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## Deliverable 6

# Impacts and feasibility of SMC Pricing in PPPs

Synthesis of findings and Guidelines for Policy

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## Foreword

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## EXECUTIVE SUMMARY

Several arguments are used to justify the increasing reliance on PPPs schemes in the provision of infrastructures and public services in the transport sector. From government budget restrictions (principles of economic convergence and fiscal restraint enshrined in the Maastricht Treaty), to the increased efficiency that one might expect from the involvement of the private sector, many are the arguments to move the transport provision towards a PPP arrangement. At the same time, several large failures in very visible PPP schemes have produced a backlash against such a large involvement of the profit-maximising private sector in public service provision.

To understand this impact and the feasibility of the participation of the private sector, it was crucial to understand not only the behaviour of the (rational) agents involved, but also how those agents, formally or informally, relate to each other. This means understanding how information is (unevenly) spread, how risk perceived and priced at the individual level and allocated by the relevant markets. These information asymmetries and the incentives necessary to actively engage parties with differing objectives was approached through the use of Incentive and Contract Theory.

Strongly related with the intensification of the private participation in the provision of transport infrastructure and service is the debate regarding the adoption of social marginal cost pricing (SMCP) in Europe which started much before the introduction of PPPs in transport sector. Considerable efforts have been made by a large research community on the theoretical construct and feasibility of application of Social Marginal Cost pricing in the transport sector, with the explicit purpose of inducing a more rational utilization of transport infrastructure and services and, consequently, a more balanced modal split in favour of sustainable cities and regions.

In fact the European Commission transformed the social marginal cost pricing (SMCP) principle in a pivotal issue within the process of consolidation of the European Transport Policy (ETP) in the last decade and, consequently became a key topic in the programmes for R&D in transport co-funded by the Commission. Substantial amounts of research devoted to explore scientific, social and practical requirements/implications of SMCP have enhanced our ability of assessing costs and benefits of schemes in which transport prices are determined to reflect the real costs generated by transport activities. While confirming that such schemes are very complex to implement, European R&D has delivered important results in the three following areas:

- Determination of costs that vary as a result of transport activities, opening the way to new, more accurate, transparent and accountable, activity based accounting methods;
- Understanding of the complex bundle of acceptance and acceptability issues inevitably associated with a pricing regime with deep implications on user behaviour largely based on discrimination among users, enhancing our ability to implementation pricing of externalities;



- Advance on IT applied to transport (such as systems to support vehicle identification and electronic fee collection) allowing to differentiate prices by vehicle and trip characteristics (including over space and time).

A long line of research has proved that, theoretically, socially optimal pricing schemes in transport lead to optimal usage of transport. This is achieved by internalising negative (and positive) externalities into the transport price that consequently leads to social efficiency in individual decisions for transport use. Nevertheless, transport undertakings, be they infrastructure or service related, are characterised by heavy initial investments and significant sunk/fixed costs, which render marginal cost pricing ineffective in addressing cost recovery considerations. For these reasons and despite the mentioned progresses, the application of SMC-based transport pricing regimes remains limited, in the European Union. The most obvious reason behind this delay and resistance to move towards SMCP in real world has to do with the fact that it could pose difficulties in funding transport investments. Nonetheless it is National Governments' responsibility to 'pick up the tab' of those deficits, in a vision shaped by the notion that it is the State's obligation to provide a minimum level of transport availability to all citizens.

The last decades have also witnessed three distinct 'heavy' trends that led to a substantial change in how society as a whole faces the issue of transport and mobility provision:

- Exploding usage of road and air transport, which are increasingly leading to serious problems of congestion with the consequential impacts in the quality of environmental conditions and, generally, in the competitiveness of the European economy, due to the increase of time losses imposed by congestion in road and air infrastructure;
- Increasing awareness of the negative externalities imposed by the unbalanced use of some modal alternatives to the detriment of others;
- Budget constraints faced by European Countries, which hinder the immediate implementation of measures to eliminate major transport bottlenecks;
- Wider consensus on the introduction of competitive practices in the economics dynamics of the transport sector, with clear views on the difference between provision of public services (i.e. minimum services of general interest) and the services for which fully fledged markets exist.

The European Commission's White Paper: "European Transport Policy 2010: Time to Decide" addresses these main trends and points out the way for a change in how transport provision is realised by European Governments and societies. Among the objectives set in this document, the most relevant to the ENACT project are:

- The introduction of market forces in the provision of transport services and/or infrastructure, with the Public State increasingly assuming one or both of two distinct roles:



- Purchaser of transport services (including infrastructure services) and/or;
- Regulator, as regulated competition is introduced increasingly in the transport sector.
- A wider introduction to the user-pays principle, with particular emphasis on equalising the playing field between competing modes;
- Pricing transport taking into consideration the external effects of transport usage in order to account (or at least, approximate) individual choices into socially optimal outcomes, keeping political and budgetary restraints (second-best alternatives to optimal pricing schemes) in mind.

In parallel, the full development of Public-Private Partnerships in the provision of public services and/or assets, has evolved in a general context of optimization of public resources, general budgetary constraints and the development of very sophisticated methods of financial engineering. This also holds for the transport sector. Nevertheless, the participation of the private sector in the provision of public assets and services assumes that, whatever the contractual arrangement between the two parts, adequate returns on investment (from a strictly financial perspective) must be allowed to occur. Particularly for the transport sector and given the characteristics of most of the projects concerned, this means that pricing at Social Marginal Cost experiences some difficulties in its application. And so there might be a trade-off between the ability to attract private financing, expertise and efficiency, and the attainment of social objectives, such as the efficient and optimal use of transport from a social point of view, if no other mechanisms are available. There is a growing trend in the usage of PPP schemes in the provision of transport infrastructure and services, where this trade-off is becoming increasingly important.

