

# WORLDWIDE SITUATION OF ROAD PRICING AND ASSESSMENT OF ITS IMPACTS

*PIARC Technical Committee A3 Road System Economics  
and Social Development*



*The World Road Association (PIARC) is a nonprofit organisation established in 1909 to improve international co-operation and to foster progress in the field of roads and road transport.*

*The study that is the subject of this report was defined in the PIARC Strategic Plan 2008 – 2011 approved by the Council of the World Road Association, whose members and representatives of the member national governments. The members of the Technical Committee responsible for this report were nominated by the member national governments for their special competences.*

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*International Standard Book Number 2-84060-242-3*

*This report has been prepared by the Technical Committee A.3 “Road System Economics and Social Development” of the World Road Association PIARC.*

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*The edition of the report was done by CEDEX (Spain), with the support of Concepción Sevillano and Mercedes Montero.*

*The French version of this report has been published under the PIARC reference 2012R01FR, ISBN: 2-84060-243-1*

<b>EXECUTIVE SUMMARY</b> .....	<b>10</b>
<i>Worldwide situation of road pricing</i> .....	10
<i>The impacts of pricing</i> .....	12
<b>INTRODUCTION – SCOPE OF THE STUDY</b> .....	<b>15</b>
<b>1. KEY CONCEPTS</b> .....	<b>17</b>
1.1. OBJECTIVES OF ROAD PRICING .....	17
1.2. PRICING TOOLS.....	19
<b>2. WORLDWIDE SITUATION OF ROAD PRICING – TOWARDS MORE REGULATION?</b> .....	<b>22</b>
2.1. WHAT'S THE NEWS ON IMPLEMENTED ROAD PRICING SYSTEMS?.....	23
2.1.1. <i>Are vignettes a transitory system?</i> .....	23
2.1.2. <i>Continued development of major roads or highway structures tolls</i> .....	24
2.1.3. <i>In Europe, generalization of distance based tolls for heavy vehicles</i> .....	26
2.1.4. <i>Congestion pricing experiences</i> .....	27
2.1.5. <i>Area charging and city tolls evolution and hesitation</i> .....	29
2.1.6. <i>Develop toll collecting to replace road transport taxation</i> .....	32
2.2. REGULATION NEWS.....	33
<b>3. THE IMPACTS OF PRICING AND THEIR EVALUATION</b> .....	<b>35</b>
3.1. IMPACTS ON MOBILITY CHARACTERISTICS .....	36
3.1.1. <i>Traffic demand and modal shift</i> .....	36
3.1.2. <i>Traffic diversion</i> .....	38
3.1.3. <i>Others mobility characteristics</i> .....	38
3.1.4. <i>The assessment of impacts on the mobility characteristics</i> .....	38
3.2. ENVIRONMENTAL IMPACTS .....	40
3.2.1. <i>Air quality and CO<sub>2</sub> emissions</i> .....	40
3.2.2. <i>Noise</i> .....	41
3.2.3. <i>Assessment of environmental impacts</i> .....	42
3.3. IMPACTS ON ACCIDENTS .....	42
3.4. IMPACTS ON THE ECONOMY.....	43
3.5. IMPACTS ON LAND USE AND ACCESSIBILITY .....	44
3.6. EQUITY.....	44
3.7. ATTITUDES TO ROAD PRICING.....	45
<b>4. CONCLUSIONS</b> .....	<b>47</b>
<b>5. BIBLIOGRAPHY/REFERENCES</b> .....	<b>49</b>
<b>6. GLOSSARY</b> .....	<b>50</b>
<b>APPENDICES</b> .....	<b>51</b>
<b>I. PANORAMA OF IMPLEMENTED AND ENVISAGED ROAD PRICING SCHEMES</b> .....	<b>51</b>
1.1. ROAD PRICING REVIEW FOR THE UNITED KINGDOM.....	51
1.1.1. <i>Background and brief description</i> .....	51
1.1.2. <i>Bridge and tunnel tolls</i> .....	52
1.1.3. <i>The M6 Toll Road</i> .....	52
1.1.4. <i>The London Congestion Charging Scheme</i> .....	53

