

URBAN ROAD PRICING¹

The question of acceptability

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**Centre d'études sur les réseaux, les transports,
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Analytical summary

Charging for vehicle movements (known as road pricing) in urban environments has been a subject of discussion for decades. Transport planners, traffic specialists and economists are as interested as ever in the use of road pricing as a management tool. Although few projects have so far been implemented around the world, several are likely to be introduced in the coming years. In practice, projects tend to founder on the issue of acceptability. Accordingly, capitalising Certu's knowledge of the field, based on our research, interviews and reading appeared to be a worthwhile exercise.

We prefer the expression "urban road pricing" to the more specific concept of "urban tolls". We also want to clearly distinguish between urban tolls for infrastructure such as bridges, tunnels and road sections (the only legal form in France) and road pricing more generally, of which urban tolls are merely one form. We wish to use and promote this broader concept, in order to avoid confusion between the two terms and to expand the debate to include other forms of charging for traffic movements.

Our aim is to provide a "debater's toolkit" relating to the topic of acceptability. Although we have not sought to close down debate and make no claim to be exhaustive, it appeared useful to seek a clearer understanding of the reasons for stakeholders' attitudes and to have an overview of the issues involved and the questions asked. To this end, we have not addressed the issue of a project's technical merits or given any final answers as to the utility of road pricing, because projects are necessarily influenced by local debate, contextual factors and political choices.

We have approached the issue of acceptability from three different angles:

Road pricing – How and Why? In order to position the debate constructively, it is important, in our view, not to focus on the question "For or against urban tolls?", which inevitably leads to deadlock. In order to develop acceptable projects, research shows that urban road pricing must be viewed as a transport policy tool, and that it is important to ensure that policy and the tools for implementing it are consistent. To this end, the decision-making process and communication strategy must be designed intelligently so that the project can be assembled in liaison with the various stakeholders.

The issues under debate. Clearly, there are numerous topics of debate relating to this complex, unpopular tool. We have outlined the aspects of the debate that relate to urban living: transport system efficiency and economics; environment and quality of life; shape and vitality of the town; social justice and freedom, etc. Road pricing lies at the crossroads of a host of issues that need to be identified and woven appropriately into projects;

Past experience in France and around the world. There is no shortage of solutions and success stories. The wide range of available techniques, measures and procedures are opening up new horizons.

A political hot topic?

Urban road pricing is very much a current issue, even if the debate has not yet spread to the general public. The first shots in the political debate have already been fired in parliament, with the vote on the Social Cohesion and Urban Renewal Act (loi SRU) in 2000. At European level, debate has clearly also been engaged.

Road pricing – How and Why?

Road pricing offers a solution to three families of urban problems: finance, regulation and the environment

Road pricing is generally proposed as a solution for three families of political project: financing transport systems, regulating traffic, and enhancing quality of life by reducing environmental nuisances. These three broad families relate to three basic principles: "the user finances infrastructure", "the user buys time" and "the polluter pays for their pollution". To the man in the street, the "polluter pays" principle is the most legitimate of the three, reflecting the extent of public concern for environmental issues. Improving the environment must undoubtedly be one of the leitmotifs of any road pricing project; the project should help to achieve this, either directly by applying a pricing system that acts as an incentive to use alternative modes of transport, or indirectly by reinvesting the funds thus raised to improve quality of life.

A tool for implementing transport policy

Road pricing solutions are generally classified in three categories: zone-based pricing, network pricing and proportional or complex pricing. Within these categories, however, the geographical boundaries of the area involved, the days and times at which the system is applicable, the fees charged, any exemptions and discounts, the manner in which funds are used and the alternatives available can vary greatly between projects. The acceptability of a project is influenced by the extent to which the proposed system is coherent with the policy it is designed to implement. Transport system stakeholders and the general public want to base their judgement on the merits of the system as a whole. Accordingly, there is a consensus among specialists worldwide that it is better to propose a basket of measures rather than an isolated pricing scheme; citizens tend to react differently and judge the policy as a whole, rather than viewing a particular tool as being an end in itself. Travel pricing can also be considered as a multimodal tool covering car travel, public transport movements and parking; the multimodality of pricing solutions is a major issue in the field of transport policy.

The importance of consultation and communication

Public acceptance cannot be achieved solely by rational argument. Rather, the decision-making process must set out to develop acceptability by organising interaction between decision-makers and stakeholders, enabling them to learn from each other and gradually shape an acceptable project. In parallel, it can generally be assumed that the objectives (e.g. reducing nuisances, decreasing the dominance of cars, reducing traffic and developing public transport) set out in relation to transport policies are broadly accepted. In contrast, the road pricing tools proposed as a means of achieving those objectives are strongly opposed, and their effectiveness is not understood.

Consultation during the decision-making process is particularly valuable in the area of road pricing, with transparency and dialogue with stakeholders being crucial success factors. Techniques used in marketing, relating to the manner in which a process able to satisfy customer expectations is organised and built, are an avenue worth exploring.

The role of the communication intended to establish the link between the objectives and the tools to achieve them emerges as being crucially important. It is essential to foster interaction between stakeholders and persuade them of the effectiveness of the proposed measure. In this area, nothing should be taken for granted and there is much work to be done.

There is, however, some scope for opinions to evolve, despite the highly negative attitude that currently prevails. Opinion has clearly already shifted regarding the "polluter pays" principle, as it eventually did with regard to metered parking - an issue very similar to road pricing. The example of 'cordon' schemes in Norway (whereby motorists are charged to enter a city), which were approved by only around 30% when they were introduced but by 50% ten years later, also supports the argument that acceptability can be developed as projects progress.

12 key acceptability-enhancing measures

By way of general recommendations, the measures listed below (in no particular order) enhance a project's acceptability:

- 1. The project must serve to implement and be consistent with a broader transport policy.**
- 2. The decision-making process should be devised to ensure transparency and facilitate interaction with the various stakeholders.**
- 3. Investing effort in communication and marketing makes for better project development and promotion.**
- 4. Issues of "fairness" should be addressed.**
- 5. The project's objectives should be in keeping with the main requirements expressed by the population.**
- 6. Revenue should be reinvested in transportation, and alternatives to car-based transport proposed.**
- 7. Adopting a step-by-step strategy makes it possible to adapt the project and keep step with public awareness.**
- 8. The population must be persuaded that there are no other viable solutions.**
- 9. The project should be kept as simple as possible.**
- 10. Special discounted rates should be charged when the system enters service.**
- 11. It is important to seek unwavering, broad-based political support.**
- 12. The various institutional tiers should establish sound negotiating capabilities.**

Elements of debate

Our experience has shown that when debate is engaged on the topic of road pricing, a series of conflicting arguments tend to be made, stimulating debate. Without claiming to be exhaustive, we have attempted to outline some of these arguments, which concern a number of areas including the economy, the environment, fair treatment and technologies. In any case, constructive discussion is only possible at local level, given how different the situation can be from one town to another. In all areas, the local context and the political objectives are the dominant factors.

Cost of transport

A few national statistics give an indication of the content of the debate when questions of transport costs arise: nuisance-related costs, subsidies, taxes and other household expenditure are often mentioned in the road pricing debate. In a nutshell, one can say that the arguments relating to the cost of car-generated nuisances are sound, especially in urban surroundings. In contrast, the benefit of public transport compared with cars in terms of total cost is harder to demonstrate, as it depends on bus occupancy rates. It should also be noted that the total cost of car ownership and use is high and often underestimated: a modest level of charges, with concessionary rates for the poorest users, would not place a significant burden on household budgets. Furthermore, local authorities have little scope for manoeuvre in their investments, and road pricing could offer a genuine solution to the transport system funding crisis.

Environmental risks of car traffic

Environmental issues are a prime concern of urban residents; in this respect, we note the importance of the "polluter pays" principle and of environmental arguments in the road pricing debate. As such, the environmental risks relating to car traffic are definitely germane to the debate. Whereas noise, traffic hazards, the contribution to the greenhouse effect and fossil fuel consumption are universally acknowledged to be long-term nuisances, the role of cars in air pollution is more subject to debate, as technological advances would appear to make for a favorable trend. Pricing is not therefore a substitute for anti-pollution regulations. It is, however, a tool consistent with a policy of reducing the dominance of cars; it also offers a means of levying the necessary financial resources for implementing nuisance reduction policies.

The prickly question of fair treatment in society

"Chequebook selection" is a leitmotif for road pricing opponents. Decision-makers and the general population rightly wonder about the fairness of a system that would charge for a previously free service, with the fate of the least well-off being a particular point of concern. In our view, discussion should always center on the urban transport system as a whole; the least affluent sections of society are most often captive public transport users, and pricing projects implemented as part of a broader transport policy can offer solutions to practical problems faced by households. Lastly, experience of urban infrastructure toll schemes show that although poorer people do use such structures less frequently, they are not excluded from the system.

Expected effects on urban planning and economics

The effects of road pricing on town planning and urban economics are poorly understood. The only objective data that we were able to locate relate to the Norwegian city of Trondheim, where no negative impact on city centre trade was observed following the introduction of cordon charging in 1991. Other theoretical analyses and studies based on analogies with parking restrictions and parking fees tend to corroborate this finding, although it may be useful to distinguish between an overall analysis of the city and analyses of individual areas. The two generally-expressed fears concern the city centre's attractiveness to residents and stores and, correlatedly, the impact on urban sprawl. The pricing structure adopted and the choice of locations and times at which charges apply can – even if they do not reassure stakeholders - at least show that the project is concerned about the impact on the city and its economy.

Benefits and drawbacks of the various available technologies

Technology is another topic of debate, against a background of fears about individual liberties. The various possible techniques are outlined below.

Type	Example	Benefits	Drawbacks
Windscreen disk	Singapore prior to 1998	<ul style="list-style-type: none"> - Very simple to implement - Does not allow the vehicle to be identified. 	<ul style="list-style-type: none"> - Rigid price structure. - Visual inspection required.
Conventional system with toll barrier and manual payment	Prado-Carénage tunnel; North Section of the Lyon ring road, intercity links	<ul style="list-style-type: none"> - Very familiar in France - Allows easy management of occasional users - Does not allow the vehicle to be identified. 	<ul style="list-style-type: none"> - Act of payment perceived directly - Slow flow rate - Hard to blend into urban environment - Vehicles brought to standstill - For single points only
DSRC badge (short-range data exchange, e.g. with a gate)	ETC at aforementioned facilities; Singapore since 1998	<p>May or may not allow the motorist or vehicle to be identified</p> <ul style="list-style-type: none"> - Easy to change prices - Flexible payment arrangements - Fairly familiar in France 	<ul style="list-style-type: none"> - For single points only - Hard to manage occasional users
GPS badge (data exchange with a satellite)	HGV traffic charge in Switzerland	<ul style="list-style-type: none"> - Custom pricing is possible, based on mileage, location or other criteria 	<ul style="list-style-type: none"> - Vehicle is identified - New technology - Hard to manage occasional users
Automatic number plate recognition	London congestion charge	<ul style="list-style-type: none"> - Allows easy management of occasional users 	<ul style="list-style-type: none"> - Vehicle is identified - New technology - For single points only

Examples around the world – Drawing on existing experience

Although the topic of road pricing is a current issue, France is not among the field's pioneers in urban environments, despite numerous precedents in Europe and around the world. These examples open up new perspectives and give an idea of the possible scope in terms of political objectives, technological solutions and implementation strategies. The annals of French history do contain a few examples of road pricing, however : urban infrastructure tolls have proved controversial; fifty years after their introduction, interurban tolls are now a familiar feature of the landscape; and paid on-street parking, which can be considered to be a form of car pricing, is a textbook example of the introduction of an unpopular charging measure.

We are aware of a large number of towns and cities that are interested in road pricing. Well-known examples include projects in Rome, Singapore, London, California and Switzerland :

- The historical centre of Rome. Since 1989, the Italian capital has been pursuing a policy of controlling access in order to preserve its historical heritage. Only residents and a limited number of professionals have access to the historical centre. Since 1998, these users must pay a subscription, which on an annualised basis is equivalent to a public transport pass. In 2002, the cordon around the zone should be made fully electronic, with travel charging being implemented inside an area delimited by 26 entry points and 29 exit points.
- All-electronic cordon-based road pricing in Singapore. Since 1975, the city state of Singapore has been operating a disc-based permit system for access to the business district, coupled with a draconian vehicle quota system in a state where space is limited. As the project successfully achieved its decongestion objectives, it was decided to migrate to an all-electronic system with no toll barriers. Benefits of included the ease with which users' permits can be checked and the flexibility of the system, which makes it possible to vary the charge according to the time of day and modify the rates if warranted by traffic conditions (not possible with the previous paper-based system). The congestion relief objectives have been fully achieved.
- The City of London introduced a cordon-based "congestion charging" scheme in January 2003. This project, championed by the mayor, Ken Livingstone, aims to relieve congestion in the heart of the English capital. The scheme is included in the municipal transport strategy approved in July 2001.
- Express toll lanes in California. Two motorways have introduced the principle of toll lanes, with other parallel lanes remaining free of charge: State Route SR-91 since 1995, and Interstate I-15 since 1998. The logic behind these express toll lanes, which can be described as "first class" lanes, is to ensure that traffic remains fluid at all times by adjusting the charge in response to the observed demand, even if the parallel lanes are congested;
- HGV traffic charge in Switzerland. Although it is not an urban pricing scheme, the Swiss example is nevertheless of interest, being the only example of remote pricing. The service-related charge for heavy goods vehicles (RPLP) has been in force throughout Switzerland since 1 January 2001.

The charge is proportional to two factors: the distance driven in the country, the vehicle's maximum weight; it is also influenced by the emissions standard with which the vehicle complies. This measure only applies to HGVs. The aim of the charge is to reduce environmental damage and slow growth in road traffic. Two-thirds of the revenue generated is invested in improving the rail system.

Far from being over, in France the debate on the acceptability of urban road pricing is only just beginning. More generally, certain aspects have not been thoroughly investigated; there is still considerable scope for sociological, political, marketing, legal and public relations studies, for example. Over the coming years, general and local studies should see the emergence of answers to the question "Can road pricing be a good thing for our towns and cities?"

Introduction

Charging for vehicle movements (known as road pricing) in urban environments has been a subject of discussion for decades. Each year, dozens of studies on the subject are conducted around the world. Transport planners, traffic specialists and economists are as interested as ever in the use of road pricing as a management tool. Although few projects have so far been implemented around the world, several are liable to be introduced over the coming years. In practice, such measures are snagged not so much by questions surrounding their technical merits, but by their acceptability to the transport system stakeholders that determine their political feasibility. Accordingly, capitalising Certu's knowledge of the field based on our research, interviews and reading, appeared to be a worthwhile exercise.

Readers may be surprised by our use of the expression "urban road pricing" rather than the more specific concept of "urban tolls". This is a deliberate choice, reflecting our desire to clearly distinguish between urban tolls for infrastructure such as bridges, tunnels and road sections (the only legal form in France) and travel charging more generally, of which urban tolls are merely one form. We wish to use and promote this broader concept, to avoid confusion between the two terms and to expand the debate to include other forms of charging for traffic movements.

Our aim is to provide an acceptability-focused "debater's toolkit", for use by anyone wishing to develop a point of view, take part in discussions relating to road pricing or commission studies for a project. Although we have not sought to close down debate and make no claim to be exhaustive, it appeared useful to seek a clearer understanding of the reasons for stakeholders' attitudes and to have an overview of the issues involved and questions raised. Accordingly, we have not addressed the issue of a project's technical merits or given any final answers as to the utility of road pricing, because projects are necessarily influenced by local debate, contextual factors and political choices. As a result, this document is written in simple terms and is aimed at all involved in the transport sector, including decision-makers, authorities, engineering departments, design offices and specialist associations.

Existing research into road pricing acceptability reveals the importance of situating the debate clearly and understanding the factors that foster acceptability: Is pricing an end in itself or a tool for implementing a policy? How should the decision-making and communication processes be shaped? This document sets out twelve recommendations that, if followed, can influence a project's acceptability. The arguments relating to road pricing can be classified in the following six basic categories: transport costs, the environment, fairness, the impact on the town and economy, technological solutions and personal liberties. Lastly, we have focused to a considerable extent on experiences in France and elsewhere in the world, which show more clearly than any theory the range of possible solutions, the decision-making processes and the technologies already in use or under consideration.

This document is divided into two sections, which approach the issue of acceptability from different, mutually-informative perspectives : Why use road pricing and how can it be implemented? What are the key elements of the debate? What can we learn from previous experience in France and around the world about the possibilities and scope for manoeuvre?

1. ROAD PRICING – HOW AND WHY?

This first section of the document is intended to warn readers against following a red herring - the road pricing debate is often reduced to a question of "Urban tolls – for or against?". We aim to show that such a narrow debate leads inevitably to stalemate, as problems are not addressed in the right terms.

So what are the "right terms"? For a start, one must accept that a tool such as road pricing can only be meaningful as part of a multimodal transport policy. The range of tools that can be deployed to implement such a policy is not limited to cordon-based charges; rather, there are an infinite number of ways to ensure that pricing tools and policies are coherent. It is the overall policy, complete with its raft of measures including road pricing, that will ultimately be judged by stakeholders and residents. Whether the system is based on cordon charges, license disks, express lane tolls or other mechanisms, the decisive factors are when and where the measure is applied, how the revenue thus generated is used, what multimodal alternatives to car use are offered and whether the project-specific arrangements are acceptable.