The ENACT project started by considering existing know-how on Marginal Cost Pricing and analysing the related issues of second best pricing. The innovation of this project was to consider this contractual framework as a problem of incentives between two agents whose objectives are different; who are in possession of different levels of information about themselves and each other (informational structure) and who are rational agents trying to maximize their objectives with minimum effort. Marginal Cost Pricing enters this framework in order to assess how this asymmetric informational structure, the incentives and the risks involved in this contractual relationship, are affected by such a change to pricing principles in transport sector's PPPs. Furthermore, the project included also the issue of financing - essential in the sense that heavy initial investments are usually involved and project cash flows are usually risky and occur during a lengthy period. The foreseen change of pricing methods (and, consequently, of cash-inflows), plus the uncertainty of calculation methodologies and technological change has significant impacts on the markets' perception of risk for any given project, thus changing required shareholders' rates of return.





By addressing the Contractual Relationships that stem from a PPP project in such a way, ENACT was able to gather knowledge that will support the enhancement of European competitiveness, the increase in general welfare conditions, the alleviation of congestion levels in major European bottlenecks, while at the same time allowing active participation of the private sector in the completion of the TEN-T program.

By taking an integrated perspective on the issue of Public-Private Partnerships in the provision of transport infrastructure and/or services, the ENACT reconciles legitimate needs of investment's returns (private sector) with social goals of transport policy (welfare enhancing), thus ensuring that the increasing usage of such schemes in the provision of transport assets/services is not leading to non-optimal pricing schemes.

The consultation on the Commission Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions are rather inconclusive as to the need of a legislative initiative. Given the increasing popularity of PPP schemes in the provision of public services in transport (infrastructure, services or both), it is thus required to invest in the conciliation between Community guidelines for Social Marginal Cost Pricing and the use of Public-Private Partnerships. This being the main challenge of ENACT project. Furthermore, national PPP-specific legislation is rather incomplete which from the private investor perspective gives room to a context of additional uncertainty.

ENACT research was organised along the following streams of analysis:

- Social Marginal Cost Pricing and Second-Best Alternatives;
- Contractual and Incentive theories;
- Risk analysis and allocation between partners.

The review of the previous research on social marginal cost pricing and the different constructs to apply it to the transport infrastructure, revealed important elements of coherence between theory and reality that must be considered in a successful PPP arrangement. In order to implement social marginal cost pricing, it is necessary to derive accurate and disaggregated estimates of all the various cost components, and to allocate them differently according with the user's type. Whilst there are difficulties associated with the measurement of each component, problems are especially acute for congestion and scarcity. The financial implications of social marginal cost pricing of transport infrastructures arise as a result of the economies of scale, of scope, of traffic density.

In the case of roads, for example, the statistical evidence suggests that there are constant or slightly increasing returns to scale, whereas engineering data indicates increasing returns. Economies of traffic density are generally recognised to exist in the rail industry, in the air and maritime transport. These economies of scale or of traffic density mean that the short run marginal cost of infrastructure use is below average cost and, hence, that marginal cost pricing will result in a financial deficit. One of the existing ways to close the gap between infrastructure costs and revenues is to add external congestion costs, accidents costs and environmental charges.



However, this approach gives rise to some criticism because it is not clear for which reason the external costs of accidents and of the environment should contribute to infrastructure cost recovery. Anyway, once congestion, scarcity, accidents and the environment costs are added for the definition of the charges, it still remains not clear whether pure social marginal cost pricing will be substantially able or not to recover total costs.

In general there is a need to focus on simple, even imperfect solutions, in order to maximise the chances of SMCP actually being implemented in a PPP arrangement. So, in the road case studies, it will be opportune to use average marginal congestion costs even if they actually vary widely across space and time. Concerning airports, there are only marginal changes proposed for the currently pricing systems used, in particular to take into account congestion aspects. It would be interesting to estimate the impact of the approach proposed for the New York airport, namely how much charges for one company can change due to congestion caused by competitor's aircrafts.

Scarcity is significant in the rail and aviation sectors. Possible solutions for allocating scarce capacity are slot trading and auctioning: when selling slots on a spot market, scarcity value is the cost of pushing another service off the tracks or into an inferior slot. In the railway case study, such a dimension can be explored, it has been proposed in the RailCalc project and well accepted by the railways community (CER, 2008).

If pure social marginal cost pricing will still fail substantially to recover total costs, various forms of mark-ups over marginal cost could be tested so as to minimise the subsidy levels, however risks of overcharging might exist. In a situation in which mark-ups are needed for financial reasons, second best policy involves two-part tariffs and/or Ramsey pricing. In both cases, it will be necessary to pay attention on possible solutions to preserve terms of competition between operators, as well as equity and acceptability issues.

Another issue lies on the fact that, changes within a mode tend to dominate modal shift, but in the road case studies, it should be stressed that pricing will not be applied throughout the entire network. This may lead to a shift from the priced road sections to the other non priced ones, which from a welfare point of view, could lead to much less positive effects. To avoid undesired side-effects, the scope needs to be chosen in such a way that there is only limited competition between the priced and the non-priced parts. The first-best choice, however, is to extend the scope of the pricing system as far as possible (IMPACT, 2007).