1.1.5. <i>The Durham Scheme</i> .....	54
1.1.6. <i>The failed proposals in Edinburgh and Manchester</i> .....	54
1.2. ROAD PRICING SCHEMES IN SWITZERLAND.....	55
1.2.1. <i>Existing schemes</i> .....	56
1.2.2. <i>Envisaged schemes</i> .....	58
1.2.3. <i>References for additional information</i> .....	59
1.3. ROAD CHARGING SCHEMES IN AUSTRIA.....	59
1.3.1 <i>Existing charging schemes in Austria</i> .....	59
1.3.2. <i>Objectives for charging</i> .....	60
1.3.3 <i>The electronic toll collection system</i> .....	61
1.3.4. <i>Revenues from toll and vignette</i> .....	63
1.3.5. <i>Results of the distance-based toll system</i> .....	63
1.3.6. <i>References for additional information</i> .....	64
1.4. THE NATIONWIDE TRUCK PRICING IN GERMANY.....	64
1.4.1. <i>How the system works</i> .....	64
1.4.2. <i>Results and problems</i> .....	66
1.4.3 <i>References for additional information</i> .....	67
1.5. THE HISTORY AND THE FORESEEABLE FUTURE OF ROAD TOLLING IN HUNGARY.....	67
1.5.1. <i>Background</i> .....	67
1.5.2. <i>The current tools/instruments</i> .....	68
1.5.3. <i>Future plans and lessons learned</i> .....	70
1.6. PRICING ON MOTORWAYS AND SELECTED ROADS IN THE CZECH REPUBLIC.....	71
1.6.1. <i>Introduction</i> .....	71
1.6.2. <i>Existing road pricing schemes</i> .....	73
1.6.3. <i>Final remarks</i> .....	75
1.7. MULTILANE FREE-FLOW ELECTRONIC TOLLING IN THE SLOVAK REPUBLIC.....	76
1.7.1. <i>Charging, an instrument for financing infrastructure</i> .....	76
1.7.2. <i>A change in the charging philosophy</i> .....	77
1.7.3. <i>References for additional information</i> .....	79
1.8. ROAD PRICING SCHEMES IN FINLAND.....	80
1.8.1. <i>Existing road pricing schemes</i> .....	80
1.8.2. <i>Envisaged road pricing schemes</i> .....	80
1.9. ROAD PRICING IN SWEDEN.....	84
1.9.1. <i>Background and short description about road pricing in Sweden</i> .....	84
1.9.2. <i>The Stockholm congestion charge</i> .....	85
1.9.3. <i>References for additional information</i> .....	89
1.10. PRICING SCHEMES IN NORWAY.....	89
1.10.1. <i>Background</i> .....	89
1.10.2. <i>Objectives</i> .....	90
1.10.3 <i>How it works</i> .....	90
1.10.4. <i>Successes and problems</i> .....	91
1.10.5. <i>Evaluation methods</i> .....	91