International experience reveals that this is no theoretical assumption – the acceptability of this type of project is determined to an extent by the decision-making and communication process. In a nutshell, road pricing can be a useful component of a solution to the problems encountered by authorities responsible for transport systems. Furthermore, such a measure can gain acceptance over time if care is taken to couch the debate in the correct terms and promote dialogue with stakeholders and the general population.

Naturally, this section does not claim to have any definitive answers to the questions "How?" and "Why?". Rather, it attempts to inform the reader and help to capitalize our knowledge in this area. We will attempt to outline the current state of affairs in France in relation to this issue, before describing the types of problems that can be tackled through road pricing. We will defend the argument that pricing must not be an end in itself but a means of implementing a policy. We then discuss the importance of communication and the decision-making process, and conclude with a list of 12 key measures that can help to foster acceptability.

We can learn two lessons from French history. By studying events and institutions (especially in pre-revolutionary France), we can see how tolls and other travel duties became widespread, both on land and at sea, generating income not only for the crown but also for a host of "turnpikers" including feudal masters, towns and village authorities, abbeys and other religious establishments. Toll were clearly among the crown competencies set out in the pre-revolutionary legal system. The aim at the time was to encourage the creation of local public services and organize their supervision, while fostering private initiative and the decentralization of public activities via delegation mechanisms, tenant farming and licensed infrastructure operation. Notwithstanding the rift that accompanied the French revolution [with the abolition of seigneurial toll rights] and the liberalism of the 19th century, the regalian characteristics of tolls can still be seen in contemporary society, with motorway operation being licensed to the semi-public corporations that began building the French network in 1956. The regalian origins of tolls explain to a large extent the suspicion still surrounding the principle today, with many users assimilating tolls to an unjustified tax rather than reasonable payment for the use of safe, efficient infrastructure.

Box 1. The history of tolls in France [L’histoire des péages en France - Dericke 1997]

1.1 A political hot topic?

Urban road pricing is very much a current issue, even if the debate has not yet spread to the general public. The first shots in the political debate have already been fired in parliament, with the vote on the Social Cohesion and Urban Renewal Act (loi Solidarité et renouvellement urbains) in 2000. This law is outlined below. Debate has also clearly been engaged at European level. Note that in France, only urban infrastructure tolls are legal, with tolls being levied for a limited period on bridges, tunnels or road sections.

In the course of debate on the Social Cohesion and Urban Renewal bill, an amendment was submitted to the Senate and National Assembly that would entitle cities with populations in excess of 300,000 to conduct limited-time trials of new forms of road pricing. This amendment was not passed, as the Infrastructure, Housing and Transport Minister, J-C. Gaysot, considered that the issue had not yet been studied in sufficient depth. Note that the members tabling the amendment were all from the Rhône-Alpes region, where they represented parties from across the political spectrum, including the left-wing Parti Socialiste and the right-wing UDF and RPR parties. The same MPs supported the first large-scale French research into road pricing, which was commissioned by the cities of Lyon, Saint-Étienne and Grenoble.

Note that the European Commission actively supports road pricing policies, including in urban areas. The White Paper "Fair Payment for Infrastructure Use" [European Commission, 1998] reflects this attitude: Member States are encouraged to develop urban road pricing schemes to deal with the external costs, including congestion costs, of urban transport. It is not appropriate that such schemes be organised at Community level, though the Commission will continue to fund research and demonstration projects related to urban road pricing. Note that Brussels has adopted an economist's position on the subject: the infrastructure charging system must cover the costs not covered by motorists (i.e. congestion, pollution, etc.).

1.2 Road pricing as a solution to three families of urban problems

Road pricing is generally proposed as a solution for three categories of political project: financing transport systems, regulating traffic, and enhancing the quality of life by reducing environmental nuisances. The situation as it stands is outlined below. For more details on these aspects, refer to the CETUR document "Péage urbain. Vivre et se déplacer en ville ["Urban tolls. City life and travel" Cetur 1994], which covers the subject in depth.

These three broad families relate to three basic principles: "the user finances infrastructure", "the user buys time" and "the polluter pays for their pollution". We describe below the results of a survey conducted by Certu [PRIMA 2000], which shows the importance to the public of environmental issues and gives a certain legitimacy to the idea that the polluter should pay for their pollution.

One can conclude that improving the environment must undoubtedly be one of the major themes of any road pricing project, whether this is achieved directly by applying a charging system that acts as an incentive to use alternative modes of transport, or indirectly by reinvesting the funds thus raised in improving quality of life.

It is only natural to wonder how efficient these three families of charging system are. In this respect, we have included some information (concerned with charging rather than taxation) relating to finance issues, and data relating to the easing of traffic congestion following the introduction of road pricing. We have not, however, addressed the influence of road pricing on cutting pollution, owing to a lack of relevant documentation.

1.2.1 The three families – Finance, Control and the Environment

In schematic terms, pricing projects can be organised into three families: finance charging, congestion charging and environmental pricing. These families are not mutually-exclusive, but provide a useful framework for analysis.

Finance charging is a familiar concept in France. This approach consists in charging for infrastructure use as a means of safeguarding the financial balance of part or all of the transport network. The toll amount is based on the network's investment and maintenance needs. France's intercity motorway system uses a finance toll system. One should distinguish, however, between urban infrastructure tolls, which apply to a particular structure or section of road, from a broader road pricing approach, which can be implemented as a source of finance for the overall road network, the entire transport network or even the global budget of a local or national authority.

Control or congestion charging is based on the "time is money" principle. Charging road use at the times and in the places where congestion forms mechanically reduces the number of vehicle movements - and the corresponding traffic jams; some road users will be willing to pay in order to save time, while others may avoid travelling, travel at a different time or to an alternative destination, use a different means of transport, etc.

Environmental pricing is based on the "polluter pays" principle, the importance of which is examined in § 1.2.3. Whenever a motorist uses their car, they generate costs to society in the form of noise, pollution and traffic hazards; these costs are not paid for by the motorist as they travel, or at least not in full. Asking the motorist to bear these costs would ensure that they are aware of the true cost of car use, leading to more satisfactory utilization of the various transport networks and more rational sharing of public spaces.

1.2.2 "The user finances infrastructure" and "the user buys time" are not generally accepted principles

A survey² was conducted to record people's reactions to the principles underpinning urban infrastructure tolls, based on how they use them in Lyon and Marseille (for the TEO ring road and the Prado-Carénage tunnel, respectively).

The results show that the principles of "the user finances infrastructure" and "the user buys time", which justify the existence of tolls, are not widely approved. Only 38 % of respondents in Marseille, and 29 % in Lyon, agreed with the statement "It is right for there to be a toll [at the Prado-Carénage tunnel / on the north section of the ring road] because it should be the users that pay". Similar responses to the statement "People in a hurry should be allowed to pay to travel faster" were obtained: 37 % in Marseille and 41 % in Lyon agreed.

Knowing the problems involved with implementing the Lyon tolls, one might expect the responses to be more encouraging in Marseille, especially as the operator of the Prado Carénage tunnel, Société Marseillaise du Tunnel Prado Carénage, markets itself as "selling time" and has enjoyed considerable commercial success. Nevertheless, the principles of "the user financing infrastructure" and "paying to save time" are not accepted by the majority. They can therefore only be part of the justification for introducing a road pricing system.

There is clearly a significant disconnect between stated principles and actual realities, given that the principles are not widely accepted but the structures have not only been built, but in 2001 were operating in line with forecasts.

Pour ou contre l'utilisateur payeur

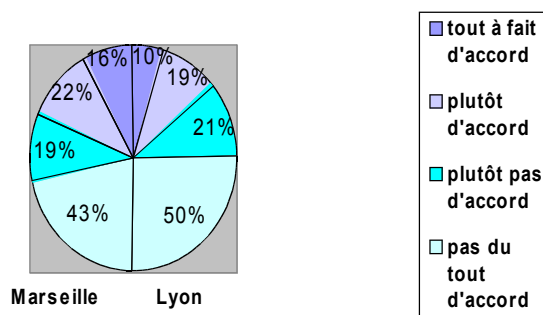


Figure 1. "The user finances infrastructure" is not generally accepted principle

²This survey was conducted within the framework of an EU project called PRIMA [PRIMA 2000], which included six other European cities (Barcelona, Bern, Oslo, Rotterdam, Stockholm and Zurich) as well as Lyon et Marseille. The same survey was also carried out in Geneva. In Marseille and Lyon, the survey was conducted by the market research agency IPSOS in September 1999, using a sample of 2x500 individuals compiled using the quota method.

1.2.3 "The polluter pays" is a widely accepted principle.

Unlike the other principles, a majority of the population approves the idea that "the polluter pays". When asked whether polluters assuming responsibility and paying for the damage they cause others would solve congestion and pollution problems, approximately 70% of respondents in both cities agreed. On the same theme, the construction of new roads is only favoured by 46 % of Lyon residents, compared with 58 % of people in Marseille.

Another question in the survey corroborates the sentiment that after several years of growing awareness of ecological issues, the "polluter pays" attitude has become the norm. 56 % of respondents in Lyon and 59 % in Marseille share the view that "taxing cars according to the pollution they create would solve traffic and pollution problems". This compares with figures of 17 % who thought the same result could be achieved by charging to use the road, and 5 % by increasing the price of petrol.

Fierce protest against petrol price increases in September 2000 underline the need for caution in interpreting these results. Fuel duty is related to the "polluter pays" principle, since the amount levied is proportional to energy consumption. However, the perceived difference in efficacy between petrol price increases and the introduction of a pollution-based tax shows that survey respondents view domestic duty on petroleum products as merely a tax that does not act as an incentive to alter behaviour. Users' perceptions are consistent with the government communication line, which conceives of domestic duties on petroleum products as a budgetary instrument.

Studies focused on the other European cities in the PRIMA project revealed that in terms of the acceptability of the "polluter pays" principle, the two French cities were those, with the Swiss cities of Bern and Zurich, which have a reputation for progressive policy in the areas of alternative means of transport and environmental protection. This finding was a considerable surprise.

What pricing tools could reduce nuisances and congestion?

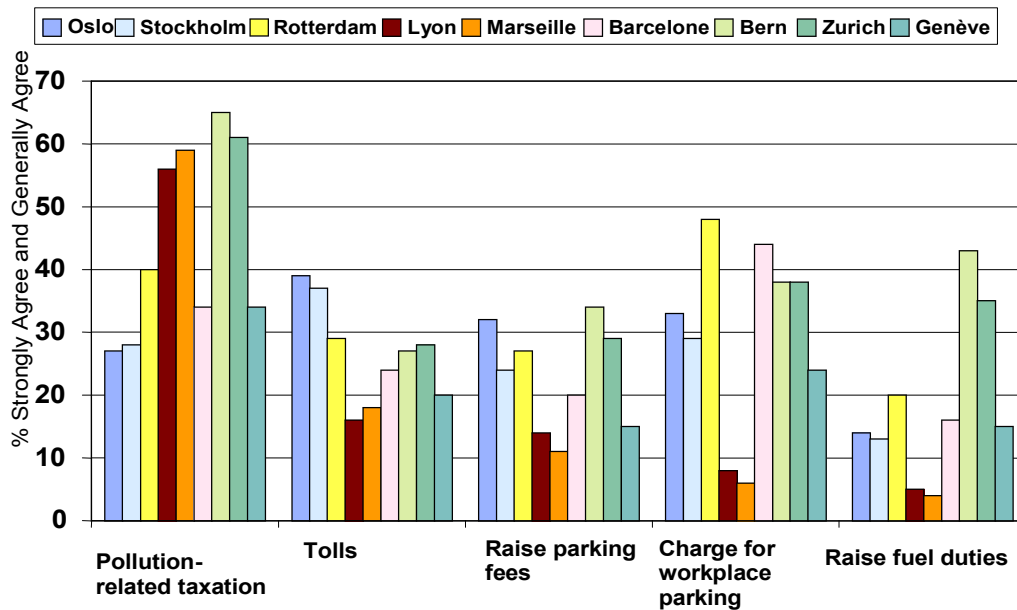


Figure 2. The "polluter pays" principle and other charging tools in Europe

The implementation of the "polluter pays" principle is also fraught with ambiguity, as eloquently expressed by a farmer : "I was surprised to find that this tax is levied on all farmers, good and bad alike, through a tax on their fertilisers and crop protection products. The result of this is that it is no longer possible to point the finger at someone who fails to observe the guidelines by saturating the soil with products, as they can simply turn round and say: 'I pay the ecotax set out by the "polluter pays" legislation; I'm legal, I've bought the right to pollute'".

Notwithstanding these ambiguities, it would naturally be unwise to hastily conclude that a "polluter pays" system could be implemented tomorrow, particularly as other surveys reveal that "pollution is caused by other people"... Also, it was not made clear in the survey whether or not the measure would apply to the respondent. However, these results support the view that predicating road pricing measures on environmental arguments is essential and undoubtedly increases the political feasibility of such a system.

1.2.4 Infrastructure financing through taxation – The solution?

A common counter-argument to the idea of introducing road pricing based on the "finance charging" principle is to use taxation rather than consider complex, unpopular measures.

Clearly, increasing existing taxes or ringfencing a portion of those tax revenues (e.g. domestic duties on petroleum products) is a mechanism mastered by the tax authorities. Furthermore, there is some scope for manoeuvre in that area, however restricted it may be. In any case, the population's reactions to such measures are better understood than to road pricing initiatives.

Without denying the realism of these arguments, two counter-arguments can be made. Firstly, the advantage of road pricing is what some refer to as a "double dividend": raising funds while at the same time modifying behaviour patterns through incentive pricing. Taxation has a less direct impact on behaviour, although certain forms of tax (e.g. fuel duty or the road fund license) that vary according to the vehicle's average consumption can have an incentive effect. This said, although it is harder to introduce road pricing than to increase an existing tax, road pricing can potentially have a much greater impact on transport system operation.

Secondly, there is less and less scope for further increases in local taxation in many cities where the tax burden is already heavy. In parallel, ringfencing a portion of fuel duty revenue for public transport is an often-touted solution that appeals to many people, resembling as it does a "polluter pays" type measure, while at the same time being relatively painless, given that fuel duty rises are more familiar than road pricing. However, French's transport authorities organization, GART, has been calling for such a measure for the last 20 years (see Box .2); these cries have fallen on deaf ears partly because of the principle of not allocating revenues in advance. Furthermore, motorists in rural areas could justifiably complain that they were subsidising urban travel.

"Looking beyond the economic situation to consider the very structure of the taxes and subsidies, France's urban transport systems remain at a clear disadvantage compared for example with their German counterparts [...]. This has prompted repeated calls by public transport stakeholders for dedicated resources. From the outset, GART advocated allocating a portion of fuel duty revenues to fund public transport. Drawing on the "polluter pays" principle, this idea returned to the spotlight in the early 1990's, when increasing pollution was making the development of alternatives to cars essential. Following on from the GART, the mayors of France's cities mobilised in 1992, but successive governments have without exception paid no heed to these calls.

In GART, 20 ans de politique de déplacements. Mieux vivre avec les transports publics, (In GART, 20 years of travel policy. Public transport for a better lifestyle) Paris, March 2000, 259p

Box 2. Public transport funding difficulties as seen by GART

1.2.5 A solution for relieving traffic congestion ?

Road pricing is often advocated as a means of relieving congestion on the roads, particularly in the English-speaking world . We are wary of offering our unconditional support to this argument, as it would appear that things are somewhat unclear from an acceptability perspective; the level of prices that would have to be adopted in order to clear congestion on road networks might prove totally unacceptable. There are however some successful examples of congestion charging schemes, which proves that the solution is not completely utopian, although the circumstances are quite specific in each case, and it is by no means certain that the strategy could be transposed to urban situations in France.

Consequently, we prefer to consider congestion charging as a concept rather than a short-term solution. Over the longer term, on the other hand, congestion charging could be considered as an evolution to a system already implemented, with charges being differentiated by time slot to reduce or eliminate congestion.

Note that motorists have difficulty understanding the notion that they should pay more as the service level deteriorates. However, if congestion is effectively alleviated, the argument is turned on its head, allowing analogies to be drawn with the differentiated charging systems already used for rail fares, telephone services and electricity, which in turn show that the idea is not completely abstract.

The price of alleviating congestion

Congestion charging forms a sound theoretical model to which to refer. However, applying it too rigidly can have results that pose problems for operators:

- The theoretical charge rates are highly sensitive to traffic conditions and could exceed €1.50 per km . in the event of hypercongestion. In view of the outcry prompted by the €2.40³ charge for 10 km in Lyon, such a price seems completely unrealistic, even if it were only applied during very limited time periods in a few precise locations;
- Charges are only levied during short periods during the day, at specific points in the network. As a result, the technological solutions that must be implemented can be complex and the revenue generated by congestion charging can be limited.