In the analysis of the impact of the financial structure of an infrastructure project on the productive efficiency, especially with respect to risk several aspects have been dealt with. The financial concept of "project finance" was discussed in depth as well as the different types of capital and respective time horizons. A main conclusion from this review was that "good" financial structuring provides efficiency incentives that might be hard to achieve with contracts by "contracting out" but "bad" structuring causes the adverse. Future uncertainty was a main aspect of the analysis since



risk evaluation (pricing) takes place in financial markets and so affects the financial structure of the PPP. Two risk assessment models have been compared Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). One of the important results of the project in the application of the CAPM rational to a transport infrastructure (presented in detail in D4). Moreover, a replica of the stylized model developed by Engel et al, (2008) was developed aiming to achieve rules for optimal contract design under different conditions. The model makes the trade-offs around systematic risk sharing, government financing of project and moral hazard.

All the theoretical review deeply contributed to develop a simulation tool that allowed to assess the following six case studies.

- Case Study A: Italian motorways
- Case Study B: Tagus river rail crossing
- Case Study C: Varna and Burgas airports
- Case Study D: Munich airport
- Case Study E: Lisbon Area motorway concessions
- Case Study F: Orkdalsvegen

The primary objectives of the case studies were to identify and analyse implications of the possible application of SMCP in PPP's and, on top of it, to discuss available alternatives of PPP design for a successful introduction of SMCP in the transport undertakings. The diversity of the case studies allowed capturing a fairly wide variety of PPP types and contexts, covering roads, railways and airports. A detailed description and evaluation of each case study using the simulation tool can be found in D5.

The results of the case studies and their comparison and interpretation, have generally shown that problems and appropriate solutions for integrating SMCP with PPP's vary with mode and context - significant differences can be found when comparing Greenfield and Brownfield projects - although some general contractual design choices can be recommended for each transport mode, the specific of each case raises some limitations of comparability due to lack of scientific objectivity.

In the following pages we briefly recap the main conclusions of the ENACT project:

Social marginal cost principles: first and second best conditions

One of the best-known policy prescriptions from economic theory is that, to reach an efficient allocation of resources, prices should be set equal to marginal costs (first best). However this postulate raises some difficulties since cost of transport comprise: cost for the operator or infrastructure manager and external cost incurred to the other members of the society (marginal external cost of congestion, of pollution and of accidents)



To guarantee the SMCP welfare optimisation the validity of first best conditions have to be fulfilled. In fact we have observed, and confirmed the results from previous research, that practical constraints to SMCP implementation (technical, organisational and institutional) lead to second best alternatives, namely:

- ∅ highly differentiated pricing systems in time and space;
- ∅ users perception and transparency and acceptability constraints;
- ∅ imperfect pricing of substitute or complementary goods;
- ∅ existence of transaction costs;
- ∅ public deficit and debt, equity issues (users pay);

Second-best pricing does effectively entail deviations from SMC, regarding:

- ∅ Mark-ups can be added to the marginal costs in order to achieve cost coverage but a good control over costs is required, otherwise overcharging risks can occur;
- ∅ Ramsey pricing a particular form of mark-up which requires that prices are increased and that the increase is inversely proportional to the price elasticity of demand.
- ∅ Multipart Tariffs consist of fixed, block wise variable and variable parts.

#### Social marginal cost pricing and cost recovery

A major problem in the adoption of SMCP within PPPs relates to the cost recovery problem, that is the incompatibility of simultaneously considering the use of SMCP (welfare objective) and the objective (private) of cost recovery. The severity of this situation varies with the scale of operation and the prevalence of first or second best conditions.

- ∅ When transport systems exhibit constant returns to scale and when “first-best” conditions prevail, theory leads us to expect that optimally designed systems will achieve full cost recovery (including capital costs) under SMCP, but ...
- ∅ Under more realistic second-best conditions - where competing modes are priced above or below SMC, where capacity cannot be smoothly adjusted to traffic because of indivisibilities, or where past investment is sub-optimal and cannot readily be optimised - the implications of SMC pricing for cost recovery are not clear

Case studies show that external cost are not included as a variable for cost allocation, except for limited application. The main objective of the implemented pricing schemes among all transport modes is the cost recovery to face the financial constraints. The degree in which the costs are



covered by the charge revenues is frequently insufficient. There is a conflict between the interests of private agents investing in transport infrastructures and the implementation of SMCP that will decrease user charges when infrastructures are improved (lower renewal costs) or extended (less congestion). There is no simple solution ready to be applied in whatever condition, as SMC pricing may in principle give rise to either surplus or deficit in revenues compared to infrastructure costs. There is no guarantee that the SMC pricing will generate sufficient revenues to cover all infrastructure costs, including increasing capacity.

In general there will be a wide gap to be filled with scarce public funds. How far we are from the hypotheses of first best depends upon: how large are the fixed costs to be covered; and the possibility to smoothly adjust capacity because of indivisibilities or sub-optimal past investment.

The limitations observed in previous research and also in ENACT case studies suggest that:

- ∅ Second best solutions, taking into account the need of cost recovery, seem to be more appropriate in a context that requires the involvement of private funds;
- ∅ There is a need to look at the concepts from a more empirical and pragmatic point of view in order to move beyond SMC pricing;
- ∅ There is the need to deal with the social cost components in a transparent and effective way;
- ∅ SMC pricing should be used as a basis to devise more suitable pricing principles to attract private investors without disregarding the social component of the transport provision

#### Alternatives for contractual design

During the course of the PPP-contract, some measure of flexibility is required in the level of the SMC price to take account of changing circumstances (e.g. technological developments, efficiency gains, etc.). This issue can be resolved through regular reviews of the price level, and specific procedures to adjust it when needed.