1.10.6. Next steps.....	92
1.10.7. References for additional information.....	92
I.11 ROAD PRICING IN DENMARK.....	92
1.11.1. Background.....	92
1.11.2 Tolls to finance major bridge projects.....	93
1.11.3. A green shift of car taxation in Denmark.....	94
I.12. STUDY OF A DIFFERENT PAYMENT FOR MOBILITY IN THE NETHERLANDS.....	95
1.12.1. Big picture of the kilometre price.....	95
1.12.2. Elimination of fixed car taxes.....	96
1.12.3. Paying per kilometre.....	96
1.12.4. Who should pay the kilometre price.....	97
1.12.5. Introduction period of the kilometre price.....	97
1.12.6. Large-scale operational test.....	97
I.13. ROAD PRICING IN FRANCE.....	98
1.13.1. French tolled network.....	98
1.13.2. The envisaged HGV road pricing scheme in France.....	102
I.14. THE EXPERIENCE IN ITALY.....	105
1.14.1. The Italian motorways network.....	105
1.14.2. Tolls.....	107
1.14.3. Electronic toll collection.....	107
I.15. ROAD PRICING IN SPAIN.....	108
1.15.1. The existing toll road network.....	108
1.15.2. Envisaged schemes.....	112
I.16. TOLL PRICING POLICY IN MOROCCO.....	113
1.16.1 Key figures on the Moroccan highway program.....	113
1.16.1 The reason why toll was implemented in Morocco.....	114
1.16.3 Toll fares.....	114
I.17. ROAD PRICING SYSTEMS WITHIN THE WAEMU COUNTRIES.....	116
1.17.1. Context and brief description of road pricing in WAEMU countries.....	116
1.17.2. Some aspects on implementation of road tolls/weight tolls in WAEMU countries.....	117
1.17.3. The future of road tolls in WAEMU countries.....	118
I.18. PRICING IN MEXICO.....	119
1.18.1. The presence of a toll motorway network.....	120
1.18.2. Aim and results of establishing the concession scheme.....	121
1.18.3. Toll scheme.....	121
1.18.4. References for additional information.....	122
I.19. UNITED STATES.....	122
1.19.1. Targeted tolling and pricing.....	123
1.19.2. Experience with comprehensive pricing.....	126
1.19.3. References for additional information.....	129
I.20. ROAD PRICING SCHEMES IN CANADA.....	129
1.20.1. Introduction.....	129
1.20.2. Canada's Highway System.....	129

1.20.3. Highway infrastructure funding .....	130
1.20.4. Road pricing schemes in Canada .....	131
1.20.5. Conclusion .....	133
1.21. ROAD PRICING IN JAPAN: TOLLS AND EARMARKED TAXES .....	133
1.21.1. History of road development in Japan .....	133
1.21.2. Earmarked tax revenue system .....	133
1.21.3. Toll road system .....	136
1.21.4. The Economic Stimulus Package for the fiscal year 2008 - Toll discount and construction of smart interchanges by national budget .....	139
1.21.5. The Economic Stimulus Package for the fiscal year 2010 - Toll free highway trial .....	142
1.22. THE CONGESTION PRICING SCHEME IN SINGAPORE .....	142
1.22.1. The Electronic Road Pricing (ERP) scheme .....	143
1.22.2. Lessons learnt .....	150
1.22.3. Conclusion .....	151
1.22.4. References for additional information .....	151
1.23. OVERVIEW OF ROAD USE PRICING SCHEMES IN NEW ZEALAND .....	151
1.23.1. Introduction .....	151
1.23.2. Tolls .....	152
1.23.3. The Auckland Road Pricing Evaluation Study (ARPES) .....	152
<b>II. EVALUATING THE IMPACTS OF PRICING: CASE STUDIES .....</b>	<b>155</b>
II.1. THE EFFECTS OF THE CONGESTION PRICING IN LONDON .....	155
II.1.1. Background: identifying causal strands .....	155
II.1.2. Impact of road pricing .....	156
II.1.3. References for additional information .....	158
II.2. IMPACTS FROM THE STOCKHOLM TRIAL .....	159
II.2.1. Effects on the characteristics of mobility .....	160
II.2.2. Effects on the environment .....	161
II.2.3. Effects on road safety .....	162
II.2.4. Cost-benefit analysis .....	163
II.2.5. Economic effects .....	164
II.2.6. Effects on the region's economy .....	165
II.2.7. Equity effects .....	166
II.2.8. Acceptability .....	167
II.2.9. References for additional information .....	167
II.3. THE EXPERIENCE IN TRONDHEIM .....	168
II.3.1. Facts about the toll cordon .....	168
II.3.2. Evaluation before implementation .....	169
II.3.3. Evaluation during the period of operation .....	170
II.3.4. Evaluation after closing .....	171
II.4. HELSINKI REGION CONGESTION CHARGING CASE STUDY .....	171
II.4.1. Background .....	171
II.4.2. The charging models .....	172