Decongestion success stories : Singapore, California and the A1 motorway in France

Since 1998, Singapore has been operating an electronic charging system in which the charges levied are intended to relieve congestion in the charged-for area. According to the authorities, as of May 2001 the system was operating with reasonable charges of between SGD 0.50 and SGD 2.50 (i.e. 0,3 € and 1,5€) per entry point to the charging zone. It is not easy, however, to transpose the Singapore example for the French or European context. This is because road pricing in Singapore is just one of a range of congestion-reducing tools, including purchase taxes and a draconian policy to restrict car numbers.

The examples of Californian toll expressways offer further evidence that it is possible to keep traffic flowing along a route by determining the right price, as in San Diego, where the charge is between \$0.50 and \$4 (i.e. 0,6€ and 4,5€) for a 13 km section, depending on the time of day. As before, the context is quite specific, as there are congested free-to-use lanes running parallel to the expressways.

Our final example concerns the peak-times charging scheme that has been in operation on the A1 motorway in France since April 1992. Between 4.30 pm and 8.30 pm each Sunday (i.e. when many people return to the capital after a weekend away), the toll is increased by 25 % (€14.70 for the journey between Lille and Paris); conversely, the toll is decreased by 25 % (€8.80 (2001 figures)) during the periods immediately preceding and following the peak slot. In autumn 1992, traffic fell by 4.4 % during the so-called Red period, and increased by 6.6 % in the two Green periods. The congestion peak was effectively dispersed; the effect on congestion appears significant, although no reliable quantifiers have been measured. The A1 scheme is an example of interurban motorway congestion relief, which cannot be translated directly to urban conditions, as congestion does not recur according to the same pattern and users are not subject to the same time slot constraints.

³In 2007: 1,80 euros.

In summary, despite these three remarkable success stories, it remains to be proved that road pricing based on the congestion relief principle would be effective and realistic in an urban road network.

1.3 A tool for implementing transport policy

Road pricing solutions are generally classified in three categories: zone-based pricing, network pricing and proportional or complex pricing. Within these categories, however, the geographical boundaries of the area involved, the days and times at which the system is applicable, the fees charged, any exemptions and discounts, the manner in which funds are used and the alternatives available can vary greatly between projects. Consequently, although it can be useful to refer to this framework it is important to bear in mind the wide range of tools available.

The acceptability of a project is influenced by the extent to which the proposed system is coherent with the policy it is designed to implement. Transport system stakeholders and the general public want to base their judgement on the merits of the system as a whole. Accordingly, there is a consensus among specialists worldwide that it is better to propose a basket of measures rather than an isolated pricing scheme; citizens tend to react differently and judge the policy as a whole, rather than viewing a particular tool as being an end in itself.

Travel pricing can also be considered as a multimodal tool covering car traffic, public transport movements and parking; the multimodality of pricing solutions is a major issue in the field of transport policy.

1.3.1 The various forms of pricing – multiple, customisable solutions

The following three categories provide an idea of the various forms of pricing that have been devised. Readers should not conclude that there are only a limited number of systems, as project-specific parameters make for a near-infinite range of possibilities.

Zone-based charges. The charge applies to a particular area, such as the city centre, a central town or any other geographic zone. "Cordon" charging, whereby a charge becomes payable when a vehicle enters the zone is one form; the charge may also be applicable to all movements within the zone, including those where the vehicle does not leave the zone. Multi-zone systems with concentric or honeycombed zones are also possible. The systems implemented in Singapore and the three Norwegian cities of Trondheim, Oslo and Bergen are zone-based charging solutions.

Network-based charges. In this case, the pricing mechanism applies to a particular network, such as a city's express roads. All the lanes in a particular section may be subject to charges, in which case the road may be referred to as a "first-class" or "premium" road. Alternatively, only certain lanes may be subject to charges, in which case they are known as express toll lanes. France's intercity toll road system and Californian toll expressways are examples of network charging solutions.

Proportional or complex pricing. The charge is directly dependent on the nature of the vehicle movement. Pricing may be proportional to the distance covered or the time elapsed, for example. There is nothing to prevent the per-kilometer or per-minute charge from varying between areas or between road sections. The HGV duties levied in Switzerland are one example of a proportional pricing solution.

Obviously, these three pricing categories are not mutually exclusive, and projects may combine characteristics of more than one type of solution.

1.3.2 Coherence between tools and policy

The notion of coherence would seem to be a key concept from an acceptability perspective. Interviews and focus groups run by Certu have confirmed that the reactions of transport system stakeholders is influenced not only by the tool proposed (i.e. license disks, cordon charging, network pricing, etc.), but also by the overall travel policy: What are the environmental, financial and control objectives? How will the revenue generated by the pricing system be used? What alternatives to car transport are available? What pricing structure and intermodality arrangements? etc. Clearly, such solutions need to be incorporated into a new Urban Transport Plan; the global, multimodal nature of these plans and the organised consultation process both help to instil a more positive image of the tool.

The international literature echoes this observation and highlights the importance of proposing a basket of measures rather than road pricing on its own. A survey conducted in London [Jones 1992] revealed that 53 % of Londoners were opposed to the principle of road pricing. After being questioned about their preferred use of the revenue raised by road pricing, if introduced, only 32% of the same sample still opposed road pricing if the funds were used in accordance with their wishes. Another survey conducted in London, in April 2001, revealed that 41 % of the population agreed with the road pricing principle, 43 % agreed with the principle of a cordon-based charging scheme around the city center and 51 % approved the scheme actually being proposed .

Specialists also acknowledge that channelling the revenue generated to the transport sector increases a project's acceptability. This has not been overlooked in the English legislation, which stipulates that any authority seeking to implement a road pricing scheme must invest the charging income into its transport plan for a period of 10 years. The revenue generated by the Norwegian cordons is also devoted to transport, mainly investment in roads. The project's main goal involved the road system; political bargaining, however, ensured that a share of the income was allocated to alternative means of transport. Revenue use is another area illustrating the importance of ensuring that the proposed tool is consistent with transport policy.

London and Rome offer two concrete examples of the importance of striking the fine balance between the proposed tool and the transport policy. Both capitals implemented a cordon charging system ringing the city center. The stated goal of the English project, is to decongest the city center and invest in public transport; in the Italian case, the aim of the project, which has been operating since 1998, is to protect the historical city center from environmental damage caused by cars. Although the basic principle – cordon charging - is the same, the objectives are very different and the manner in which the two schemes are run is accordingly also very different.

The charge in London is naturally high⁴, at £5 (=7,42 €) per day; in Rome, only certain categories of motorist can enter the city center, subject to payment of a fixed annual fee equivalent to the public transport annual pass. Both projects use cordon charging, but each is implemented in a manner consistent with the local objectives.

We conclude this section by noting the importance of the availability of viable alternative forms of transport. The greater the range of alternatives, the less coerced and deprived people feel. All aspects of the alternative offering should be given careful consideration, including the ability to change times, destinations, modes and means of payment. English cities seeking to introduce cordon charging schemes are faced with a "chicken and egg" question: Must we invest in the public transport before introducing the charge, or afterwards, using the funds generated by the system ?

1.3.3 The multimodal issue

Road pricing can and should be multimodal. This aspect must be given consideration if road pricing is to be incorporated into a transport policy, which by nature will be multimodal. Three forms of multimodal pricing are outlined below, ranked in order of their degree of integration.

Road pricing revenue can be pooled between all means of transport.

Comparable amounts can be charged to the prices paid by public transport users.

multimodal means of payment covering car travel, public transport and parking can be used.

In their research, the cities of Lyon, Saint-Étienne and Grenoble adopted the principle that only multimodal pricing tools would be eligible for further analysis.

1.4 The importance of consultation in the decision-making process

Public acceptance cannot be achieved solely by rational argument. Rather, the decision-making process must set out to develop acceptability by organising interaction between decision-makers and stakeholders, enabling them to learn from each other and gradually shape an acceptable project. In this area too, the transport policy acts as the foundation on which the project must be built; it is important to seek a consensus on the diagnostics and the consequences of not solving problems by means of an appropriate policy.

Consultation during the decision-making process is particularly valuable in the area of road pricing, with transparency and dialogue with stakeholders being crucial success factors. Techniques used in marketing, relating to the manner in which a process able to satisfy customer expectations is organised and built, are an avenue worth exploring.

⁴In 2007 : £12 (17,8 €)

1.4.1 Transparent decision-making

The examples involving Lyon, Marseille and Toulouse, highlight the importance of the decision-making process and the public perception of transparency. Consultation and communication are key factors in this decision-making process.

Transparency is not achieved simply by complying with procedures, as the counter-example of the TEO ring road in Lyon clearly demonstrated. France's system of urban travel plans (PDU) and the related requirements in terms of notifications, consultation with stakeholders and public information campaigns ensure a certain degree of transparency within the decision-making process. This approach can clearly be adopted as a model to follow, particularly as road pricing projects should only be envisaged as part of a global transport strategy, as explained in § 1.2.2.

Several European cities have turned the consultation process to political advantage, notably the British cities of London, Edinburgh and Bristol, which are accustomed to such procedures. Much can be learnt from these case studies, which clearly demonstrate the utility of the consultation process in encouraging the population to adopt a project and ensuring that the decision-making process is transparent.

The next section of this document describes the findings of a network of European cities that conducted road pricing consultation exercises and the results of the public consultation process undertaken by the British government in preparation for the road pricing bill adopted by parliament in 2000.

1.4.2 Findings of the Europrice network of cities relating to consultation on the subject of road pricing

The cities⁵ in the Europrice project [Europrice 2000], supported by the European Union, joined forces in a network of urban communities that share their experiences in the area of road pricing research and implementation. They formulated a number of findings regarding the consultation exercises that they conducted:

- 1) Consultation is a key acceptability factor;
- 2) There is a relationship between the effort invested in the consultation process and the level of approval and awareness of road pricing;
- 3) Consultation in the Europrice cities is facilitated by the fact that decisions are local, but the national debate surrounding planned legislation help to raise awareness of the issue;
- 4) The most fervent proponents are the parties representing the general public, which see road pricing as offering solutions to congestion and pollution problems. The fiercest opponents are the lobbies that represent special interests, which see road pricing as inhibiting the freedom of movement;

⁵In 2000, the network comprised the cities of Belfast, Bristol, Copenhagen, Edinburgh, Genoa, Leicester, Rome and Trondheim.

5) The attitudes of certain stakeholders are a major grey area, with some players expressing themselves in hypothetical terms or sticking to positions that are not clearly defined. Such attitudes reflect the complexity of the issue.

1.4.3 The English consultation process on planned legislation to authorise road pricing

In the United Kingdom, four different laws provide for road pricing :

The Greater London Act of 1999 authorised the introduction of road pricing and charging for workplace parking.

The English, Scottish and Welsh Transport Acts were passed in 2000 and 2001.

The English Act and the Greater London Act were preceded in 1998 by a wide-ranging consultation procedure based on a preparatory document entitled "Breaking the logjam. The Government's consultation paper on fighting traffic congestion and pollution through road user and workplace parking charges".

This consultation paper had itself been preceded by a White Paper entitled "A new deal for transport", which sought to carry forward the debate on new forms of pricing.

The consultation procedure lasted four months, between December 1998 and March 1999 ; some 8,000 copies of the rather thick document, which asked 47 questions. A total of 665 replies were received, 200 of which from local authorities, 120 from companies or representatives of the business world, 110 from private citizens and the remainder from miscellaneous associations, transport corporations, etc. Three local meetings were held, in Birmingham, Leeds and London. In all, 75 % of respondents took the view that new pricing systems were necessary, with 20 % opposing them; naturally, these figures are not representative of the general population.

The government response

The results of the consultation lent weight to the government bill, which therefore retained the articles on charging. In early 2000, the government published a report on the consultation procedure, entitled "Breaking the logjam. The government's response to the consultation.". This assessment reveals that the consultation appears to have clarified some of the government's uncertainties and considerably strengthened the government's case for legislation.

Further to the consultation, for example, the government decided that :

- Towns and cities would be free to choose whether or not to implement new pricing systems;
- All revenue generated by pricing schemes must be invested in transport for the first ten years following their introduction;
- No improvements to the transport system would be required prior to application of the charge. However, such improvements were acknowledged to be an important point with a potential impact on acceptability; improvements could be financed by borrowing or through public-private sector partnerships (PFI).
- The risk of strangling city centre economies was a major concern of respondents. The government considers that a well-engineered global project should offset the drawbacks, by charging in appropriate places and using the income to improve the transport system;

- Towns and cities would be largely free to decide on exemptions: ambulances, police cars and fire engines would be exempted nationwide. There was no consensus on the question of a nationwide exemption for the disabled; the government did not arbitrate on this point in its report.

Points of interest to the French context

In the light of events in Britain, the importance of adequate consultation appears obvious, and it should be planned for from the outset. Accordingly, we strongly recommend designing the exercise meticulously, with help from specialists in PR and marketing, etc. This is particularly important given that the consultation procedure will need to be adapted to suit France's cultural context. Note the following points:

- The situation at national level influences public awareness of transport and pricing issues: should a national debate occur before, during or after local consultations? There is no clear-cut answer.
- What is proposed during a consultation exercise is an overall project: a transport policy including the introduction of a particular tool. Specifically, the system's aims and the manner in which the revenue generated will be used must be explained.
- There are two possible attitudes: prompting residents to respond either to general city scenarios or to the operating arrangements of near-finalised system. (cf. the examples of the systems in Edinburgh and London). Do these two attitudes complement or compete with each other?
- The consultation and communication initiatives must address a range of target groups, including residents, districts, lobbies, etc. In particular, the British attach great importance to economic and trade-related stakeholders.

1.4.4 Drawing on marketing techniques to build an acceptable project

Certain methods developed in the marketing industry can play a major role in building a project and making it acceptable. These techniques make it possible to better understand "customer" expectations, while also segmenting users in order to tailor the solution to their characteristics.

R. Revat [Abraham et al., 2000] echoes these conclusions after examining the case of the northern ring road in Lyon, which encountered serious difficulties when it opened. We advise licensing authorities and operators to adopt a marketing-oriented logic in order to ensure that their toll infrastructure projects are acceptable. This marketing-oriented approach should be assimilated via a dual perspective:

- In terms of the principle - considering the user as a customer with freedom of choice and attempting to satisfy them more than the competition. This paradigm shift should be made at each stage of this type of project;
- In terms of the approach – supplementing the traffic studies with genuine consumer tests, measuring the shifts in public opinion until the sales targets are achieved and periodically checking that customers are satisfied. It is important not to lose sight of the fact that communication is only one aspect of marketing.

Provided this advice is heeded, it is possible to transparently and simultaneously satisfy the interests of all the stakeholders in this type of project, including local authorities, citizens, users, operators and investors.

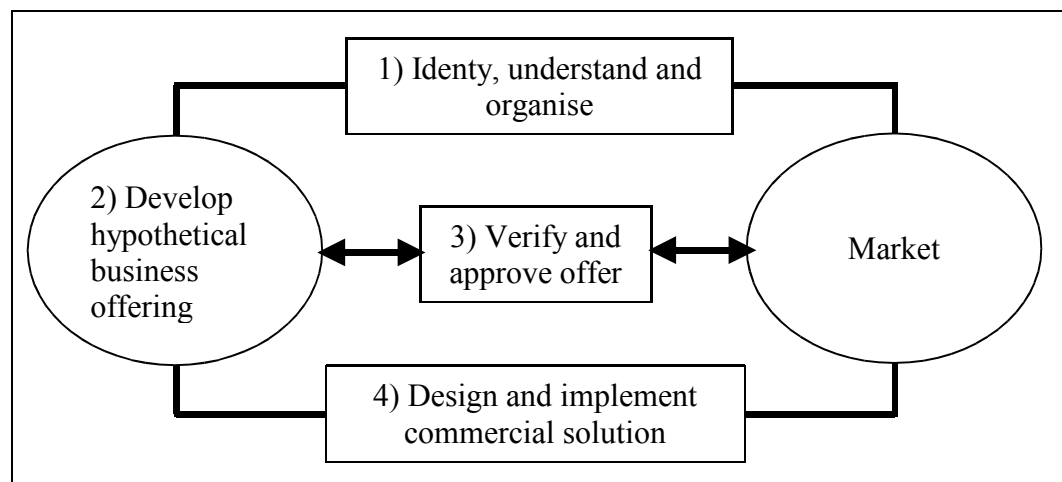


Figure 3. The marketing-oriented approach, as seen by Revat [Abraham et al., 2000]

The example of the Prado-Carénage tunnel in Marseille offers a good illustration, as the company operating the tunnel adopted a clear marketing-based strategy. The tunnel had originally been expected to open with a toll of €2, but in practice, the charge was reduced to €1.5 for acceptability reasons after conducting marketing research. The price was raised after the opening period, and was €2.1 in 2001. Similarly, the pricing structure has been devised to offer numerous services and discounts to the various categories of tunnel user, including season ticket holders, occasional users, taxis and businesses.

1.5 Changes in attitude required and to be expected : the importance of communication

Objectives for public transport policy are generally accepted these days (reduction of nuisances, reduction of automobile traffic and congestion, development of public transport, etc.). However, the tools for charging automobile movements proposed to reach these objectives are strongly rejected and their efficiency is not included. The roles of communication that has to make the connection between objectives and tools appears of the utmost importance: convincing people of the efficiency of this measure. In this area, nothing is taken for granted, and this is an important area of work.