Because of possible returns to scale, SMC pricing may yield insufficient revenues for the private operator to cover all infrastructure costs. With supplemental payments from the government this issue can be remedied.

Incorporating external marginal costs in the price charged by the private operator may produce perverse incentives on the long run:

- ∅ Perverse incentives to favour users with high external costs.



- Ø Perverse incentives to keep external costs of congestion, environment and accident high. It is possible however to pass the part of the SMC price that should cover the external marginal costs on to the government. The private operator will then receive only the part to cover marginal cost of infrastructure, and perhaps in addition, supplemental payments by the government to cover a possible shortfall in revenues.
- Ø It will be difficult for a public party to get reliable information on the marginal cost of infrastructure from the private party. When supplemental payments are to be paid to a private operator, it will be difficult to ascertain the correct height for these payments.
- Ø When SMC pricing is implemented as a rigid price regulation, yield management and price discrimination to optimise utilisation of capacity and maximise revenues will not be possible.
- Ø The government's perception of SMC may differ from that of a private party, because of a different sensitivity for and appreciation of risks, which will be reflected in a different valuation. This will mean that the SMC will be different when perceived from the private party than when perceived from the government. Firms will require to charge above SMC and thus obtain above normal profits in order to take the risks involved in innovation. Hence SMC pricing will inhibit firms to innovate.

Decoupling is a possible solution: separating reward for provision and income from charges:

- Ø The application of PPPs in the transport sector will probably not be much affected when SMC pricing or second best alternatives are introduced;
- Ø Separating reward from provision and income from charges will likely be possible in all cases. Usage can normally be registered, hence the government could always pay usage payments as a reward for the provision of services. In some cases (mainly road and rail) it will be possible to pay availability payments (which is preferable to usage payments because of a better allocation of risks and more sophisticated incentive structure).
- Ø Public-Private Partnerships based on performance based payments (usage or availability payments) will also be able to meet the EUROSTAT criteria on recording an investment done by way of a PPP off Government Balance sheet, so it will not count in the computation of the Annual Government Deficit (this is an important consideration for some governments in Europe to engage in PPPs).
- Ø The only circumstances in which direct payment by users (instead of performance based payments by the government) is preferable, is when users are better able than the government to observe performance, and furthermore have alternatives to their disposal. This may be true for especially ports and airports.



The picture that emerges from field observation is that SMCP is highly desired by policy makers while legislation for PPPs is to a large extent lacking in the EU. There might be fiscal incentives for the state (as a budget restraint entity of its own, not as representing society) in the accounting rules for PPPs to prefer PPPs over standard contracting out. The financial structure's impacts on incentives of various actors are emphasized. In short, "good" financial structuring provides efficiency incentives that might be hard to achieve with contracts by "contracting out" but "bad" structuring causes the adverse.

### Risk evaluation

Risk evaluation is a particularly important issues and it should cover a wide spectrum, from planning and traffic risks to ownership and political accountability. Risks are assessed differently in different cultural and institutional frameworks. But risks that cannot be eliminated should be evaluated. The benchmark model for pricing risk, the Capital Asset Pricing Model (CAPM) is presented in some detail in ENACT (D4) as well as criticized and compared to the alternative Arbitrage Pricing Theory (APT). An application of the CAPM idea to a transport infrastructure project represents one of the main results of the project.

Optimal risk sharing among parties means that the social value of the project is maximised taking into account asymmetric information among parties (moral hazard and adverse selection) and the wish and ability to bear risks. Thus, the main motivations to invest in a PPP transport infrastructure asset can be summarized as follows:

- Ø Attractive risk/return profile compared to property, bonds and equity in the current market;
- Ø Inflation-linked nature of many assets that provide a profile of returns attractive to institutions such as pension funds with long-term liabilities to match;
- Ø Further value-added opportunities by using expert knowledge of project structures to optimise the value of individual PPP projects;
- Ø Further value-added opportunities through portfolio effects (including efficiencies across insurance, PPP management and life-cycle management);
- Ø High recovery value of infrastructure assets after the PPP contract termination;
- Ø PPP investments can tie up substantial capital expenditure and stabilized revenues streams over long concession lives of often 30 years to 35 years.



Case studies provided valuable insight on the issues at stake. Some managed specific conclusions on SMCP and PPP design within their own context, while others more thoroughly detailed possible benefits and disadvantages of different solutions. The financial impact SMCP application on PPP depends on what level of sunk costs are considered in the PPP contract.

There are too many ways of calculating SMCP and this may make it unreliable for private partners and of difficult political understanding and acceptability. SMCP will lead to greater uncertainty and therefore may lead to higher risk premium and/or tension for renegotiation and inevitably increase contractual and transaction costs.

SMCP principles should not be abandoned but performance enhancement mechanisms should be used to ensure agents behave towards efficiency. Finally, a word of advice, SMCP is a policy option not a case by case decision, so it should be seen as a long term perspective.

#### Pragmatic recommendations

The ENACT project provides significant new knowledge that may be important to politicians and other decision makers dealing with transport infrastructure. These are:

- PPPs may - with an enhanced contract design - contribute very much to the efficiency of the whole package of building, maintenance and operating of infrastructure projects.
- PPP contracts should be formulated to stimulate risk taking according to ability and willingness to manage risks, taking into account asymmetric information.
- Transferring too much risk to concessioners would lead the charging of too high risk premiums.
- By good contracting the role of banks and financing institutions may enhance the efficiency of PPPs.
- The wish to combine payment to infrastructure providers with Social Marginal Cost Payment (SMCP) from infrastructure users is understandable and desirable, but in general not feasible. Logically, these two purposes do not fit very well. But they may be combined in some ways.
  - If (in the rare case) intake from infrastructure users cover costs and there is no perverse incentives SMCP from users may be applied;





- If (in the most common case) no cost coverage: The price of public funds is high and no perverse incentives:
- A combination of SMCP from and an additional subsidy between a lower and a higher border to secure cost coverage and avoid too high payment to the provider: The price of public funds is low and/or danger of perverse incentives;
- A two part model with SMCP from users to government and performance based payment from government to provider may give good incentives to all actors.