II.4.3. <i>The expected effects</i> .....	173
II.5. AUCKLAND ROAD PRICING STUDY .....	185
II.5.1. <i>Introduction</i> .....	185
II.5.2. <i>Road pricing schemes examined</i> .....	186
II.5.3. <i>Impacts</i> .....	187
II.5.4. <i>Public acceptability</i> .....	190
II.5.5. <i>Public consultation process</i> .....	190
II.5.6. <i>Further work</i> .....	190
II.6. THE EFFECTS OF THE ECOPASS CHARGING SCHEME IN MILAN.....	194
II.6.1. <i>Description of the ECOPASS system</i> .....	194
II.6.1. <i>ECOPASS assessment</i> .....	194
II.6.3. <i>Conclusion</i> .....	197
II.7. RESULTS OF IMPLEMENTED AND ENVISAGED PRICING SCHEMES IN HUNGARY.....	197
II.7.1. <i>The effects of the envisaged Budapest charging scheme</i> .....	197
II.7.2. <i>Assessing the impacts of the Hungarian nation-wide “E-Vignette” system</i> .....	199
II.7.3. <i>Assessing the introduction of a distance based tolling in Hungary</i> .....	202
II.7.4. <i>References for additional information</i> .....	202
II.8. IMPACTS OF THE DISTANCE-BASED CHARGING SYSTEM FOR HEAVY VEHICLES IN AUSTRIA.....	203
II.8.1. <i>Effects on mobility characteristics</i> .....	203
II.8.2. <i>Effects on transportation costs</i> .....	205
II.8.3. <i>Effects on the environment</i> .....	205
II.8.4. <i>Revenues for infrastructure maintenance and financing</i> .....	206
II.8.5. <i>Effects on the economy</i> .....	206
II.8.6. <i>References for additional information</i> .....	207
II.9. THE CASE OF THE GERMAN LKW-MAUT.....	208
II.9.1. <i>The decision to set up the German LKW-MAUT</i> .....	208
II.9.2. <i>Effects of the tolling system</i> .....	209
II.9.3. <i>References for additional information</i> .....	211
II.10. THE CASE OF THE PERFORMANCE-RELATED HEAVY VEHICLE FEE IN SWITZERLAND.....	212
II.10.1. <i>Introduction</i> .....	212
II.10.2. <i>Effects of the pricing scheme</i> .....	212
II.10.3. <i>Evaluation methods</i> .....	216
II.11. ASSESSING THE IMPACTS OF A NATIONAL HGV CHARGE IN FRANCE.....	217
II.11.1. <i>Optimising road freight industry</i> .....	218
II.11.2. <i>Levying resources for transport infrastructure developments, in a global         inter-modal strategy</i> .....	219
II.12. ASSESSMENT OF ACCESSIBILITY IN A PRICING SITUATION IN SPAIN.....	220
II.12.1. <i>Introduction</i> .....	220
II.12.2. <i>Assessment of territorial accessibility</i> .....	220



II.13. CONSEQUENCES OF THE KILOMETRE PRICE ENVISAGED IN THE NETHERLANDS.....	222
II.13.1. Introduction.....	222
II.13.2. Methodology and basic premises.....	224
II.13.3. Effects on mobility.....	225
II.13.4. Effects on the environment.....	227
II.13.5. Economic effects.....	230
II.13.6. Financial consequences.....	232
II.14. THE IMPACT ANALYSIS OF THE INTERNALISATION OF EXTERNAL COSTS THAT ACCOMPANIES THE REVIEW OF THE EUROVIGNETTE DIRECTIVE.....	235
II.14.1. Impact on transport.....	236
II.14.2. Economic impact of transport dynamics.....	237
II.14.3. Environmental impact of transport dynamics.....	238
II.14.4. Social impacts of transport dynamics.....	238
II.14.5. Implementation costs.....	239
II.15. LESSONS LEARNED FROM THE US VALUE PRICING PILOT PROGRAMME AND URBAN PARTNERSHIP AGREEMENTS PROGRAMME.....	239
II.15.1. Introduction.....	239
II.15.2. Effects of VPPP projects.....	242
II.15.3. Effects of Urban Partnership Agreement (UPA) projects: HOT Lanes on I-95 in Miami.....	246

## EXECUTIVE SUMMARY

The aim of this study – in accordance with the request received by Technical Committee A.3 from the PIARC Executive Committee – is to deepen the understanding of road pricing effects and the approaches for their assessment. Pricing schemes considered in this analysis include those for which the primary goal is to finance the construction and/or maintenance of road networks, as well as pricing schemes (also) used as traffic-management and/or environmental-protection tool. Single road (even bridge or tunnel) as well as region- or nation-wide charging schemes have been considered, as well as urban and interurban road-user charging schemes.