But there is room to manoeuvre to develop opinions despite current very negative attitudes. It is partly via careful communications policy that a growing number of people will support a given project.

Several elements support this theory. Opinions have already obviously changed towards the idea of a polluter/payer, or are at least changing in terms of paid-for parking, which is now politically feasible. The Norwegian experiments mentioned below support the idea that acceptance is growing.

Towns that have encouraged public transport and reclamation of urban spaces to the benefit of alternative modes of transport all say that the first few steps are the hardest and that thing get a lot easier afterwards (see Box .3).

“Examination of public opinion regarding transport policy shows that courage becomes more and more easy as courageous measures are taken. In other words, the permeability

of public opinion to restrictive measures increases with restrictive measures. The first steps are the hardest. Public opinion can learn.”. Y. Laurin, Communauté Urbaine de Strasbourg, in Certu, Stationner, circuler, respirer - le stationnement instrument politique de la ville, Lyon, 2000.

Box .3. Strasbourg's experience in restrictive measures against motorised traffic.

1.5.1 Locals agree with the objectives but charging schemes not understood

Most people want to see a solution to traffic problems [PRIMA 2000]: In Lyon and Marseille, more than 80% of those questioned said jams and parking were an great or very great problem when coming into the city centre. Similarly, more than 85% thought public transport had to be made more attractive to reduce jams.

However, when asked if road charging would resolve the issue of traffic jams and pollution, more than 80% said they tended to disagree or disagreed strongly. The question concerned "road charging around the city centre" (83% in Lyon, 81% in Marseille), "road charging on all motorways in the city area" (87% in Lyon and 92% in Marseille) or "road charging on new roads" (87% Lyon, 91% Marseille).

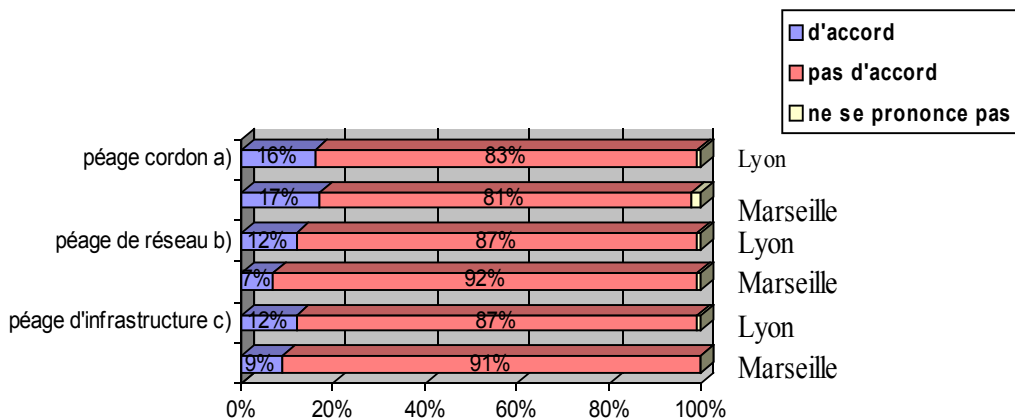


Figure 4. For or against road charging
 (for in blue color ; against in red color ; no answer in yellow color)

1.5.2 Communication and the media

Communication and the role of the media in preparing and continuing a project are very important. We have seen how much the gap between a charging scheme and its objectives can be overcome, particularly through communication. The contrasting examples of Lyon and Marseille in terms of urban toll schemes show the importance of communication and the media.

In Marseille, the concession holder was very much present before opening in terms of advertisements, event sponsoring and a logo showing a smiling car. In Lyon, the strategy was much more discrete. The front pages of the Marseille and Lyon local dailies a few days before opening were very different: "2 minutes 30 seconds to cross Marseille" compared to "Northern circular: blackspots before opening". The success of the Marseille scheme and the problems in Lyon are partly linked to these communications strategies.

A few features of a road charging scheme marketing campaign ·

Increase awareness of the costs generated by the transport system; ·

Link transport objectives and the efficiency of the proposed charging scheme; ·

Make sure that the first users of the system have had a positive experience; ·

Provide a range of choice (transport type, means of payment, etc.) for users to create a feeling of freedom of choice; ·

Develop awareness of alternative means of transport by making them attractive and ensuring they're known about. From [CAPRI, 1999]

Box 4. Communication elements for a road charging scheme

1.5.3 30% in favour: a useful threshold?

It is probably not a good idea to expect people to vote in favour with road charging, especially in the first cities to take such schemes on. The 30% threshold of people in favour with road charging before implementation is perhaps a significant figure to bear in mind and one found in the case of paid parking and in Norwegian cities that have created charging zones. Of course, there's no harm in trying to reach 60% in favour, as in the case of Edinburgh.

In terms of public opinion, Norway is interesting because cordons were created in its cities despite a majority of the population being against the idea. However, the proportion of people in favour with the schemes has continued to grow, for example from 28% in 1989 to 45% in 1998 in Oslo, which implemented a system in 1990. The same goes for Trondheim, where 70% of its inhabitants were opposed to a charging project a few months prior to its opening, compared with 40% two years later.

In the case of paid parking, a survey quoted in the press claimed that 30% of people were in favour with paid parking on streets in the late 1960s, just when the first French cities were bringing it into force.

1.6 12 key elements for building acceptability

The general purpose is to clear up the question of acceptability; it is however possible in a fairly schematic way to make a few recommendations that can regularly be found in documentation on the subject. All these recommendations are included in the text of this document. It's not a question of laying down rules but of giving a summary of the elements that have proved to assist in building acceptance by the various groups involved.

1. **The project must serve to implement and be consistent with a broader transport policy.**
2. **The decision-making process should be devised to ensure transparency and facilitate interaction with the various stakeholders.**
3. **Investing effort in communication and marketing makes for better project development and promotion.**
4. **Issues of "fairness" should be addressed.**
5. **The project's objectives should be in keeping with the main requirements expressed by the population.**
6. **Revenue should be reinvested in transportation, and alternatives to car-based transport proposed.**
7. **Adopting a step-by-step strategy makes it possible to adapt the project and keep step with public awareness.**
8. **The population must be persuaded that there are no other viable solutions.**
9. **The project should be kept as simple as possible.**
10. **Special discounted rates should be charged when the system enters service.**
11. **It is important to seek unwavering, broad-based political support.**
12. **The various institutional tiers should establish sound negotiating capabilities.**

Box 5. 12 elements for building acceptability

1. The project must be part of the overall transport policy and coherent with it. Charging for automobile travel as part of a whole and coherent action mean that those involved see a policy and not a measure taken in isolation, increasing acceptability. Furthermore, this helps communication and debate.

2. The decision-making process must be built so as to guarantee transparency and facilitate interaction with the various groups involved. Efforts to find an agreement on projects increase transparency in the decision-making process, something that is not achieved by strictly keeping to procedure. The decision-making process must therefore be explained to facilitate interaction of the various interested parties: Urban Transportation Plans are one such example. Experience shows that a majority in favour with road pricing does not have to be achieved to see a project through.

3. Communication and marketing campaigns should succeed in elaborating upon and promoting the project. Public opinion, which may be against road charging, can change if the project is made part of an overall policy and also if communication on the project is included in the decision-making process: raising awareness and convincing are the keywords here. A marketing-type approach is more likely to reach public opinion and key parties in the transport system: it promotes the "product" and makes it more closely match people's expectations.

4. Questions of balance must be taken into account. The project can improve spatial and social balance in terms of transport via a policy of investment made possible by the project (deprived areas, public transport, etc.) or by adapting fare policy on public transport networks (social charges, fare reductions, etc.). The charges for the project must also include concerns on fairness: subscriptions, concessionary rates, timetable variations, etc.

5. The project goals must match the main expectations of the population. A charging project is more likely to be accepted if it meets the key transport requirements for the population. This has implications in terms of the type of project; on the other hand, fallout from the project must be foreseen by all concerned parties, and that is not always obvious. In France, a specific importance must be attached to environmental concerns.

6. Revenue must be dedicated to transport and alternative solutions to the car should be proposed. The project is part of transport policy and therefore involves investment, so the population needs to be reassured that the money they spend will go towards this policy. The transport policy must include investment in alternative modes of transport to the car, to provide sufficient choice for users. If it is preferable for these investments to be made before implementation of the project, the required sums can be released only once charging is applied. A choice must therefore be made between borrowing before implementing the project and investing throughout project implementation.

7. A step-by-step approach helps to adapt the project as it progresses and match awareness among the population. A step-by-step strategy helps gradually change the rules of the game in terms of transport to allow the involved parties to gradually adapt their modes of transport. A step-by-step strategy also helps to adapt the project depending on the reaction of the population: test phase to definitive implementation, reverting to previous status, etc. The project must start with an introductory pricing scale that can be increased later if necessary. It is also useful to apply the project to a small area and then extend it or during a limited number of hours which are then extended, etc.

8. The key is to convince people that there are no other solutions. The population has grown used to seeing roads as a free item. As a result, they need to be convinced that road charging is the only solution for carrying out the improvements required for the transport system.

9. The project must remain as simple as possible. Despite inconveniences in terms of efficiency or fairness, simplicity and transparency help the user to understand the project better and more easily calculate its cost. The project definition stage must define the limits of complexity by discussing it with its future users.

10. The prices charged on opening should be introductory. It is easier to increase prices once the project has been implemented and accepted than to reduce prices to defuse a tense situation. The marketing stage must give the most appropriate list of rates depending on the different types of user while maintaining the project's simplicity. Reference prices are bus ticket prices.

11. Wide political backing should be sought. In France, the difference between left and right on the issue of road charging is not great. This needs to be made use of to "de-ideologise" the debate by engaging thoughts on a general transport policy. Questioning a project, for example after new elections, would have damaging consequences not only for the project itself but also for its ability to propose new projects in the future: the first experience leaves its mark.

12. The various institutional levels should ensure they have a good negotiating capacity. Several organising authorities (State, region, department, local authority) are concerned by urban transport networks and the State needs to change the law to authorise road charging: the local authority cannot gloss over these institutional difficulties in constructing a project. Furthermore, State financial aid helps the implementation of the project by the local authority and increases acceptability.

2. ELEMENTS OF THE DEBATE

Experience has shown us that when a debate starts on the theme of road charging for cars, a series of arguments are brought to the table. Without being exhaustive, we have tried to gather a part of these arguments which touch on the economy, the environment, fairness, technology and so on.

After having given an illustrative list of arguments for and against, we will cover parts of the debate by category: transport cost, environmental challenges, questions of fairness, impacts on the city economy, technological solutions and concerns about freedom to move.

2.1 Arguments “for and against”

By way of illustration, we can give examples of arguments for and against road pricing which are regularly brought up. This is not exhaustive and is not intended to give responses and counter-arguments but is intended to give an overview of the debates through phrases and expressions. Elements covered in this table are given in a more structured manner in the text throughout Part 2.

For	Against
Economic category	
<p>Taxpayers pay for motorists, even if they don't use the roads and don't pollute;</p> <p>This redistributes costs towards the user/payer and the polluter/payer, as it is currently for users of public transport;</p> <p>It's the only way of getting non-taxpayers (outside the city boundaries) to pay for the transport system that they use;</p> <p>Public transport is financed by taxpayers, companies and users whereas motorists benefit from it indirectly;</p> <p>In an average car budget, the annual cost for road charging is very small and is not that great if motorists do not use their cars every day;</p> <p>We need to find a solution to paying for transport systems.</p>	<p>Users of private vehicles are taxpayers and have already paid for infrastructure;</p> <p>The motorist already pays a large part of costs relating to cars in private costs and taxes;</p> <p>The annual cost of a charging system is excessive, especially for those with limited means;</p> <p>The motorist is being milked for even more tax.</p>
Behaviour category	
<p>Encourages the use of alternative modes of transport;</p> <p>A more flexible solution than complete exclusion or complete congestion;</p> <p>Makes modes of transport more complementary; Indirectly repays cleaner behaviour; Another way of sharing limited space: selection by money is more efficient than selection by time.</p>	<p>Restrictions a person's freedom to move;</p> <p>It's a restriction on mobility;</p> <p>The system will not reduce congestion;</p> <p>There is no free alternative;</p> <p>The public transport has to at the very least offer the same level of service as the car.</p>

Environmental category	
Favours the polluter/payer; Reduces the car's space in town and its various nuisances; Improves quality of life, especially as the project will use revenue for this purpose.	Pollution problems will be solved by technological progress.
Equality category	
It improves the lives of the poorest people without cars; Relevant social charging will improve the lives of the most deprived motorists; Allows everyone to use their cars from time to time for a small fee; Selection by money is made at the car purchase level.	Selection by money; The community should give people the freedom to move; Those who live far away are the poorest and they pay the most; It's the return of city tolls; You have to pay for sitting in traffic jams. Only people who are reimbursed by their employers can afford to pay.
Spatial category	
Implementation will be step-by-step over time to limit the impacts; Charging is only in place on certain days at certain times to reduce the effect.	The rules of the game are being changed, we're being encouraged to live further out, then we're made to pay for it; Space is free and belongs to everyone; The city will be cut in two
Impact on the economy and the city category	
Improving the transport system is good for the economy; The system will encourage people to rationalise their movements; Other European cities have put this in place and they want to pursue the system.	It will harm local businesses in favour of those on the outskirts; It's bad for the city's economy; It will make the city less competitive compared to others; It's privatisation of the city.
Perception technology category	
There are technological solutions (e.g. electronic wallet) that make payment completely anonymous; Subscriptions are possible.	It's an attack on our private lives; all our movements will be monitored; Operational costs are very high.

Table 1. Arguments for and against road charging for automobiles.

2.2 Transport costs - a few figures

The below section shows how the debate can develop when questions of transport costs are brought up by means of general national examples: cost of nuisances, subsidies, taxes and other annual expenditure for households are often mentioned in discussions on road charging.

As always, things are not simple and the figures cannot be taken lightly. In summary, we can say that arguments on the cost of automobile nuisances are solid, especially in urban areas. However, the general interest of public transport over cars in terms of overall cost is not obvious and depends on bus usage rates. We should also point out that the overall cost of owning and running a car is often unknown; modest road charging with special rates for poorer motorists will not break most household budgets. As for road charging as a solution to the financial crisis in transport systems, we show that investment does not allow much room for manoeuvre.

In any case, a full debate can only take place at a local level because the situation can be very different from one city or town to another. Local transport accounts, equivalent in a city to the national transport account mentioned in this chapter, were made obligatory by the Solidarity and Urban Renewal Act; these should form part of the debate.

2.2.1 In cities, drivers do not fully cover the costs they incur to the region.

Road charging projects are often justified by the existence of external costs created by cars but carried by the region: damages incurred by pollution, noise, lack of safety, etc. However, drivers contribute towards these costs with specific taxes. A survey shows that on a national scale, costs for the region and specific taxes balance out (€26 bn apiece in 1998). But in urban areas, external costs are greater than in the rest of the country: nuisances such as local pollution and noise are more concentrated there and have more damaging effects than in rural areas. Drivers are therefore far from covering the costs they incur for a city's local authority. This situation largely justifies the comments on charging for road usage by motorists in cities.

Specific taxation for motorists includes taxes on fuel and various other taxes paid exclusively by motorists. VAT, which hits most economic activities, cannot be considered as a specific taxation on motorised transport. VAT on TIPP can however be considered as a specific tax.

Overall, motorists paid more than €26 bn in 1998 in specific taxes. Given the end of road tax for private vehicles (brought in in 2001), specific taxation was still at €25 bn.

Fuel taxes (inc VAT on TIPP)	19.4
Fines	0.7
Road tax	1.8
<i>...paid by private individuals</i>	<i>1.7</i>
Tax on insurance	3.0
Tax on company cars	0.5
Registration certificates	1.0
Tax on driving licence and fee for driving test	1
Total specific taxes	26.5
Total specific taxes except road tax paid by private individuals	24.8

Table 2. Specific taxes paid by motorists (users of a private car and light utility vehicles for transporting people) in €bn 1998 [Quin et al, 2001].

On the other hand, motorists generate costs that the local authority has to pay for. These include:

public costs for roadways (not covered by motorway tolls);

cost of nuisances such as accidents (part not covered by motorists or their insurers), noise, local air pollution and the greenhouse effect.

Thanks to the National Public Transport Account [Quin et al, 2001] and the latest official values for nuisance costs, it is possible to estimate all these costs at €26 bn, €7 bn in public costs and €19 bn in nuisance costs.

Public costs (excluding taxes)	6.8
<i>including roadway expenditure created by light vehicles and paid for by local authorities</i>	5.3
<i>including roadway expenditure created by light vehicles and paid for by the State</i>	0.9
<i>including traffic police expenditure created by light vehicles and paid for by the State</i>	0.6
Cost of nuisances (according to recommendations from the Boiteux report of 2001)	19.2
<i>of which accidents (net of costs paid for by motorists and insurers)</i>	<i>11.7</i>
<i>of which greenhouse effect</i>	<i>2.1</i>
<i>of which noise</i>	<i>1.5</i>
Total costs paid for by the local authority	26.0

Table 3. Automobile costs (Private Cars and Light Utility Vehicles for transporting people) paid by the local authority in €bn 1998.