### Requirements for SMCP implementation in PPPs

As argued in especially Chapter 3, PPPs in road, railway, and inland waterway transport can be fully compatible with SMC pricing when they are performance based, rather than based on direct user charges. The same happens with maritime and air transport, although with much lower level of effectiveness. When SMC pricing would be introduced, it would therefore be recommended that current PPP-contracts based on direct user charges are renegotiated to performance based contracts, and that all new PPPs are performance based.

As demonstrated in the next chapter to undertake performance based PPP arrangements reform of the accountancy system is required in order to create institutional capacity to monitor the infrastructure business and ensure market bias will not occur.

As is clear from the previous chapters and annexes, European policy and legislation with regard to Public-Private Partnerships facilitates contracts with adequate incentives that generate value-for-money. Even though the EUROSTAT-guidelines are sometimes misused by governments to design risk sharing in PPP-contracts for the sole reason of moving them off the public balance sheet, they also make performance based PPPs more attractive for governments (relative to PPPs that are based on charging users directly). The EUROSTAT guidelines make it easier for governments to fit performance based PPPs into their annual budgets while still meeting the Maastricht Convergence Criteria.

Hence there is in principle nothing in European policy and legislation that inhibits performance based PPP-contracts in road, railway and inland waterway transport. However there may be some room for additional measures and initiatives on European Union level, that could assist member states in this respect when SMC pricing would be introduced. When current PPP-contracts based on direct user charges (mostly PPPs for toll roads) would have to be converted to performance based PPPs, a likely consequence will be that government expenditures in some countries in which such PPPs are common (especially Italy, France, Spain, Portugal) will grow, as they now would have to pay performance based payments to private operators. The revenues these governments receive from SMC pricing may not quite be sufficient to offset these extra payments. For these countries



special provisions could be made to smoothen the transition, e.g. an exemption on counting these additional expenditures as part of the government deficit, in return for the obligation to use receipts from SMC pricing (nationwide, not only on the particular pieces of infrastructure) to pay for the converted contracts.

For PPPs in ports and airports, it was recommended that the main objectives behind SMC pricing (a level playing within and between modes of transport, and internalisation of external costs) should rather be achieved through a harmonised competition policy and additional regulation. What would be needed to implement this recommendation is a harmonised framework for charging, state aid, and a delineation of port and airport infrastructure (e.g. breakwaters, dredging, buoys, etc. in relation to ports; and e.g. shopping areas, luggage handling facilities, etc. in connection to airports). For airports much of the basic regulation has been put in place. Though the Directive on Airport Charges (2009/12/EC) would have to be adjusted to take better account of the internalisation of external costs, and would have to be applied to all airports. For ports regulation would be required which moves far beyond initiatives to make port dues and state aid transport (Communication on a European Ports Policy (COM(2007)616)). Here new regulation would need to be developed and implemented.

For public transport services it was recommended that SMC-pricing is integrated in the PPP contract, while supplementing revenues with subsidies in case cost recovery is not achieved (and providing additional incentives to take account of possible perverse effects of internalising external costs). European legislation already makes this possible through Public Service Obligations. Hence no legislative action is needed.

For all modes, infrastructures and services, an accounting framework based on a systematic ABC rationale would allow identifying with greater rigor functional costs that enable charging equal or above marginal external costs and below total costs, clarifying the drivers for each cost category and thus bringing more transparency and accountability to the efforts of improved efficiency.

This activity oriented rationale constitutes an approach to pricing based on forward-looking incremental cost supported by current costs rather than historic costs. Hence, ABC principles applied to transport infrastructure business may provide multiple contributions to its development, namely:

- By providing the level of transparency needed for effective regulatory monitoring (REGULATORY Perspective)
- By enhancing cost accounting accuracy and enabling cost management (MANAGEMENT Perspective)
- By providing effective link between cost of activities and charging in order to send sound economic signals to infrastructure (MARKET Perspective)



- By fostering cost efficiency and reliable market reactions for decisions on investment (INVESTMENT perspective)

Last but not least, the current EU policies and associated legal frameworks offer no barriers to the implementation of this proposed practice of bridging cost accounting and charging for transport infrastructure services, leaving the regulator the freedom to decide whether or not competition should be intensified, according to willingness to pay and market maturity (Figure 5-2, example A versus example B) .



## 1 INTRODUCTION

The provision of public services and, particularly, of transport services and/or infrastructure has been witnessing substantial changes in the past decades in Europe and North America. Where previously the public administration was responsible for providing transport services and/or infrastructure, nowadays an emergent use of Public-Private Partnerships (PPP) is being considered and put to practice. From the several experiences done during the last decade the PPPs can be considered as the optimal structure that links private sector profitability to sustained performance over the long term, yielding robust and attractive cash-flows for shareholders in return for delivering better value for money to the taxpayer. Besides, the long term view enables to consider the challenges of maintaining the target level of service along the life cycle of the infrastructure and the respective associated costs.