To accomplish its objective, the Committee organised its work through the collection of information from several case studies, either implemented or envisaged. For each case study, the Committee member in charge was requested to focus his/her research on the identification of (1) the effects that have been considered/analysed when the pricing scheme has been evaluated, (2) the significance/magnitude of these impacts, and (3) the evaluation methods/approaches used to determine the identified significance. In order to facilitate the identification and selection of the case studies, the Committee did in advance a review of the existing and envisaged pricing schemes worldwide. Taking as starting point a general overview of worldwide progress of road pricing, this report provides a review of the impacts that have occurred in schemes that have been implemented or likely to occur in planned schemes. Those impacts - which typically refer to travel time, mobility patterns, the environment, the economy, accessibility, equity issues, etc. – together with public attitudes towards pricing, are key issues for decision makers in planning and implementing road pricing schemes.

### Worldwide situation of road pricing

The first part of this report reflects on some major trends in road pricing through an international review of recent pricing experiences within the countries represented in the Committee as well as other countries with innovative road pricing schemes. In particular, the following trends were identified:

- Toll in road infrastructure (main roads, bridges, tunnels) or on networks are still used widely. These relatively simple pricing systems provide revenues for road investment and/or maintenance. In countries with strong tradition of road or highway concessions, opening new toll highways has continued in recent years. Also some countries that historically have not used tolling of road infrastructure have chosen this solution. It is also worth noting that several developing countries have chosen to charge for their infrastructure too, including for roads already built, in order to guarantee their maintenance.

In some countries there are also “*asset development*” schemes; such schemes involve implementing a toll, through a concession or through a public-private partnership contract, on existing infrastructures that might need some upgrading or rehabilitation.

- National vignette systems payable for accessing all or part of the trunk network and for all vehicles (licensed in the country or abroad) are also widely spread, especially in Europe. This vignette can vary in order to favour certain vehicles compared to others, for instance the less polluting ones. It can coexist with other types of road pricing, namely tolls on specific roads or structures. This pricing system is simple to manage but commonly criticized for its rigidity and incapacity to regulate traffic and, more generally, the demand of road transport. It tends to decline (more for heavy goods vehicles, HGV) and gives way to the emergence of distance based pricing schemes.
- Since the beginning of this century, distance-based toll systems are increasingly being developed in parallel for one single vehicle category: heavy vehicles, and in most cases HGV. In Europe especially, distance-based toll collecting for heavy vehicles used in Central European countries are now increasingly being used in more peripheral countries. This is because European legislation encourages this kind of system and not so much the vignettes, and maybe also due to a greater public acceptance. These systems are based on electronic toll collection, which enables their implementation on the existing network without major changes of the infrastructure, like toll booths.
- Some vignette or kilometre-based toll systems previously mentioned may aim at encouraging the use of less polluting vehicles (price variation depending on vehicle's emission standard) or at regulating traffic congestion (especially by proposing variable rates depending on the period of the day/week/year). In these cases, fares are pre-determined and fixed for each period; they encourage users to reduce their trips on the infrastructure during peak periods, but they don't adapt to the real load on the network and they don't enable optimizing in real time the use of the total road capacity, even if in some systems, tolling levels are regularly revised.
- To meet these optimization needs, dynamic electronic pricing systems have steadily been tested and then introduced, mainly in the US. American experiences have specifically led to a system that consists of tolling High Occupancy Vehicle (HOV) lanes with variable electronic toll and in real time, depending on the traffic, and thus transforming HOV-lanes into High Occupancy Toll (HOT) lanes. This solution was proposed after observing that some HOV lanes were underused. A similar tolling system has also been used in the US to finance the construction of extra lanes to increase the capacity of existing highways.