However, the debate on external costs remains fierce: the National Passenger Transport Account mentions cost estimates for accidents, noise, air pollution and greenhouse gases of €8-38 bn for light vehicles. Including other external effects such as water and earth pollution, the effects of cut-off, use of space, etc. could increase these amounts further.

2.2.2 Social costs by journey: delicate comparisons between modes of transport

Unlike automobiles that incur considerable external costs and for which most direct costs are paid by motorists themselves, public transport generates much lower external costs that are however considerably subsidised. It is therefore interesting to compare "social" costs of journeys that take all these elements into account. It is very difficult in this area to compare national averages. Each town and each transport network is different: highly used public transport networks during rush hours and town centres are much more preferable than cars in economic terms; a network with underused buses cannot justify itself in economic terms compared to cars even if it can be justified for social reasons.

As part of the National Public Transport Account, social costs for some types of journey were estimated. These social costs are the sum of the following :

- direct costs (excluding tax) paid for by the private and public sectors;
- and four external costs (accidents, local air pollution, greenhouse effect and noise) estimated from recommendations by the Boiteux group [Boiteux 2001]. Congestion costs, which should be taken into account in a microeconomic analysis, were not estimated in this macroeconomic exercise because no method has been validated by the scientific community.

The main results concerning urban journeys outside Paris can be found in Table 4 below.

Mode of transport	Public transport (daily average, all journeys within urban areas)	Public transport (examples of journeys during rush hours or in city centres)	Car (daily average, all journeys within urban areas)
Occupation rate (journey/vehicle)	11 -13	22 - 26	1,1 - 1.5
Equivalent occupation rate	14% -16%	28% - 32%	22% -30%
Length (km/journey)	8,0 - 8.5	8,0 - 8.5	7-7,5
Social cost (€/journey)	2.7-3.0	1.3 - 2.1	2.2 - 3.1
of which external costs (€/journey)	0.05-0.12	0.03 -0.06	0.18 -0.27
Journey time (minutes)	32 - 35	No figure	16 -18

Table 4. Examples of social costs for journeys in urban areas outside Paris with more than 300,000 inhabitants (1998)

It should be noted that:

on average social costs for urban journeys outside Paris in public transport or individual transportation are close. However, where bus and metro usage levels increase (e.g. rush hours or in city centres), social costs for public transport decrease considerably;

journeys on public transport generate much fewer external costs than equivalent journeys in individual modes of transport. However, external costs remain quite low (around 6-11% of the social cost of a journey by car). Including congestion costs and a better understanding of the impacts of urban traffic could lead to an increase in social costs for car journeys;

on average, the time for an urban journey outside Paris is twice as long on public transport as individual transportation.

These elements show that the development of public transport is good for the environment and road safety but this hampered by the unattractive nature of urban transport networks compared to the car (in terms of journey time in particular). This unattractiveness leads to underuse of public transport (average bus capacity of only 15% is one example of this) and, as a result, an increase in the social cost per passenger carried. The underuse of public transport services is further pronounced because the system provides a public service in sparsely populated areas and during off-peak hours, which see very low numbers of passengers. These services are not likely to be withdrawn, given that they provide a right to transport guaranteed by law. Finally, public transport will be much more socially profitable when used to a high level.

The analysis that we carried out shows that a comparison of the various modes of transport is a delicate exercise. Each mode of transport has advantages and disadvantages depending on the type of journey in urban and periurban areas, over long distances, during rush hours and off-peak hours and depending on the performance criteria such as costs, environmental effect and journey times.

2.2.3 The car, a major household expenditure

On average, a car costs a household €350 per month including tax; most households are not aware of the extent of this cost. It's clear that car ownership and use do not suit all budgets and road charging is not a huge additional cost if it costs around the same as a monthly travelcard on public transport - around €40 in most French cities outside Paris. It would however be wrong to use average situations which hide must more tense situations in reality: social charges suitable for modest incomes could reduce such problems.

This budget of €350 month is an average. This expenditure includes maintenance and depreciation plus motorway tolls and parking [Quin et al, 2001]. The Fédération française des automobiles-clubs (French automobile association) says that the budget for a small urban car bought new and kept for four years costs more than €450 a month. Certu has shown that the "minimum automobile budget" for a small second-hand urban car is more than €230 a month.

The car remains an expensive mode of transport, therefore, which can require considerable financial commitment, too much for some households. In 2000, 21% of households did not have a car, 50% only had one and 29% had more than one. Car ownership is directly linked to household income.

Standard of living	Households with at least one car	Households with several cars
1st quartile	63 %	15 %
2nd quartile	76 %	26 %
3rd quartile	88 %	33 %
4th quartile	91 %	41.00%
Together	79 %	29 %

Table 5. Household with at least one car and with more than one car, depending on their standard of living, in 2000 (in %)

Finally, money is still an obstacle for automobile mobility. Using a fixed road charging scheme of, for example, €40 a month would have an impact on the least well-off households. It is important to note, however, that:

road charging would not be the sole cause of problems for the less well-off motorists because the cost of a car is not much less than €230 a month;

social problems arise when you make a public property paid-for. These can affect swimming pools, libraries, water, electricity, on-road parking, public transport or motorway tolls. Concessions are one solution and are already used in public transport. The SRU law requires systematic reductions of 50% on urban public transport for people with couverture maladie universelle (CMU - full medical coverage).

§ 2.4 covers the question of selection by income and social equality in more detail.

2.2.4 Financing for transport systems: little room to manoeuvre

Financing transport policy is a difficult problem for local authorities in this field as in others with constrained budgets. For public transport, local users of the services only pay for a quarter of the cost of their journeys; on a local level, road users do not pay for road financing directly. The difference between revenue and costs must therefore be made up by public powers. In this area, it is obvious that there is little room to manoeuvre and little in the way of funds available to launch voluntary transport policy.

The analysis of unitary journey costs has shown the level of underuse of public transport with an average capacity of 15% in towns and cities outside Paris. As a result, the cost of these public transport services is not at all covered by commercial revenue.

On urban public transport networks, transport taxes paid by companies with more than nine employees and paid directly towards public transport services is the main source of income. On departmental networks, which do not benefit from the transport tax, it's mainly State departments (via the decentralisation fund) who pay for three quarters of costs. The service is made up of school transport, which is obligatory in all departments, and marginal public transport use outside urban areas. The SRU law provides payments for mixed transport authorities outside of urban transport perimeters and should help this unfavourable situation for departmental public transport.

	Public transport in the Paris region	Urban public transport outside Paris	Departmental transport	Total
Users	28.00%	24.00%	21.00%	26.00%
State	15.00%	4.00%	42.00%	16.00%
Local authorities (excl VT)	12.00%	19.00%	34.00%	17.00%
Transport tax (VT)	28.00%	46.00%	0	29.00%
Other (loans, employer payments, etc.)	17.00%	7.00%	3.00%	12.00%

Table 6. Le financement des transports collectifs de proximité (1998) [Quin et al, 2001] (Local Public Transport Financing)

Thanks to the transport tax and moderation in public transport development policy (or because of the latter), local public transport is not really going through a major financial crisis. The National Public Transport Account has shown that in 1998, urban networks outside Paris:

- repaid more capital than they borrowed;
- devoted only 20% of their expenditure to investment.

BY way of comparison, in 1997, investment represented 55% of expenditure excluding tax on all road networks .

Finally, in terms of major road investment, bypasses and crossings that may be required here and there are often extremely expensive, especially if they are underground. Financing these projects by way of a toll is often considered in these cases. This happened in Marseille and Lyon ; in Lyon, users will still only end up paying for 10% of the project.

There is a case for charging motorists for all journeys rather than just those using the infrastructure in question. Otherwise, we could end up charging people for using bypasses, the use of which should be encouraged, while driving through a city remains free of charge.

Finally, transport authorities have similarly little room to manoeuvre: to finance road investments, public transport or increase user participation, increasing transport funds or widening urban transport areas are not always acceptable locally. Implementation of a voluntary policy of public transport development or major road investment requires new types of funding.

NB: the question of a taxable solution rather than road charging is covered in § 1.2.4.

2.3 Environmental risks of motorised traffic

Environmental issues are a major concern of the inhabitants of our cities: to this end, in part 1 of this document, we have covered the importance of the principle of polluter/payer and environmental arguments in road charging for automobiles. The environmental risks of motorised traffic are obviously part of the debate. Below, we try to present a few key elements. While noise, road safety, the greenhouse effect and depleting fossil fuels are all unanimously recognised as ongoing nuisances, the role of automobiles in air pollution is cause for more debate: depending on the pollutants and theories about future behaviour, technology could be on an upward slope in this field.

It would be politically dangerous to only use environmental arguments to justify road charging. If there are some surprises in store in terms of air pollution, a part of the problem will have been solved by anti-pollution standards without using charging. However, this does not remove discussions on the place of the automobile and the durable nuisances that it causes and will continue to cause. Road charging is therefore a tool for providing continuity in a policy of reducing car usage and increasing financial resources for reducing these nuisances.

2.3.1 Trends, prospects and challenges in pollution

Below, we cover a few elements of the study on PDUs and the environment [Certu, 1999b] which we will return to for more detail

The various pollutants that make up local and global air pollution will change in future years. Their development will depend on technological progress and changes in fleet but especially in terms of vehicle use: distance travelled, air-conditioning, way of driving, etc. Together with developments concerning journeys, vehicle renewal, actual emissions, city air quality and known effects of pollution on health and the environment, the pollutants and nuisances we can expect to see in the future that have an implication for urban area travel in future should be:

carbon dioxide (CO₂), seeing continued growth and the main cause of the greenhouse effect, even if it is not involved in local pollution;

nitrous oxides (NO and NO₂). These emissions are being reduced but the concentrations have not seen similar changes. They are involved in most cases of local and regional pollution;

Those who see their situation improving in terms of emissions while still posing major problems for ambient air quality: COVs responsible for smog, le benzene – a carcinogen – and particles (especially PM₁₀) pose respiratory and cardiac problems. For some of these, ambient air levels have only recently been regulated for;

Carbon monoxide. Automobile emissions are on the decrease but can still cause problems in narrow streets, underground car parks and tunnels.

For noise, the growth of areas affected by noise pollution from land transport and particularly of critical noise areas, blackspots and super blackspots is particularly worrying. In this area, vehicle technology does not seem to provide any decisive response to reduction of vehicle noise.

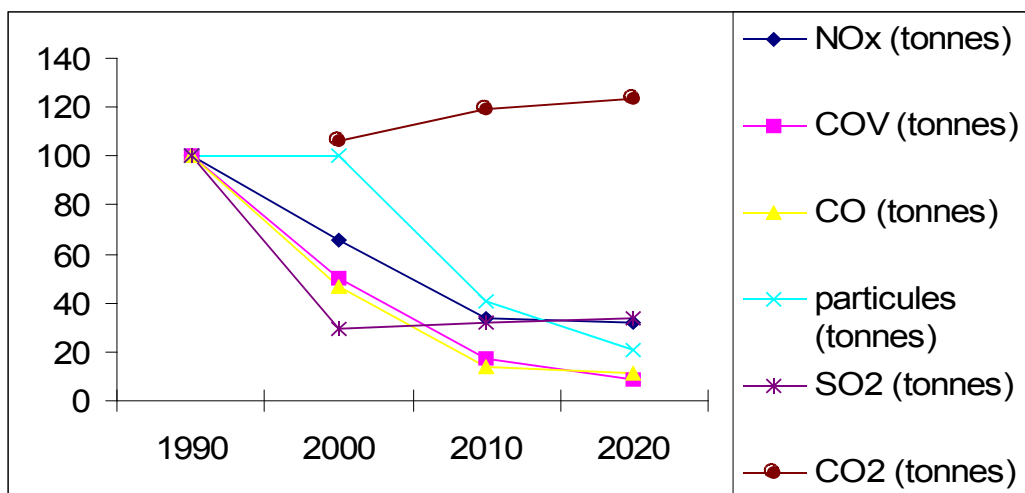


Figure 5. Changes in pollutant emissions from road traffic between 1990 and 2020. Median scenario⁶

We should point out that the late introduction of catalytic converters, the large proportion of diesel vehicles on our roads and uncertainties concerning vehicle energy and environmental performance could hold back the renewal of the vehicle fleet for some time in terms of concentrations of NOX, on energy use and CO2 emissions from traffic. However, in 2000, for the first time since the petrol crises, there was no growth in consumption of fuel for transport, linked both to transport policy and the considerable rises in fuel prices.

	1993/1994	2020		
	Reference	Growth trend	Growth homothetic	Controlled spread
N adults (10⁶)				
Centre	13,2	11,4	15,5	13,1
Suburbs	12,5	14,8	14,8	16,1
Outskirts urban	6,7	8,7	7,9	10,7
Outskirts rural	11,0	16,0	12,7	11,0
Total	43,4	50,9	50,9	50,9
Total automobile traffic (10⁶ veh.km/an)				
Centre	59,2	62,4	84,0	71,7
Suburbs	68,9	92,7	92,1	102,7
Outskirts urban	45,3	84,7	77,6	104,1
Outskirts rural	88,4	196,6	158,0	137,0
Total	261,8	436,4	411,7	415,5
Emissions (10⁶ t/an)				
CO ₂	53,7	89,3	84,1	85,0
CO	7,2	6,7	6,1	6,8
NO _x	0,38	0,63	0,59	0,60

Table 7. Potential for automobile traffic reduction, consumption and emissions in three scenarios for urban development by 2020. Source Inrets

⁶Source : MELT – DAEI/SES, *Éléments d'évaluation environnementale des schémas de service : effets sur l'environnement des différents scénarios de la demande*, avril 1998.

2.3.2 Road safety

Road safety is a part of the debate on road charging on several levels: accidents are one of the major nuisances caused by automobiles; the charging system can change traffic flow and have an indirect impact on safety; and drivers' behaviour could change in the case of a variable charge depending on the time of day.

In terms of nuisance, we present a few national statistics; here again, each city is a different case. Road safety in cities concerns mainly less serious accidents than in the open countryside given the lower speeds but accidents that do occur involve many more unprotected users such as pedestrians and cyclists. In towns and cities of more than 30,000 inhabitants, the number killed per 100 accidents was 2.1 compared to 13.6 in the countryside in 1999 . But out of those killed, in the same towns, 27% were pedestrians compared to 5% in the countryside. In 2000, 7,600 people were killed, 162,000 injured, of which 27,400 seriously in France alone.

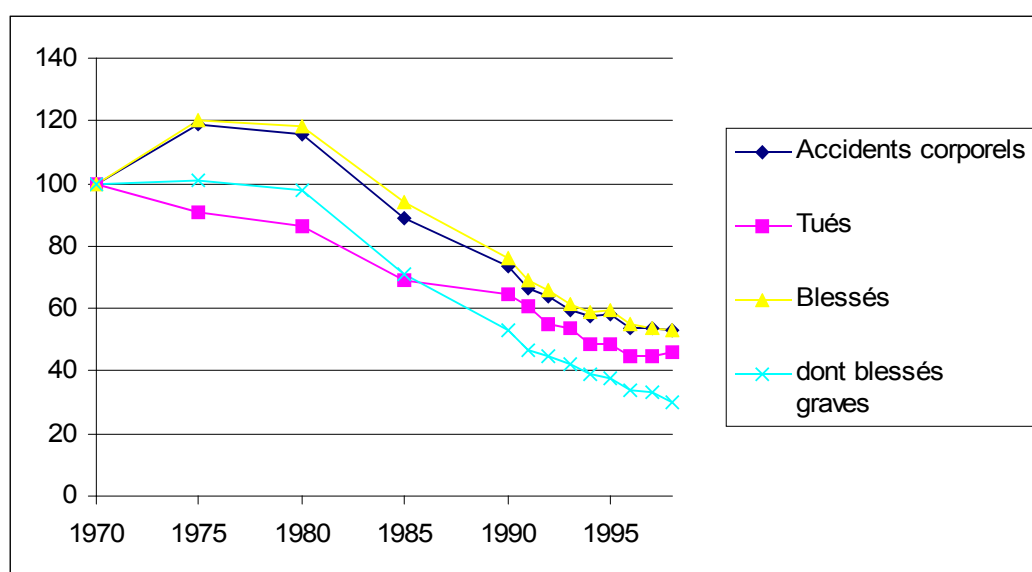


Figure 6. Changes in the number of accidents and victims on French soil (base 100 in 1970).

Road charging has an effect on traffic flow generally: depending on the type of charging system, drivers can decide not to make a journey or change the time when they drive, their route, destination or type of transport. On any given section or junction, traffic flow and speeds can thus go up or down, creating problems for road safety if the road has not been modified to suit these changes.

Furthermore, road charging that changes depending on the time of day could encourage dangerous behaviour: speeding up or slowing down to cross the barrier at a cheaper time of day, for example. We do not have any documents surrounding this issue but numerous road charging schemes world-wide show that dangerous behaviour is marginal compared to the positive effects of the system in terms of congestion, comfort and thus safety. Singapore authorities also note that “there are vehicles that slow down when going through a barrier to wait for the applicable time period to end or avoid a higher charge.” These phenomena appear around rate change times (every half hour). [...] Random police presence discourages this type of dangerous practice.”