The term "Public-Private Partnership ("PPP") has been in general use since the 1990's, however, there is no widely agreed single definition or model of a PPP at the Community level. The use of PPP's has now expanded to most EU members where depending on the country and the current politics, the term can cover a wide spectrum of models. In the 2003 EC Guidelines for successful Public - Private Partnerships, the term of PPP was defined as "a partnership between the public sector and the private sector for the purpose of delivering a project or a service traditionally provided by the public sector". In 2004 in the context of the Strategy for the Internal Market 2003-2006<sup>1</sup>, the Commission published the Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions (COM (2004)327) that referred to PPPs as "forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service".

The paradigm of transport service provision was significantly altered with the introduction of the PPPs . Where governments were responsible for designing, financing and, most of the times, operating each project, it is now possible to shift these traditional responsibilities to private partners keeping however a significant role for the government in the specifications of the infrastructure in configuration, functionalities, level of service and integration as component of a major complex system which is the overall mobility system itself. Indeed the private sector is increasingly being responsible for designing, financing, building and operating public assets. The role of the States has thus shifted from a public asset provider,

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<sup>1</sup> Strategy for the internal market, Priorities 2003-2006, COM (2003) 238 final.



to a public service purchaser and/or regulator, regardless of the ultimate ownership rights to the asset itself<sup>2</sup>. This new role of the State raises several important questions, namely in assuring that real value for money is provided and that social and efficiency objectives are met.

In the case of PPP, it seems quite clear that the contractual relationship between the public and the private sector is compromised by the fact that, not only large asymmetries of information between the contracting parties exist, but also that basic incompatibility of interests have to be effectively considered. On the one hand the private partner tries to maximise profits by maximizing revenues and minimizing costs. On the other hand, it is in the State's interest to ensure that the private agent's behaviour is maximising efficiency and minimizing cost (from the State's perspective), while maintaining the established levels of quality.

The full development of Public-Private Partnerships, in the provision of public services and/or assets, has thus evolved in a general context of optimization of public resources, general budgetary constraints and the development of very sophisticated methods of financial engineering. This also holds for the transport sector. Nevertheless, the participation of the private sector in the provision of public assets and services assumes that, whatever the contractual arrangement between the two parts, adequate returns on investment - from a strictly financial perspective - must be allowed to occur. Particularly for the transport sector and given the characteristics of most projects concerned, this means that pricing at Social Marginal Cost will be difficult to accomplish. And so there seems to be a trade-off between the ability to attract private financing, expertise and efficiency, and the achievement of social objectives, such as the efficient and optimal use of transport from a social point of view. There is a growing trend in the usage of PPP schemes in the provision of transport infrastructure and services, where this trade-off is becoming increasingly important.

## 1.1 Objectives of the research

The research specification as defined in the program task to which ENACT answers required an in-depth investigation of the workings of Public-Private Partnerships (PPP) and the practical issues that could affect them by fully integrating social marginal cost pricing principles in the use of transport assets. In line with these requirements ENACT project aims to:

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<sup>2</sup> Ownership can also change during the duration of the PPP project (contract).



- Devise ways to apply Social Marginal Cost pricing within Public-Private Partnerships in the provision of transport infrastructure/services in order to set transport pricing to socially optimal levels (at least, to second-best solutions) and;
- Enhance a more efficient, rational and balanced use of resources available, avoiding congestion through the correct pricing of those resources.

It was foreseen that ENACT would be able to gather significant knowledge to support the enhancement of European competitiveness, an increase in general welfare conditions and an alleviation of congestion levels in major European bottlenecks, while at the same time allowing active participation of the private sector in the completion of the TEN-T networks program. This objective was indeed achieved by gathering real case studies from different realities and still engaging additional contributes (see annexes) whenever the results of the case studies were considered insufficient.

The approach to the issue of Public-Private Partnerships in the light of Contract and Incentive Theory is not new. However, to the extent of our current knowledge, the application of pre-determined pricing principles has not been a research subject, as research has so far been limited to the role of contract completeness and asset ownership in the determination of optimal incentives schemes. The ENACT project aimed to bridge the gap in this knowledge by taking an integrated approach and approximating conceptual modelling to close real life situations.

The involvement of different levels of expertise resulted in a comprehensive investigation into the functioning of PPPs, thus allowing the research to assess the application's possibilities of optimal pricing schemes in transport-related PPPs. One of the questions raised was how close outcomes of different PPP arrangements are from the first-best solution, i.e. Social Marginal Cost pricing. A simulation tool was developed to comply with this objective and a selection of case studies covering different modes was assessed with this tool, benefiting from the use of real data with the insufficiencies existing in the real world instead of using the more traditional approach of optimal case studies hardly representing the asymmetries of information existing in the real world.

The research was designed with the following pillars which developments and conclusions are presented in the next chapters of this report:

- The theoretical constructs and principles underlying the application of social marginal cost pricing and second best alternatives, considering prior research related to optimal determination of mark-ups for recovery.
- Incentives and contract theory (in procurement and provision) and financing and cost structures for an in-depth analysis of the role of financial structures and financial market's perception of risk in PPP's



- A set of diversified case studies covering all modes and different contextual realities that have been submitted to an assessment performed with an effective simulation tool also conceived in the framework of ENACT research. These cases were further complemented by contributions of international experts that are now in annex to the current report.

In the development of ENACT a permanent concern was present to the policy objectives as set out in the European Commission's White Paper: "European Transport Policy 2010: Time to Decide" (2001):

1. The introduction of market forces in the provision of transport services and/or infrastructure, with the State increasingly assuming one or both of two distinct roles:
  - § Purchaser of transport services (including infrastructure services) and/or;
  - § Regulator, as regulated competition is introduced increasingly in the transport sector.
2. A wider introduction to the user-pays principle, with particular emphasis on equalising the playing field between competing modes;
3. Pricing transport taking into consideration the external effects of transport usage in order to account (or at least, approximate) individual choices into socially optimal outcomes, keeping political and budgetary restraints (second-best alternatives to optimal pricing schemes) in mind.

