in the past, but have never reached political approval. Three schemes were tested in the PRESS project, and it is two of these that have been modelled in detail in PRoGRESS – passage-based and distance-based charging. The modelling is being carried out using MTCP software (based on EMME/2 networks and demand matrices) calibrated to 2000 levels.

Copenhagen The city of Copenhagen has 500,000 inhabitants, but it is at the centre of a region of 1.8 million. Increased car use in the past ten years has led to congestion problems on a historic road network. The modal split of trips has car and bicycle the same at 33%, public transport having 27%. The current transport strategy focuses on the environmental harm caused by congestion.

There is no legislation for road pricing in Denmark, but the parliament is now keen for research to be undertaken. Through PRoGRESS, multiple zone and kilometre charging are tested. Very little modelling has been carried out to date; a trial with 400 drivers using GPS equipment (run August 2001 to August 2002) is providing the results for PRoGRESS and the national debate.

Gothenburg Like many cities, the 470,000 population of Gothenburg needs to be seen in the context of a regional population of almost 800,000. There are around 1 million daily trips in the city. For trips to work, cars make up over 60% with public transport only 20%. The current traffic plan involves investment in public transport and roads, and road pricing.

Road pricing has been researched both for alleviating traffic jams and raising revenue for infrastructure investment, particularly under the 1995 Gothenburg Agreement and several EC-supported projects. A great deal of modelling was carried out through the PRESS project in 1998; as part of PRoGRESS, around 350 volunteers will be demonstrating congestion based and mobility management orientated pricing using GPS equipment.

Bristol The Bristol city area has a population of 400,000 in a region of around 1 million. More than 420,000 vehicles enter the city each day, and congestion has grown on a historical road network. Car use accounts for more almost 60% of journeys to work, with public transport (mainly bus) at 15%; private cars make up almost 80% of the vehicles on the roads in the city centre. Road user charging is one element of an integrated transport strategy outlined in the Local Transport Plan.

The strategy of road pricing has been investigated since 1990, with a variety of studies and demonstrations. Volunteer-based trials were undertaken through the EC supported projects CONCERT-ELGAR in 1998 and INTERCEPT in 2000. An outline scheme was defined in 1999, and this city centre cordon is contained in the main policy document, the Local Transport Plan. As part of PRoGRESS, the real scheme is being developed, but due to delays to the implementation of the complementary measures, the road user charging implementation has been delayed beyond the end of PRoGRESS. Therefore in co-operation with the national government, Bristol will be demonstrating the use of GPS equipment for road user charging in commercial vehicles. This trial will be undertaken in 2003.

Edinburgh The population of the city is almost 500,000, and the city centre is a World Heritage Site. Traffic growth is high, and private car use makes up around 57% of all trips, public transport 18%. Funding improvements to the transport systems is a key issue in the local transport strategy, and road user charging is seen as a key means of providing revenue for reinvestment.

Two alternative road user charging schemes are under consideration: a single cordon around the city centre, and a double cordon around the city centre plus the city by-pass; either scheme would be likely to use Automatic Number Plate Recognition (ANPR) technology. New TRAM-based models have been developed to investigate the various road user charging options. The implementation of the full scheme will not be possible before 2006, and within PRoGRESS, Edinburgh will therefore carry out a demonstration of the retail mechanisms for registering number plates with the ANPR system, and a trial of the camera and enforcement systems.

Genoa The city of Genoa stretches for 30km along the Thyrranian coast, and is home to 650,000 people. The elongated nature of the city means that any east-west trips are concentrated through the city centre, so through traffic levels are high. Around 40% of commuting trips in the morning are made by car and 42% by bus.

Road pricing in the city centre has been considered for several years, and researched through other EC-supported projects. A city centre area covering 1.0 km² has been defined for a feasible full-size RP scheme, using video plate recognition technology, and this will be tested through PRoGRESS. However, due to political reasons, the implementation of this demonstration may not happen with all users paying real money, and a volunteer-based trial may be used. A great deal of modelling work has been carried out, using the multi-inter-modal MTCP30 system.

Rome The Rome municipal area includes some 4 million inhabitants. Across the city, 60% of trips are made by private transport, although in the historical centre this falls to 37%. As well as road transport, there is extensive rail, tram, and metro provision; the city's mobility plan is principally to increase the proportion of public transport use over private cars.

Legislation exists in Italy for pricing schemes to protect historical city centres. In Rome, an Access Control System was commenced in 1998, whereby certain authorised non-residents have to purchase a permit – in 2001, this system was moved across to an electronic basis with cameras at entry points to the restricted area. The replacement of

this flat-fare scheme with a more dynamic one is being researched, and this, along with changes to the operating hours, has been modelled extensively: the work is still running, according to the first months real application of the ACS and flat RP scheme.

Trondheim The city is the largest in a region of 260,000, and peak hour traffic conditions have seen an increase in queuing problems. Car use represents 60% of modal split in the city, with public transport at only 9% (1992).

A toll ring has been in operation since 1991, commenced to fund improvements to the transport infrastructure. This scheme was changed in 1998 to a zonal system, and most users now have electronic tags for automated charging. Through PROGRESS, a new CBD toll zone will be implemented, and a trial of through traffic charging will be carried out by using existing and new toll plazas to charge traffic in both directions. The integration of public transport modes with smartcard ticketing is also being progressed. No modelling work is envisaged within PROGRESS.

Comparison Among Pricing Scheme Characteristics

The involved cities studied two basic types of pricing schemes: cordon (pay each time crossing a section) and distance (pay proportionally to the length and type of route performed).

It is noted that the choice of RP scheme is strictly related to its extent. Distance based schemes involve a greater area of application (citywide), while multiple zone cordons (Edinburgh, Trondheim) affect only a portion of the entire urban area (up to 250 km²), and single zone cordons (Genoa and Rome) affect central areas of only a few square km (less than 5 km²). This subdivision is important also with respect to the objective of RP application: in the first cases RP is applied mainly to get revenues, with no major benefits on environment and mobility, while in the latter case the aim is exclusively to protect valuable areas against private traffic impacts.

In general, it is found that the mean fee varies from 0.5_ (Genoa, low fare case) to 8_ (Bristol, high fare case) per passage for cordon based schemes, and is around 0.7-1.5_ per km for distance based schemes. The expected global yearly revenues obtained by a real-life scheme range from 2m_ up to 120m_, exceeding the cost of technology installation and maintenance/service by a large margin.

The study has demonstrated that road pricing reaches the maximum beneficial effects if combined with application of complementary interventions on mobility. These must facilitate the mobility of users affected by the pricing measure, thus promoting the shift from private car mode to other modes (public transport, intermodality, walking, bikes, etc.).

Modeling of full-size RP schemes has been conducted by the cities at different level of extent and with different approaches.

As expected, RP application always induces a reduction of private traffic within the affected area, which is obviously more consistent in cities adopting a cordon pricing to protect only a limited central area (Genoa and Rome), with several crossing route

alternatives. From simulations, this reduction varies from -11% up to -30%, according to the fee level and the period of day. In the other cities adopting different schemes, private traffic reduction is null or limited to a few percent.

In cordon based schemes, emissions are lowered as a consequence of car density reduction within the RP area. In the areas external to the RP area, where an increase in congestion is to be expected due to border effects, the traffic increment is limited and spans between the values of +5% to +11%.

In all cases, it is shown from simulations that the application of RP measures induces overall benefits in terms of congestion reduction and environmental impacts, while maintaining minimal boundary congestion levels as a side effect.