2.4 The thorny issue of social equality

"If there is selection by money in our society, it happens at the point of purchasing a car", Mr Grimaud, head of police in Paris, on the introduction of paid-for road parking in Paris, Le Monde, 14-15 Dec. 1969

Selection by money is often an argument used by opponents of road charging schemes. With reason, local decision-makers are questioning the fairness of a system that charges money for a previously free service, given concern for the welfare of the less well-off in our society. We think it is useful here to always replace the discussion in terms of the whole transport system; the less well-off are most often captives of public transport and every charging scheme for a multi-mode transport policy can bring solutions to the problems posed for many households. Analysis of winners and losers and a theoretical presentation of equality help us understand the size of this problem. Experiences across the world in urban charging schemes also show that while the poor use roads less frequently, they are not excluded from the system.

2.4.1 Analysis of winners and losers that suggests answers

The analysis of winners and losers for a project before and after implementation encourages opinions from different types of people. By way of illustration, Table .8 helps classify the main groups of winners and losers generally. The strategies suggested in this table to encourage acceptability with the losers include the three suggestions in terms of the use of revenue: improve road services, improve alternative multi-mode services and improve quality of life.

	Group	Strategy for building acceptability
Winners	<ul style="list-style-type: none"> ● Those who do not change their behaviour and for whom time means more than the cost of the charge ● Those who benefit from investments generated by the project ● Those who benefit from reductions in traffic and nuisances 	
Losers	<ul style="list-style-type: none"> ● Those who do not change their behaviour and for whom time means less than the cost of the charge ● Those who change route, times, mode; ● Those who decide not to travel. 	<ul style="list-style-type: none"> ● Improving comfort, safety and associated services. ● Implementing concessionary rates; ● Offer a high-quality multi-mode alternative; ● Improve the environment and quality of life.

Table 8. Winners and losers on introduction of a charging scheme

Social equality is thus covered by an analysis of winners and losers that distinguishes the poorest motorists, i.e. those who value time less and prefer to pay in time rather than in money. Subscription rates or reduced rates for the poor can reduce the difficulties that a road charging scheme may have, especially where journeys can only be made by private vehicle.

The "changing the rules of the game" argument that comes from the winners and losers analysis is quite key. After years of encouraging people to live outside city centres, inhabitants see themselves as being penalised because their behaviour has a detrimental effect on the transport system. This feeling of injustice is not without grounds, especially for people who moved outside city centres for financial reasons. We can only limit this problems by gradually introducing the scheme to gradually change the rules of the game, a point covered in § 1.6.

It's also worth noting that, in theory, there is only one type of road charging with no direct losers: tolls for new infrastructure. In this case and if no measures are taken on parallel roads, users have the choice between sticking to their normal behaviour and benefiting from less congestion on parallel roads or taking the toll road if the route is of use to them. V. Piron [Abraham et al 2000] however points out the levels of frustration, which he calls bitterness, with a new infrastructure that people can't use because it's too expensive. He says that the general range of acceptability covers the use of the new infrastructure and the degree of necessity it presents for the end user. A considerable level of obligation together with considerable frequentation and high charges are an untenable situation, as illustrated in Figure 7. The bridge on Ile-de-Ré illustrates this principle: a crossing costs €0.8 for local inhabitants, who are frequent users, and €8.40 for tourists, who only use it occasionally.

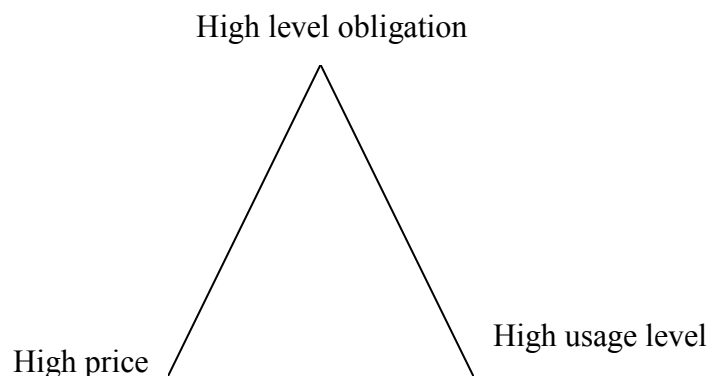


Figure 7. Incompatibility triangle for urban infrastructure toll. From Piron [Abraham et al. 2000]

2.4.2 The three principles of equality

There are three principles of equality, according to C. Raux and S. Souche [Raux et al, 2000]. These give an interesting framework for analysis and are explained below. The different arguments concerning equality can be attached to one or another of these principles.

Territorial equality, guaranteeing accessibility for all;

Vertical equality, concerning the poorest users;

Horizontal equity, which supposes equal and impartial treatment for everyone

Territorial equality is linked to the right to transport that can on the one hand be found in the French constitution as "freedom of movement" and on the other hand in the Loi d'Orientation sur les Transports Intérieurs (loi 82-1153) in which economic and environmental considerations are key (see box below).

Chapter I: On the right to transport and general principles applicable to domestic transport.

Article 1

The domestic transport system must satisfy the needs of users in economic, social and environmental conditions that are to the advantage of all. This refers to national unity and solidarity, home defence, social and economic development, balanced construction and durable development on the territory as well as the expansion of international exchange, especially European.

These needs are satisfied in the observance of limitation or reduction of risks, accidents, nuisances, especially from noise, emissions of pollutants and gas and the greenhouse effect by the implementation of measures that give every user the right to travel and choose their means of travel as well as their ability to transport themselves and their property or use an organisation or company of their choice to do it on their behalf.

Box 6. Article 1 of Loi d'Orientation sur les Transports Intérieurs (LOTI)

The principle of vertical equality involves judging the result of policy by the well-being of the poorest people in society. Depending on the methods used in a charging project, the poorest people in society should benefit from investment in public transport, which those who cannot afford a car are obviously obliged to use.

The principle of horizontal equality concerns society guaranteeing equal and impartial treatment for all citizens. This equal and impartial treatment primarily involves the use of non-discriminatory principles, in this case in terms of modes of transport. However, equality of treatment in an economic sense means the principle of the user/payer, i.e. that the user must cover the cost they incur to society and/or infrastructure management.

2.4.3 Experiences teach us about those excluded from the system

The cases of express toll roads in California, the Prado-Carénage tunnel in Marseille and the northern section of the Lyon circular road show us that these paid-for projects have not totally excluded the poorest of users. Usage by those on low incomes is however less frequent than those on higher incomes: some users obviously think, "I'm in a hurry today so I'll go by car and use the toll route." So, even if there is a certain amount of discrimination by money, it does not split the population down the middle quite as much as some people think.

With the SR-9 in California, it is interesting to note that out of 100 people who could travel on the road's express lanes, 53 never use them, 20 rarely or sometimes, 15 often and 13 every time (1996 figure). It's not just frequent users going to work every morning and many of those use the system on days when they're in a hurry. The proportion of frequent users on express lanes (more than 4 out of 10) only moderately depended on household revenue: 10% of frequent users were from poor households compared to 23% from the richest households. Furthermore, as seen by Figure .8, for journeys between home and work, 20-25% of very low and low income households frequently use the SR-91, and 30-35% of medium and high income households and nearly 50% of very high income households. The poorest are not excluded from the system.

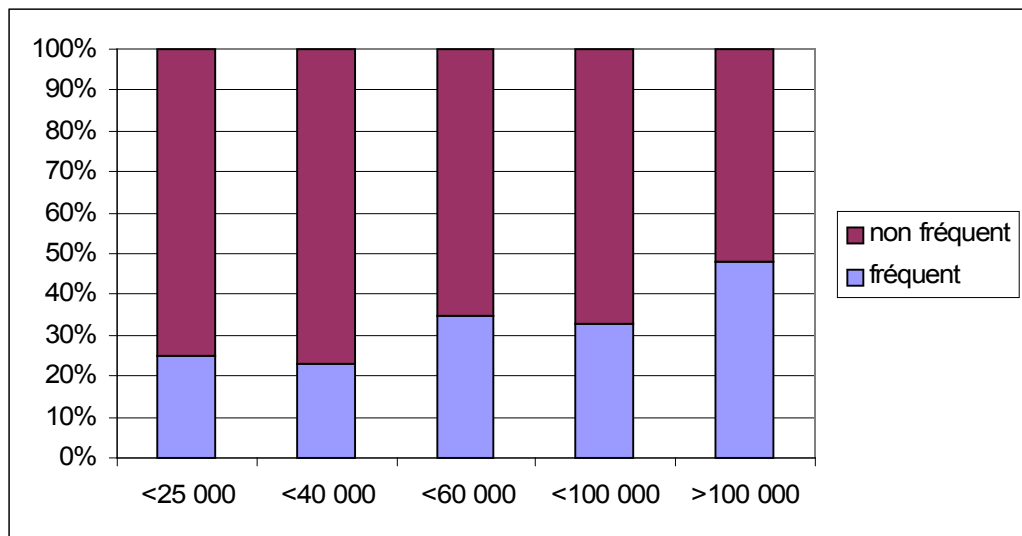


Figure 8. Frequency of use of the SR91 for journeys between home and work at rush hour, by type of revenue (annual household revenue in \$)

(frequent user = 4 times out of 10 or more, non frequent = less than 4 times out of 10).

The same seems to be the case in Marseille and Lyon. In 1995 [Certu 1999a], the majority of regular users did not have a subscription: only 23% of journeys through the tunnel were paid for by a Tunnel Pass card. The previously-mentioned PRIMA survey [PRIMA 2000] shows that many people use these projects on an occasional basis (in 1999) as shown in Figure.9. Those who never or only occasionally used the tunnel came from all social classes . In Lyon, the number of those who never use TEO is much higher; but the tunnel only concerns the northern part of the city and the tunnel is more recent.

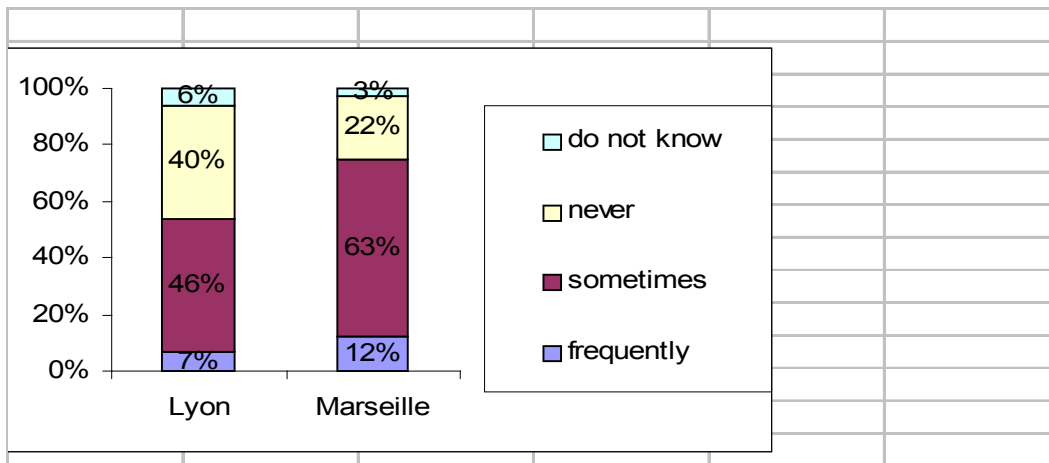


Figure 9 . Use of urban tolls - PRIMA survey 1999 [PRIMA 2000].

2.4.4 Captives of all modes of transport

The case is often made of captives of the car who have no other choice but to pay when they use their car. While the problem should not be ignored, it is useful to consider the transport system in its entirety and not only automobiles.

There are not only captives of cars, there are also captives of public transport, and those people are usually in the same kinds of numbers. To summarise, it's worth noting as F. Duprez does that a third of people living in France are captives of their car, a third captive of public transport and a third have a real choice of modes (see Box .7). Even if each city and journey is different, it is always useful to not forget a third of the population in any case.

Scientific literature does not clearly define the idea of the captive of the automobile. An operational approach involves considering this as being anyone that is obliged to use a car due to their physical environment (isolation, no credible public transport). Captives of the automobile should not however make us forget that another section of the population does not have access to a car.

Comparing those captive and those excluded from cars gives us a view of the French population depending on their modes of transport:

- 30-40% of French people are captives of the car;
- 30-40% of French people are excluded from the car;
- 20-35% of French people have a choice of mode of transport.

The right to transport obviously concerns "three thirds" of the population.

However, this segmentation is theoretical. In practice, the problem of a choice of transport must be applied for every journey: for example, the same person can be a captive of the car to go for a ride in the country and have a choice of transport for going shopping in town. The development of park-and-ride schemes, on-demand public transport, car hire and car pooling should make the notion of "captives" more difficult to define.

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Box 7. Car use: captives and the excluded [Duprez 2000]

We have already noted in § 1.2.5, the importance of a real multi-mode alternative as part of the project, which is generally called a basket of measures approach: park-and-ride, limited application hours, improvements in public transport, etc. Gradual implementation will make it easier for people who are currently captives of one type of transport to adapt to new conditions of service and charging.

2.5 Expected effects on urban planning and economics

The effects of road pricing on town planning and urban economics are poorly understood. The only objective data that we have been able to find relate to the Norwegian city of Trondheim, where no negative impact on city centre trade has been observed following the introduction of cordon charging in 1991. Other theoretical analyses and studies based on analogies with parking restrictions and parking fees tend to corroborate this finding, although it may be useful to distinguish between an overall analysis of the city and analysis of individual areas.

It would be rash to simply transpose such data or studies directly for other cities, since it is so important to take account of the local context; this does however demonstrate that objective and scientific arguments may stimulate debate on this highly complex issue.

The two generally-expressed fears concern the city centre's attractiveness to residents and stores and, correlatedly, the impact on urban sprawl. Generally speaking, we may say that the impact is feared most by retailers and businesses, for whom it is a very sensitive issue. The pricing structure adopted and the choice of locations and times at which charges apply can – even if they do not reassure stakeholders - at least show that the project is concerned about the impact on the city and its economy.

Indeed, the effects vary a great deal, depending on whether the project involves a cordon charging system ringing the city's central business district or a multimodal card covering the metropolis, on whether charges are applied during peak times or 7 days a week, and on how high the charges are.

There is also a third fear, that of a negative effect on the appeal of the city compared with other cities where it still costs nothing to use the roads. It is even more difficult to say whether or not such fears are justified. In any case, if the project helps to improve the city's transport system, this should in turn increase its competitiveness and attractiveness. At the same time, interoperable pricing schemes between private vehicles, public transport and parking facilities would offset a lack of appeal in the eyes of the occasional visitor, who could then use his or her subscription to the motorway ETC system or, in the near future, electronic wallets, to pay the charge required.

2.5.1 Trondheim: no negative impact on trade observed

The cordon charging scheme was set up in 1991 in the city of Trondheim.

The inhabitants of Trondheim were extremely concerned about the project's impact on the city centre and its appeal; moreover, there was a great deal of uncertainty in the traffic studies concerning the impact on journeys for the purpose of shopping. In 1990, a survey showed that 25 % of users were likely to change their habits insofar as shopping journeys were concerned; in 1992, only 10 % of those questioned said that they had changed their shopping habits.

Between 1991 and 1992, the Chamber of Commerce carried out a survey that concluded that no impact on retail trade had been identified, in the course of the year. Nonetheless, within the trend that has been observed over many years relative to the decline of the city centre and the growth of retail outlets on the outskirts of town, a few cases of retailers who noticed a drop in sales due to cordon charging were identified during the first few months.

In the longer term, between 1987 and 1997, the figures tend to demonstrate that the introduction of cordon charging has had no impact on retail business in the city centre, bearing in mind the general context of a decline of the city centre.

Figure 10. Sales for the retail trade in the different areas of Trondheim [Europrice 2000] below shows the market share of the retail trade in the different areas of Trondheim. The city centre, the major district affected by the cordon, saw a rise in sales following the introduction of cordon charging in 1991, thus reversing the trend. Since 1992 however, the trend has been rather a stagnation in the absolute value of sales and a continuing drop in the market share of city centre retailers in relation to the city as a whole.