The first objective points to the Commission's ambition to facilitate the use of Public-Private Partnerships (PPPs) in the provision of transport infrastructure. As stated in the Commission's "Guidelines for Successful Public-Private Partnerships": 'PPPs have demonstrated the ability to harness additional financial resources and operating efficiencies inherent to the private sector'. Hence through PPPs it is possible to increase value-for-money through faster implementation, reduced life cycle cost, better risk allocation, better incentives to perform, improved quality of service and/or generation of additional revenues (EC, 2003, p. 16).

Objectives 2 and 3 above also point to the ambitions described in more detail in the Commission's White Paper "Fair payment for Infrastructure Use" (1998). In this White Paper it was outlined that transport infrastructure should in principle be charged in accordance to Social Marginal Cost Pricing, as this will contribute to deal with:

- Distortions of competition between Member States;
- Distortions of competition between modes, and within modes;



- The failure to consider social and environmental aspects of transport (so the relative environmental impact of different ways of making the same journey is not reflected in prices).

Moreover, according to the White Paper the application of Social Marginal Cost Pricing could also contribute to overcoming the difficulties in funding infrastructure investments, by increasing the level of cost recovery by charging users. The latter would make business models possible that may be attractive for private parties and investors (which are a form of Public-Private Partnership): a private party investing and operating a piece of infrastructure, and earning back its investment and operational expenses by charging users. This in turn would decrease the current reliance on public funding for investments in transport infrastructure.

## **1.2 Characteristics of a PPP arrangement relevant for price setting**

As previously mentioned there is not a general and comprehensive definition for a PPP. However, there are certain features that are generally assumed to characterise these arrangements and that can be easily identified from the previously presented definitions. Given that there is no common agreement on the definition of a Public-Private Partnership, the ENACT consortium has decided to create not a definition but some broad characteristics that we believe a PPP must entail. So in ENACT's vision, a PPP is any project (Green or Brown Field or both) in which the investment (or part of) is contributed by the private sector and where there is a regulatory contract between the private and public sector defining risk allocation for the main players engaged, that is the infrastructure and/or services provision.

Moreover in the ENACT perspective additional characteristics that must be present in a PPP arrangement as relevant for price setting purposes include a lifecycle project period, a tariff setting (real or shadow), a distinguishable financial structure and the parties involved should face information asymmetries when designing the PPP contract. The level of PPP complexity will then differ by project being appraised and it should be noticed that the complexity is not due to the PPP mechanism per se, but caused by the risk mitigation mechanisms and the use of project finance to fund the project.

When considering the key question whether and how introduction of the principle of Social Marginal Cost pricing can be reconciled with Public-Private Partnerships in the transport sector, it is important to bear in mind the objectives that lie behind Social Marginal Cost pricing and Public-Private Partnerships. Hence the important question is how distortions of





competition between Member States, modes of transport and companies within the transport sector can be reduced and users are induced to better take into account the social and environmental costs of transport, while at the same time value-for-money in the provision of transport infrastructure and services can be increased.

A especially important element is to understand how far existing community policies regard charging principles used in infrastructure and to what extent the short marginal cost pricing principle is implemented in the current EU legislation. This is reflected in annex 7.4 of this report and also in chapter 2.

### **1.3 Structure and content of this report**

This report is structured in six chapters and a body of annexes. The second chapter addresses the main challenges of the implementation of social marginal costing pricing. This chapter addresses the theoretical constructs of the problem and the conciliation between public and private interests and risk sharing around building and exploring transport infrastructures. The third chapter addresses contractual design elements and its alternatives. The fourth chapter presents the results obtained from the analysis of case studies and scenario simulation. The fifth chapter deals with the policy issues upstream and downstream the adoption of PPP's model for transport infrastructure and proposes a business oriented approach that enhances the conciliation of interests of both public and private parties in the arrangement. Finally, the six chapters presents the overall conclusions.

Last, but certainly not least, a body of annexes is presented where the results of relevant research work undertaken outside the ENACT framework is presented in the form of three separate papers addressing the following issues: key issues in adopting PPP model for maritime transport; experiences and reflections in betterment of risk allocation; and majoring element for political risks in PPP arrangements.



## **2 MAIN CHALLENGES IN THE IMPLEMENTATION OF SMCP**

This chapter introduces the issue of social marginal cost pricing (SMCP) as an economic instrument towards social welfare and as a policy of the European Commission, and presents the main challenges for its implementation, focusing particularly on those that relate with the private involvement in the provision of transport infrastructure or services.

### **2.1 Social Marginal Cost Pricing**

Classical economic theory prescribes that, to reach an efficient allocation of resources, and consequently a maximization of social welfare, prices of goods should be equal to the marginal costs of their production. In other words, the socially optimal market output occurs when consumers face a price equal to the costs involved in the production of the good consumed. The notion of marginal cost accounts for those costs involved in the production of one extra unit of output; therefore, it reflects variable costs directly resultant from the production of the good, with no fixed capital costs included.

In the so called perfect markets the result of welfare maximization through marginal cost pricing occurs naturally. The result has been theoretically demonstrated under the following conditions:

- (i) Markets should be competitive (firms act as price-takers);
- (ii) There must not be any public goods nor external effects;
- (iii) Cost functions should show no increasing return to scale and;
- (iv) There is no information asymmetry.