- Another type of pricing scheme, zone-based pricing, also called urban toll, is increasingly being considered an option to reduce congestion problems in cities. In recent years, many municipalities – basically in developed countries - have studied the opportunity of implementing such city tolls. However, despite several successful examples, urban tolls still raise today strong debates in many countries.
- Apart from the above pricing approaches, other more comprehensive initiatives have been or are still being studied, although they have not been implemented. These initiatives may lead to fully revise road transport pricing and taxation approaches (still nowadays in most countries based on fuel taxation). In the Netherlands, for example, the entire road transport taxation system was thought to evolve towards mobility taxation through the implementation of a kilometre price system. On the other hand, the US is also seeking how to stabilize income for roads that come from fuel taxes nowadays by means of a distance based toll collecting system that could vary based on the level of congestion.

### The impacts of pricing

With regard to the impacts of pricing, the following are the main findings:

- All pricing schemes (vignettes, facility-based tolls, urban pricing, mobility pricing) include an analysis of the new mobility characteristics when they are evaluated.
- The study of the new mobility characteristics focuses first on the changes in (or in the new) travel demand in the priced facility/area:
  - Road pricing schemes in urban areas for congestion management may likely lead to a 10-20% reduction in traffic demand, based on experiences from implementations in Singapore, London and Stockholm. Traffic studies for Helsinki also show similar expected reductions.
  - Traffic studies for the Dutch nation-wide mobility pricing scheme also show expected reductions of around 15%.
  - Tolling schemes (whole facility tolls, HGV tolls, HOT lanes and dynamic toll lanes) and vignette systems have been found to be less effective in lowering total traffic demand. Traffic may divert to alternative routes, and total traffic demand for the corridor remains similar. In some cases the travel demand may even grow significantly, due to induced traffic (e.g. new toll motorways built parallel to existing free roads).
- Other relevant mobility characteristics that are often considered during the evaluation of a pricing scheme include:

- Traffic diversion: potentially significant in some specific cases of HGV tolls and toll motorways, although this rarely occurs in practice.
  - Transport mode change: transfer from private road use to public transport, cycling and walking is a key issue for urban pricing (annual increases of 5%-10% in public transport use is referred, depending on the city); on the other hand, some studies envisage a transfer from road to rail in the case of HGV tolls, although such results have not been confirmed in practice.
  - Time of travel: this is an issue for urban pricing schemes and other schemes when they want to manage congestion.
- Environmental impacts are – after mobility characteristics – the second group of pricing effects most commonly evaluated. Environmental impacts are typically a direct result of travel impacts, and they usually concern emissions of key air pollutants and noise. Air pollutants can be an important issue for some schemes, especially in urban areas (their drop can be approximately in proportion with the vehicle-km driven) or for schemes in regions like Europe (very environmentally sensitive). Noise is not an issue, because people would require changes in traffic flows of around 50% to perceive a decrease or an increase in noise.
  - The results of the evaluation of pricing effects in road safety are inconclusive in urban pricing schemes, although could be some minor reduction in personal injuries. In the Dutch kilometre price a more significant reduction of injuries has been estimated. In other cases, the impact is not clear, or even has not been considered as an issue.
  - Most of the potential negative impacts of pricing that some people envisage on the economy have not been confirmed through experience.
  - Urban pricing is recognised to have some impact on land use and on commercial and residential location. The risk of a ‘boundary effect’ seems greater in a single-cordon model. These effects are however rarely considered, probably because they are difficult to assess and take place in the long term.
  - Effects on accessibility are basically considered in nation-wide pricing schemes studies, particularly in countries with strong sensitivity to territorial issues (e.g. Switzerland, Spain).
  - Equity issues typically arise in planning and implementation across all pricing schemes, although they have rarely led to project termination, probably because experience shows that the perception of unfairness may be sometimes exaggerated.

- Social acceptability is probably the most critical issue in the implementation of a successful pricing project. This is particularly true for urban pricing schemes (especially if alternative public transport is not sufficiently considered), the Dutch kilometre price, or toll facilities with no alternative free route.