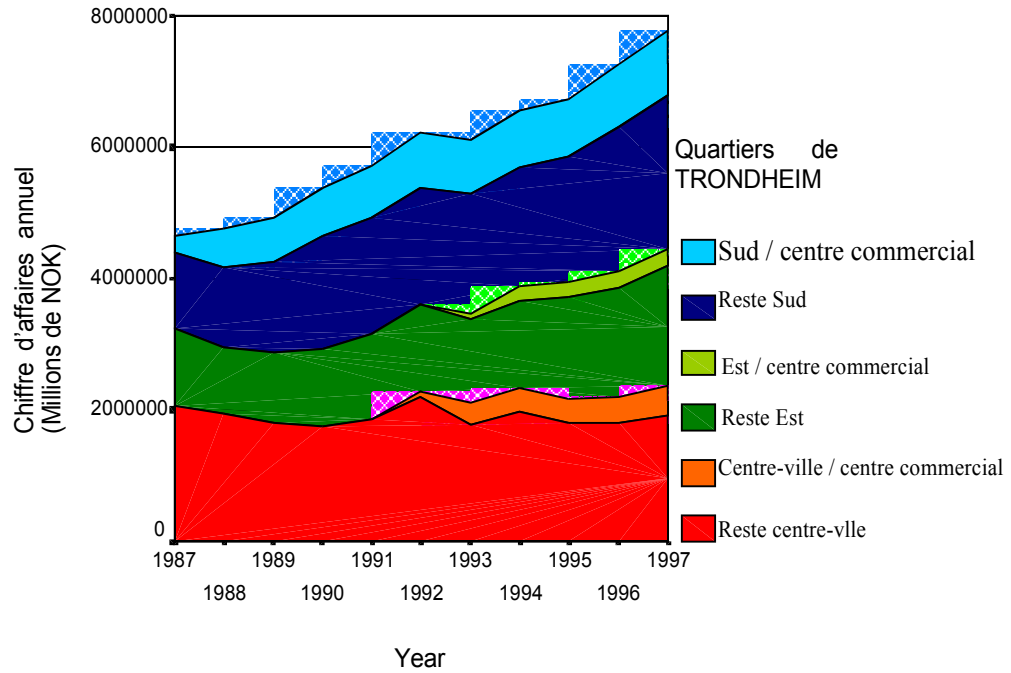


Figure 10. Sales for the retail trade in the different areas of Trondheim

Of course, it is very difficult to draw any definite conclusions regarding the role played by cordon charging in relation to other economic and urban factors observed over the same period. In any case, the reversal of the trend, from a decline to stagnation of the city centre gives a much more positive image of the impact that cordon charging has had on the city centre.

It has also been noted that many shops now close later, allowing consumers to do their shopping after 5pm and on Sundays, when there is no charge to cross the cordon. This response on the part of retailers has undoubtedly had an influence on the number of purchases made and, consequently, on maintaining overall sales levels.

2.5.2 In theory, the impact depends heavily on the individual scheme

In theory, it is probable that increasing the cost of transport tends to make the city more compact. In fact, insofar as households and businesses would like to reduce their travel costs and rents, it is in the interests of urban development agencies to reduce the length of their journeys. However, a study on household spending on transport and housing would tend to prove that households in the Ile-de-France area do not assess transport costs accurately when deciding where to live. Furthermore, we have to be very careful when dealing with the interaction between urban planning and transportation.

The impact on urban development is clearly intricately related to the individual scheme in question: a general pricing scheme based on the distance travelled and a cordon charging scheme will not have the same effects on the location of homes and jobs, and only a specific local study can clarify the matter. For example, cordon charging may have the effect of concentrating housing and business within the cordon or, on the contrary, outside the cordon, or, then again it may have different effects on housing and business.

Charging for use of radial express roads is designed to encourage people to live closer to their most regular destination, etc. When all is said and done, the effects could just as well depend on the overall project as on specific details of the system developed, such as price levels, the “permeability” of the cordon, whether it applies on working days or only at peak times, etc.

A theoretical study produced in Auckland, Canada, using a modelling tool, demonstrates, with all the reservations that go hand in hand with the use of this type of tool, that cordon charging may have a tendency to halt urban sprawl but to “decentralise” retail outlets, which relocate to housing and work areas.

2.6 The different technological solutions: advantages and disadvantages

The acceptability of the technologies available for implementing road pricing is far from being a minor issue. These technologies provide the interface between the system and the driver, and form a key factor in the driver’s appreciation of the proposed system. In particular, the technological solutions available raise the question of respect for privacy; indeed, road pricing brings with it the spectre of “big brother” watching over every trip the motorist might make. In the section below, we shall examine, in this order, “conventional” systems, systems that allow the motorist to be identified and use DSRC technology (Dedicated Short Range Communication technology) and, lastly, other types of systems.

In each case, we will look at the following issues:

- revenue collection,
- control measures,
- Interoperability,
- Possible links with other services,
- Respect for individual freedom,
- Safety of the system as a whole.

This review of the different systems also shows that technology in the field of road pricing is developing very quickly, making it possible to be increasingly demanding in terms of transparency, anonymity and flexibility. However, and as always, we must not get carried away by the heady possibilities of technology, but ensure that its use is governed by a clear policy.

Type	Example	Advantages	Disadvantages
Windscreen disk	Singapore prior to 1998; Rome	-Very simple to implement -Does not allow the vehicle to be identified.	-Rigid price structure. -Visual inspection required.
Conventional system with toll barrier and manual payment	Prado-Carénage tunnel; North Section of the Lyon ring road, intercity links	-Very familiar in France -Allows easy management of occasional users -Does not allow the vehicle to be identified.	-Act of payment perceived directly -Slow flow rate -Hard to blend into urban environment -Vehicles brought to standstill -For single points only
DSRC badge	ETC at aforementioned facilities; Singapore since 1998	May or may not allow the motorist or vehicle to be identified	
		-Easy to change prices -Flexible payment arrangements -Fairly familiar in France	-For single points only -Hard to manage occasional users
GPS badge	HGV traffic charge in Switzerland	-Custom pricing is possible, based on mileage, location or other criteria	-Vehicle is identified -New technology -Hard to manage occasional users
Automatic number plate recognition	London congestion charge	-Allows easy management of occasional users	-Vehicle is identified -New technology -For single points only

Figure .9. Advantages and disadvantages of the different technologies available

2.6.1 “Conventional” systems

To begin with, tolls were collected at specific points and to cross distinctly identified engineering structures (e.g. bridges), and this is how the very first tolls for motor vehicles worked (so-called “open” systems).

We have also used “semi-open” toll systems, not unlike the above, but where the toll can cover different motorway sections that all share a common section. The charge is the same regardless of the distance travelled, and it is possible to use automatic toll collection systems, such as tollbooth coin baskets. Such systems are widely used in periurban areas.

“Closed” toll systems, on the other hand, are widely used in the open countryside: users are given a ticket upon entering the system and pay as they exit, the toll payable depends on the ticket produced (and, as appropriate, on other factors such as vehicle category and the time of travel, etc.).

This is by far the most widely used system in France, and in all the European countries that have introduced toll systems. In general, it is secure, even though it should be mentioned that it has given rise to several types of fraud:

Fraud by users across the entire network, thanks to a clever system of exchanging toll cards (greatly facilitated by restaurants that straddle the motorway, or the existence of motorway services that can be used by motorists travelling in both directions).

Fraud by personnel (cheating over the vehicle class).

This is obviously not the place to go into a detailed description of such fraud. However, it is important to note that the situation regarding these conventional systems, although satisfactory overall, is not one hundred percent perfect.

In France, users have always paid upon exiting a closed toll road, but we should be aware that methods quite different to our own have been used elsewhere; for example, in Italy, at the start of a toll motorway, users used to pay upon entry (and they were given a receipt, to be presented upon exit), which presumes that, firstly, they know the exact name of the exit they are going take and, secondly, that they will not change their minds en route!

In all previous cases, the transaction could remain completely anonymous, since users could always pay in cash; naturally, if they paid by cheque or credit card, this would imply an end to their anonymity.

With such a system, the toll charged is usually fixed, and depends only on the class of the vehicle and the distance travelled. All the same, especially in France, some companies have experimented with toll adjustment processes (SANEF and SAPRR in particular). Even if such operations have generally achieved their aims, their implementation has been lacking in flexibility. Last of all, there are usually no related services, with the possible exception of information displayed on small screens near the tollbooths.

The fact that users have to stop implies a loss of time. Furthermore, the rate of traffic through a toll lane with a tollbooth manned by an assistant is usually only around 150 to 170 vehicles/hour. At peak times, when the motorway throughput is 5,000 vehicles/hour or more (for a three-lane motorway), more than thirty toll lanes are needed, which is both costly in terms of personnel and also uses up a great deal of space, which is a problem in several respects (how well does this blend into the landscape, complaints by local residents, users find it difficult to see which lanes are open or closed, etc.).

Even if it is possible to design suitable facilities to reduce the width, it would still be extremely difficult for such toll gates to be used in an urban context.

Note that in Trondheim, of the 16 paying access routes into the city centre, only two have manual toll gates for occasional visitors or tourists to drive into the city without needing a pass.

Furthermore, due to the diversity of payment methods, the operators have created specific lanes:

Lanes with manned toll-booths,

Automatic lanes with credit card payment,

Lanes for pass holders, etc.;

This organization is, basically, complicated; moreover, since it varies according to different motorway management companies, it becomes increasingly difficult to divide up traffic flow in the immediate vicinity of the tollgates.

All these reasons help to explain the interest shown by motorway concession holders on the one hand, and city authorities interested in road pricing schemes, on the other hand, in alternative systems that no longer necessarily require either a physical barrier or that vehicles should stop. Such systems, generically termed ETC systems, are described below.

2.6.2 ETC, or electronic toll collection, with or without driver identification and using DSRC

DSRC (Dedicated Short Range Communications) are a set of European standards, currently still at an experimental stage, which define the communication protocols between an onboard terminal – a transponder or tag - and equipment installed on the road, either on an overhead gantry, or a “beacon” at the side of the road. Two transmission media are provided for in the protocol standards: the 5.8 GHz hyperfrequency link and infrared link. In practice, the hyperfrequency link has been developed the most extensively, at least in Europe.

Users must have a transponder which enables dialogue between the vehicle they are driving and the toll infrastructure system. The transponder may be associated with a given vehicle, as in Singapore, or not, as is the case with interurban ETC in France. Following on from the early read-only devices, we now have read/write transponders; in other words, dialogue with the toll infrastructure system works both ways.

The system allows a choice between anonymity and driver or vehicle (with the transponder onboard) identification. In the case of interurban tolls in France, for example, the ETC user subscribes to the system and his/her account is automatically debited each time s/he passes through the toll “gate”; the system thus recognises the driver and can keep records of cars passing through the toll. On the other hand, the system introduced in Singapore does not recognise the driver or the vehicle, since, when the transponder is fitted in the vehicle, the number plate is not recorded and payment is made using a prepaid chip card inserted in the transponder, a bit like a phone card, and which is entirely anonymous.

Several alternative forms of payment exist: prepayment, postpayment, subscription at special rates, etc. Furthermore, users perceive the ETC system as “painless”, thus making it much more acceptable. These systems have several other advantages, including the fact that the toll may be adjusted very easily, according, for example, to the time of day and level of congestion observed on the network, such as on the I-15 in California.

Features such as these make this technology particularly interesting for urban road pricing schemes.

There are many places in the world where this technology has been used. In France, the various motorway companies, after beginning to develop independent systems, launched the TIS scheme (Télépéage InterSociétés, or inter-company ETC), which was widely implemented in the course of the year 2001.

Their DSRC-based ETC systems make it possible to significantly increase toll lane throughput by (in theory, from 170 vehicles/hour, as recorded prior to the project, up to around 600 vehicles/hour).

Even though transactions can, in theory, be performed totally on the fly, and extremely quickly, the motorway companies still often prefer systems whereby the users continue to be channelled into lanes, entailing a stop and a barrier to be raised (which makes it easier to identify anyone attempting to evade payment, and is also safer for the personnel). In spite of these remaining limitations, systems such as these are generally popular with the general public, since they cut waiting times drastically.

It is more difficult to deal with violations and, more generally, with any problems (insufficient funds in users' accounts, faulty or incorrectly positioned transponders, unregistered users, etc.), if transactions are processed without having to pass through a physical barrier. In theory, violations can be "detected" thanks to number plate recognition (video camera combined with OCR – optical character recognition), as implemented in some countries, for example in Australia. However, at least to date in France, these systems raise certain thorny legal issues: for example, non-payment is not an infraction for which the owner of the vehicle can be prosecuted, whereas this is the case for jumping a red light. In the future, the use of electronic plates should simplify the way in which violations, however occasional, are dealt with, provided, of course, that all the legal aspects and regulations can be resolved.

In addition to the advantages described above, DSRC can also be used to send users traffic information and weather updates, etc. Other services could be added to the toll collection system; in Singapore, for example, prepayment cards used for road pricing can also be used in some cafeterias and shops for small purchases. Closer to home, Italy's ETC card can be used to pay for petrol and at some motorway service stations.

2.6.3 Other systems based on vehicle identification: GPS and number plate identification

The development of satellite technology, which enables us to locate mobile devices, has opened up a host of new possibilities. Thanks to GPS (global positioning system), it is now possible to locate a device to within a few metres. Galileo, the future European satellite navigation system, will further improve GPS performance but other existing positioning systems can already be used.

Most electronic toll collection solutions that use global positioning are making increasing use of GSM communication technology. Although not strictly indispensable, this addition does make it possible to update pricing tables (when they are stored in the onboard terminal), to add on certain services, such as the transmission of information or emergency calls, and, more generally, to facilitate supervision of the entire system.

It should also be noted that if, in addition to locating a mobile device, we are able to unequivocally identify the road on which the mobile device is travelling (for example, thanks to DSRC systems like the ones mentioned above), it should then conceivably be possible to charge according to the distance travelled and the type of journey, among other factors.

This pricing scheme could also include other factors, such as:

- ✓ The class of the vehicle,
- ✓ The period during which the journey is made (thus avoiding the threshold effects we now get in the case of toll adjustments, or even free access for motorbikes and caravans on certain days).

Even though implementing such a system is yet to become widespread, other parameters could also be factored into charging, for instance:

- ✓ Road network congestion,
- ✓ Pollution emissions from the vehicle (if the system is related to the vehicle rather than the individual motorist),
- ✓ The quantity of merchandise, or people, transported,
- ✓ The fact of towing a trailer or caravan, etc. (the possibilities are endless!).

Here too, any number of services could be integrated in addition to those mentioned above, such as the possibility of “tracking” the transportation of dangerous materials. But it will also be possible to track all users’ journeys. Great care must be taken to protect individual liberty, since such systems may easily take on shades of “Big Brother”! A company promoting such a system must convince people of its good intentions in this realm.

As for the overall safety of these systems, one concern is that they are not sufficiently fraudproof, at least in their current state; for example, what would happen in the event of GPS failure, or deliberate damage? For the time being, we do not have enough experience of these systems to form an objective opinion. We should nonetheless point out that the Swiss, for their RPLP service-related charge for heavy goods vehicles (see Part 3) opted for a combined system based on GPS and DSRC, with the transponder also connected to the lorry’s electronic tachograph, to calculate the distance travelled. GPS serves to confirm the estimated distance travelled and to ensure that the system works all over Switzerland.

As for London, the system to be introduced is entirely based on automatic number plate recognition (ANPR). Users will not need a transponder; thus making the system much more flexible. However, even though the authority in charge undertakes to automatically destroy all records of vehicles entering and leaving the zone, the technology will make it possible to track the comings and goings of all vehicles at the different gantries around the zone. Another feature of the system is that it allows users to “rectify” their situation within 24 hours, if they are not pass holders or did not plan the journey in advance.

The Netherlands, when planning to introduce congestion charges on the motorway network, tested a number of other options including an automatic number plate recognition system which proved satisfactory; their tests showed that the system served to detect 90 % of plates with a margin of error of 0.01 % .

To reduce the margin of error, the system detects both front and back number plates. The test was carried out on a three-lane motorway, in all weather conditions and with traffic throughput of around 5,500 vehicles/hour at peak times. It was calculated that ten full-time employees would be required to process the ANPR system manually.

2.7 Will we accept paying for our freedom?

“It’s a return the days of city tolls”, “it’s tantamount to privatising the city”, “it’s a violation of civil liberties” are some of the arguments frequently raised in protest against the introduction of road pricing schemes. The subject involves some deep-rooted and justifiable social and cultural issues that would be difficult for us to explore in great detail in this document, since we lack the appropriate sociologic studies on road pricing.

We would however like to suggest some possible approaches to the subject, by drawing an analogy with paying for water. In point of fact, everyone would agree that cars are a symbol of individual freedom; water, on the other hand, is a symbol of life. In the popular imagination, and in terms of biology, the idea that “water is life” is one of the fundamental ideas running through our culture.

Nonetheless, we now have to pay for our water; and we find it perfectly normal, if not natural, to pay our water bills. The fact of paying for it is wrapped up with the quality of our water and the service provided; whether this connection is something that is understood or perceived, it makes paying acceptable. Basically, the fact of paying to use water that is essential to life is no longer questioned.

“City tolls” and “privatisation” are obviously associated with the concept of liberty mentioned above. The abolition of city tolls was one of the victories of the French Revolution; and the concern over “privatisation” also carries with it a fear of control over our movements by an indeterminate, yet unquestionably inhuman, higher authority. It is not our place here to say whether or not such fears are justified – they obviously are, since they are deep-rooted in our culture –, but rather to put the issue in perspective by showing how charging for water gave rise to similar concerns yet we do not now feel as if live in a dehumanised world because we pay for our water.

2.7.1 Paying for water, paying for life: not quite that simple

Examples of the introduction of water charges in France in the 19th century or in developing countries in the 20th century, show that, in urban areas, the measure was introduced in gradual stages: water could be delivered by water carriers who charged high prices to save people the time they would otherwise have to spend walking to and waiting in line at the nearest well; this was followed by cleaner and more readily available water piped into the home, in return for a charge. The introduction of water charging, therefore, has always been related to having a choice – the well, the water carrier or a connection in the home – and, at the same time, an overriding idea of a service provided – safe and readily-available water. Nonetheless, people were extremely reticent to begin with, as can be seen in some of the reactions on the part of Parisians shown in Box .8.

In the Third World, the issue of charging for water is currently on the agenda in order to develop water and sewage networks and improve water quality. However, the introduction of water charging is not as simple as all that; as demonstrated by this expert

in village water supply in the Côte d'Ivoire: "I asked the villagers, what will you do if this well [which had a hand pump] stops working? We'll all make a contribution to pay for it to be repaired, they answered. But collecting the contributions wouldn't necessarily be that simple. Was there, based on the customs of the village, a way to establish a fair principle that would be acceptable to all for sharing the cost of water, access to which has traditionally been free and unlimited?" ; as also demonstrated in the case of Lele community in Nepal which, in 1995, decided to introduce a tariff for water in order to improve the sanitation system, aided by UNICEF. Once the community itself had taken the decision, a fifth of the inhabitants refused to pay the water tariff, believing that the government provided a water supply system free of charge.

The importance of having a choice, as we saw in § 1.3 when discussing alternative forms of transport, together with arguments focusing on the amount of time wasted going to draw water from the well or public fountain - the equivalent of traffic congestion - brings us directly back to our comparison of the issues involved in water and traffic management.

"The water carriers were thus part and parcel of the Paris landscape. Most carried water in two buckets hanging from a yoke slung across their shoulders, while others had casks [...].

As can well be imagined, this caused all sorts of problems. Public fountains and the area around them were swarming with or even monopolised unscrupulously by the water carriers, who obviously worked hand in glove with each other, and who often completely drained the basins for their own stocks. The population had to submit to their rules or risk a brawl... Servants and housewives lost time and patience; as for passersby, as we have seen, they were forced to make detours around the mob...

Moreover, water carried by a man, or woman, was expensive. In 1858 for example, it cost 3.75 francs a cubic metre, while water from private concessions cost only 0.28 franc a cubic metre for water from the Seine and spring water, or 0.14 franc for water from the Ourcq Canal!

Judging from the reports, essays, facts and figures, you might be led to believe that everyone would now have jumped at the opportunity to have water supplied directly to the home. In fact, while the situation was indeed ripe for change insofar as the city authorities and the more enlightened were concerned - not that this stopped the Palais des Tuileries from still being supplied by water carriers right up until 1848! - simple citizens of Paris were still far from ready for such a change, steeped as they were in their old habits and prejudices. As in the days of the Perier brothers, house owners were afraid that the pipes would burst, causing flooding and humidity problems. They also feared that subscribing to the city's water supply would result in excessive use by their tenants, especially in the lavatories, thus requiring frequent, and therefore costly, pumping out. They were not completely wrong. The progress qui s'offre implicated such massive changes that it seemed impossible to overcome the problem. In fact, it would take all the incredible audacity and inventiveness of the Second Empire to bring about the desired change.

But then again, as we say, necessity is the mother of invention."

Translated expert from Liliane Franck "Eau à tous les étages. L'aventure de l'eau à domicile à travers l'histoire de la Compagnie Générale des Eaux", published by AAA, Paris, 1999, pp408.

Box 8. The gradual introduction of domestic water charges in Paris in the 19th century

Water as synonymous with life also becomes synonymous with time wasted and health problems when things go wrong, due to the population explosion and the shortage of water. Charging, although it may initially seem unfair and implies major cultural changes, becomes one of the most effective means to improve quality of service and to prevent resources being wasted. The parallel with road pricing remains pertinent: road pricing must be anchored in the goals of reducing nuisances and improving management of the transport system; road pricing should no longer be viewed as depriving us of our liberties, but as improving the system.

2.7.2 Providing information and involvement in the decision-making process to introduce water charges.

For several decades, scores of experts have been researching the issue of improving supplies of drinking water in countries that have no organised supply system. It is interesting to note that, on the one hand, they see charging for water as the only solution to issues such as ensuring a return on the investment in infrastructure and managing a precious resource, while on the other hand, they insist on the importance of information, transparency, of the decision being taken by the village or community in question and of the need to adapt to the specific cultural and social context.

At the international conference on water and sustainable development held in March 1998, the International Water Supply Association stated that, “people are generally prepared to pay a fair price for a good quality service provided that they are informed in an appropriate manner and involved in the decision-making process.” . Other specialists say that, “to achieve reliable solutions for managing drinking water supply systems by the community, we must take account of what the users think in designing such systems. [...] It is difficult to develop a cost recovery system when the service fails to meet the needs of all the different categories of users, and when no account is taken of their specific needs and their ability to pay. For this reason, it is becoming more usual that development projects include asking the community’s opinion on issues such as the standard of service and choice of appropriate technology, etc [...].”

All these conclusions and comments equally apply in the case of road pricing, as we described in detail in Part 1 of this document. We would not take the comparison too far however; the user is much more receptive and therefore likely to understand of the logic of: “I’m paying for better quality, more hygienic and more accessible water” than the equivalent logic in road pricing: “I’m paying for a more efficient transport network.” The willingness to pay for water is thus certainly much higher than for transportation.

To conclude then, we would say that in our culture, there is no longer any need to demonstrate that charging for water is justifiable and effective; the same cannot be said of road pricing. Water, a symbol of life, has survived privatisation; should we now have any fears about our cities becoming dehumanised by charging for the use of our cars, a symbol of freedom?

Conclusion

The purpose of this study has been to provide inspiration for further research and provoke debate. We hope we have been successful in this. We felt that it is vital to position the debate constructively, rather than focus on the question "For or against urban tolls?", which inevitably leads to deadlock. In order to develop acceptable projects, research carried out in France and elsewhere shows that urban road pricing must be viewed as a transport policy tool, and that it is important to ensure that policy and the tools for implementing it are consistent. To this end, the decision-making process and the public relations strategy must be designed intelligently to ensure transparency and develop the project in liaison with all the stakeholders concerned.

Clearly, there are numerous topics of debate relating to this complex, unpopular instrument. We have outlined, very broadly, some of the issues that need to be discussed and which affect various areas of the urban environment: the efficiency and cost-effectiveness of transport systems; the environment and quality of life; the city's health and vitality; social freedom and justice; etc. Road pricing thus lies at the centre of a multitude of different issues that must be worked out in order to make such projects as viable as possible.

Lastly, experiments implemented all over the world have convinced us that an essential success factor has been the fact that the solutions developed, or that are in the course of being developed, have all been adapted to suit the local context and have always involved dialogue and consultation with the local population to define the main points of the project. The wide range of available techniques, measures and procedures are opening up new horizons, and there is no shortage of solutions or experimental projects.

Nonetheless, the debate over acceptability is far from closed, in fact, it is really only just getting underway in France. Concrete studies being conducted in cities, are likely to carry the debate forward. More generally, certain aspects of charging motorists for road use have yet to be thoroughly investigated; there is still considerable scope for research on sociological, political, marketing and legal aspects as well as public relations and intermodality pricing, for example. Over the next few years, general and local studies should help to ensure progress is made on the subject of the usefulness of introducing road pricing schemes in our cities.

Contents

1. ROAD PRICING – HOW AND WHY?	11
1.1 A political hot topic?	12
1.2 Road pricing as a solution to three families of urban problems	12
1.3 A tool for implementing transport policy	19
1.4 The importance of consultation in the decision-making process	21
1.5 Changes in attitude required and to be expected : the importance of communication	25
1.6 12 key elements for building acceptability	28
2. ELEMENTS OF THE DEBATE	31
2.1 Arguments “for and against”	31
2.2 Transport costs - a few figures	33
2.3 Environmental risks of motorised traffic	39
2.4 The thorny issue of social equality	42
2.5 Expected effects on urban planning and economics	45
2.6 The different technological solutions: advantages and disadvantages	47
2.7 Will we accept paying for our freedom?	52
3. Bibliography	62
4. List of abbreviations	64

3. Bibliography

Reference works in French on road pricing in urban areas

Abraham Claude, Bonnafous Alain, Chabanol Daniel, Chabert Marc, Crozet Yves, Dalmais Christiane, (eds.), *Péage et financement d'infrastructures en milieu urbain*. Lyon les leçons d'un périphérique, LET, Lyon, 2000, 245p.

Certu, *Comportements des automobilistes face au péage urbain - L'expérience du tunnel Prado-Carénage*, Lyon, 1999, 68p.

Certu, *Les premières mises en place du stationnement payant sur voirie - Quelle acceptabilité pour les mesures de tarification*, Lyon, 2000, 58p. Download from Certu website www.certu.fr.

Cetur, *Péage urbain - Vivre et se déplacer en ville*, Paris, 1994, 141p.

Dericke Pierre-Henry, *Le péage urbain – Histoire – Analyse – Politique* », publ. *Economica*, Paris, 1997, 197p.

Puget Jacqueline, Benayon Laurent, le Collectif Anti-Péages, *L'affaire du péage de Roques – Victoire d'un collectif d'irréductibles citoyens*, publ. Loubartières, 1998, 216p.

Raux Charles, Lee-Gosselin Martin, (eds.), *La mobilité urbaine : de la paralysie au péage ?*, PPSH Rhône-Alpes, Lyon, 1992, 363p.

Raux Charles, Andan Odile, Faivre d'Arcier Bruno, Godinot C. *Les Réactions au péage urbain*. Enquête exploratoire, LET, Lyon, 1995, 163p.

Works in English

Button K.J., Verhoef E., (eds.), *Road Pricing, traffic congestion and the environment – Issues of efficiency and social feasibility*, Edward Elgar Publishing Ltd, 1998, 316p.

Johansson B. and Mattson L-G., (eds.), *Road pricing: Theory, Empirical Assessment and Policy*, Kluwer Academic Press, London, 1996, 239p.

EUROPRICE, Technical Paper 1. City status report, Bristol City Council, July 1999, 46p. Download from: www.europrice-network.org

EUROPRICE, Technical Paper 2. Priority policy issues report, STA, City of Rome's Mobility agency, 2000, 76p. Download from: www.europrice-network.org

EUROPRICE, Technical Paper 3. Priority policy issues report, City of Edinburgh Council, 2000, 102p. Download from website: www.europrice-network.org

Selection of other documents used in writing this study

BOITEUX Marcel, *Transports : choix des investissements et coût des nuisances*, La documentation française, Paris, 2001, 441p

CAPRI, Deliverable 4. Road transport pricing issues with particular reference to urban road pricing, 1999, 33p.

Certu, *Plans des déplacements urbains – prise en compte de la pollution de l'air, du bruit et de la consommation d'énergie*, Lyon, 1999, 300p.

European Commission, *Des redevances équitables pour l'utilisation des infrastructures : Une approche par étapes pour l'établissement d'un cadre commun en matières de tarification des infrastructures de transport dans l'UE*, White Paper, COM (1998), Brussels, 1998, 58p.

du Crest Thierry, Duprez Fabien, *Le péage de décongestion : Un outil efficace, une mise en œuvre délicate*, in *Les Annales des Ponts et Chaussées*, No.94, 2000.

Jones Peter, Review of available evidence on public reactions to road pricing, Report to London Transportation Unit, July 1992, 131p.

Piron Vincent, L'acceptabilité politique du péage routier. Quelques exemples européens, in Transport, No.385, September-October 1997.

Piron Vincent, Transport, urbanisme et péage : Peut-on chiffrer l'acceptabilité politique ? , in Transport No.402, July-August 2000.

PRIMA, Deliverable 1, 2, 3 and 4, 2000. Download from www.certu.fr/internat/peuro/prima/prima.htm

Quin Claude, Duprez Fabien, Bourgis Nadège, Compte national du transport de voyageur (1998), Rapport au ministre de l'équipement des transports et du logement (février 2001), Paris, 2001.

Quinet Émile, Problèmes et enjeux de la tarification des effets externes dans les transports, in Transport, No.395, May-June 1999.

Raux Charles, Souche Stéphanie, L'acceptabilité des changements tarifaires dans les secteurs des transports : comment concilier efficacité et équité ?, XXXVIème colloque de l'association de science régionale de langue française, conference in Crans-Montana, Switzerland, 6-9 September 2000.

Servant Louis, Le péage urbain d'Oslo, IAURIF, Paris 2000, 27p.

Websites

Keywords for searches on the Net include: road pricing, road user charging, value pricing, road user fee, congestion charging.

For a general view of the situation, we would refer readers to www.certu.fr/transport, to the section on "tarification des déplacements" (road pricing), which provides information on the most interesting websites dealing with this subject. For example:

Prado-Carénage tunnel site www.tunnelprado.com

Lyons northern ringroad website www.peripheriquenord.com

SR91 website www.91expresslane.com

I-15 website www.sandag.cog.ca.us/data_services/fastrak/index.html

Value Pricing website, North American portal on road pricing www.valuepricing.org

Europrice cities network website www.europrice-network.org

European Progress project website (8 tests at pilot sites) www.progress-project.org

4. List of abbreviations

- CES – Conseil Économique et Social, France’s Economic and Social Council
- CNT – Conseil National des Transports – National Council for Transport
- CNTV – Compte National du Transport de Voyageurs – national “passenger transport” account
- CMU – Couverture Maladie Universelle – free healthcare cover for people on low incomes
- DSRC – Dedicated Short Range Communication
- GART - Groupement des Autorités Responsables de Transport - French Transport Authorities Group
- GPS – Global Positioning System
- GSM – Global System Mobile communication
- LOTI – Loi d'orientation sur les Transports Intérieurs – Act on guidelines for domestic transport
- PDU – Plan de Déplacements Urbains - Urban Transportation Plan
- PTAC – Poids Total en Charge – gross weight (of a vehicle)
- PS – Parti Socialiste – Socialist Party
- PTU – Périmètres des Transports Urbains – urban transport zones
- RPLP – Redevance sur les trafics des Poids Lourds liée aux Prestations - service-related charge for heavy goods vehicles (Switzerland)
- RPR – Rassemblement Pour la République – Rally for the Republic, name of the Gaullist party in France
- SMTPC – Société Marseillaise du Tunnel Prado-Carénage - the operator of the Prado Carénage tunnel in Marseille
- SRU – loi sur la Solidarité et le Renouvellement Urbain - Act on Solidarity and Urban Renewal
- TC – Transport Collectif – public transport
- TIPP – Taxe Intérieure sur les Produits Pétroliers – Domestic duty on petroleum products
- UDF – Union pour la Démocratie Française – Union for French Democracy
- VP – Voiture Particulière – private car
- VT – Versement Transport – Transport Fund
- VUL – Véhicule Utilitaire Léger – light duty vehicle
- ZTL – Zone à Trafic Limité - limited traffic areas

Table of contents

1. ROAD PRICING – HOW AND WHY?	11
1.1 A political hot topic?	12
1.2 Road pricing as a solution to three families of urban problems	12
1.2.1 The three families – Finance, Control and the Environment	13
1.2.2 "The user finances infrastructure" and "the user buys time" are not generally accepted principles	14
1.2.3 "The polluter pays" is a widely accepted principle.	15
1.2.4 Infrastructure financing through taxation – The solution?	16
1.2.5 A solution for relieving traffic congestion ?	17
1.3 A tool for implementing transport policy	19
1.3.1 The various forms of pricing – multiple, customisable solutions	19
1.3.2 Coherence between tools and policy	20
1.3.3 The multimodal issue	21
1.4 The importance of consultation in the decision-making process	21
1.4.1 Transparent decision-making	22
1.4.2 Findings of the Europrice network of cities relating to consultation on the subject of road pricing	22
1.4.3 The English consultation process on planned legislation to authorise road pricing	23
1.4.4 Drawing on marketing techniques to build an acceptable project	24
1.5 Changes in attitude required and to be expected : the importance of communication	25
1.5.1 Locals agree with the objectives but charging schemes not understood	26
1.5.2 Communication and the media	27
1.5.3 30% in favour: a useful threshold?	27
1.6 12 key elements for building acceptability	28
2. ELEMENTS OF THE DEBATE	31
2.1 Arguments “for and against”	31
2.2 Transport costs - a few figures	33
2.2.1 In cities, drivers do not fully cover the costs they incur to the region.	33
2.2.2 Social costs by journey: delicate comparisons between modes of transport	35
2.2.3 The car, a major household expenditure	36
2.2.4 Financing for transport systems: little room to manoeuvre	37
2.3 Environmental risks of motorised traffic	39
2.3.1 Trends, prospects and challenges in pollution	39
2.3.2 Road safety	41
2.4 The thorny issue of social equality	42

2.4.1	Analysis of winners and losers that suggests answers	42
2.4.2	The three principles of equality	44
2.4.3	Experiences teach us about those excluded from the system	44
2.4.4	Captives of all modes of transport	46
2.5	Expected effects on urban planning and economics	47
2.5.1	Trondheim: no negative impact on trade observed	48
2.5.2	In theory, the impact depends heavily on the individual scheme	49
2.6	The different technological solutions: advantages and disadvantages	50
2.6.1	“Conventional” systems	51
2.6.2	ETC, or electronic toll collection, with or without driver identification and using DSRC	53
2.6.3	Other systems based on vehicle identification: GPS and number plate identification	54
2.7	Will we accept paying for our freedom?	56
2.7.1	Paying for water, paying for life: not quite that simple	56
2.7.2	Providing information and involvement in the decision-making process to introduce water charges.	58
3.	Bibliography	61
4.	List of abbreviations	63