In reality these conditions are never met completely. However, in most types of markets for goods and services it is assumed that these conditions are closely met, and therefore there is no need for State intervention to fix their functioning. But this is not the case of the transport sector, in many of its components.

In fact, the use of transport infrastructure normally imposes external costs. In this case, the rule of marginal cost pricing must apply to all the costs to society, including those that are not directly felt (or taken into account) by the consumer; therefore, price must reflect social costs, i.e. it must include both internal and external costs. Unfortunately, in the presence of external effect the market equilibrium price does not equal the social optimum price.

Moreover, the transport sector shows network economies in the construction and use of infrastructure, and that is why it should be up to the State to plan infrastructure. Network



economies and centralized infrastructure planning also lead to a situation of monopolies of infrastructure provision, where market competition does not exist or is too narrow. For these reasons, marginal cost pricing in the provision of infrastructure (and some transport services) will not naturally occur.

Altogether, in the transport sector the previously mentioned conditions are hardly met and the State may need to impose marginal costs pricing as a means of maximizing welfare in the use of infrastructure and transport services.

This has been one of the principles embraced by the European Commission for transport policy for over a decade.

## **2.2 European policy**

The 2001 and 1998 White Papers as well as the 1995 Green Paper represented the European Commission endeavours to provide a comprehensive reform of transport pricing policy for all modes and countries based on the principle that transport prices should include not only infrastructure and operational marginal costs but also all the external effects that result from transport use.

The publication of the green paper "Towards fair and efficient pricing in transport" (CEC, 1995) in 1995 by the EC represented a landmark in EU Transport pricing policy (Nash, ver). In this paper the EU gave indications that infrastructure pricing should incorporate not only maintenance and operating costs but also all the external costs. Since then, the EC has been making efforts towards the implementation of a charging policy based on social marginal costs.

The white paper on "Fair payment for infrastructure use" in 1998 (CEC, 1998) focused on how transport charges should/could be related with all the underlying internal and external costs associated with infrastructure use under the restriction of cost coverage requirements, and advanced a phased approach to implement social marginal cost pricing so that transport users and providers could have time to adjust to this new transport policy paradigm.

In its 2001 White Paper "European transport policy for 2010: decision time." (CEC, 2001b) the EC restates the importance of the "alignment of the principles for charging for infrastructure use; the integration of external costs..." (p16, CEC, 2001b), as a way of 'rebalancing' the distorted competition between modes of transport (Goodwin, 2001), reducing the unsustainable traffic growth and contributing for the overall economic prosperity. This white paper proposes a framework directive on pricing - based on the social



marginal costs principle - setting up the main pricing guidelines applicable to all transport modes.

Recently, in a communication to the European Parliament, the Commission reaffirmed the commitment to a transport pricing policy based on the internalisation of external costs (CEC, 2008):

“The internalisation of external costs is part of a package of initiatives intended to make transport more sustainable. Today, it is vital for the transport sector to contribute to the Commission’s key priorities of sustainable development and maintaining competitiveness in Europe.”

Transport Policy has also developed with regard each transport mode: the “Eurovignette” directives on heavy good vehicles charging; the directive on rail infrastructure charging (CEC, 2001a); the directive on airport charging (CEC, 1997b); and the green paper on seaports and maritime infrastructure (CEC, 1997a).

In spite of all these advances on transport policy making, the implementation of this policy has not progressed fast. In fact, the successful implementation of the EU transport policy still requires overcoming some challenges. One of the main challenges, which is the reason of existence of the ENACT study, is to ensure that private parties operate and manage transport infrastructure accept and implement a pricing scheme based on social marginal costs (Verhoef, 2001). This is of paramount importance because in the presence of market failures (like externalities and monopolies) the market equilibrium price (the price imposed by private parties) differs from the socially optimal, calling for State intervention in price setting. As a consequence, the Commission approach regarding transport pricing requires that governments are able to take decisions about pricing and investment in transport infrastructure. For this reason, it is important to assess how States can design (or renegotiate) concession contractual arrangements so that price is set equal to the SMCP while ensuring that the private party has incentives to perform according to the public goals and at a reasonable price.

### **2.3 Social marginal costs of transport**

In the case of transport, social marginal costs comprise the producer marginal costs (infrastructure and operation costs) and marginal external costs.

Producer marginal costs are usually designated by infrastructure costs, which reflect the marginal costs of operation and maintenance of the infrastructure. Marginal external costs are all costs generated by transport activities that do not fall on the individuals who have



caused them, but on other individuals or on society as a whole. The most relevant external costs related to transport activities are: Congestion/Scarcity Costs, Environmental Costs (Air pollution, Global Warming and Noise) and Accident Costs. Accident and environmental externalities affect non-users as much as users of the transport system. Congestion externalities arise when agents decide to introduce an additional vehicle to the transport network without considering that it may impose increasing delays for all the other users of the transport network. In types of infrastructure where specific slots are allocated to particular users, the major issue is not so much congestion but scarcity value of slots (Nash and Samsom, 1999).

## 2.4 Internalisation Strategies

According to the IMPACT Project, the transport external costs should be internalised using a combination of instruments. IMPACT recommends different Internalisation Approaches for different transport modes and different external costs types, although the design of internalisation strategies should always consider other environmental and transport policy. The main recommendations are the following (see Table 2-1):

- § Climate Change Costs should be internalised by fuel taxes (based on carbon content) or by the inclusion in ETS, and be part of an overall climate change strategy;
- § Air Pollution Costs, Noise Costs and Congestion / Scarcity Costs should be internalised by differentiated kilometre charges. The kilometre charges should discriminate on grounds of vehicle characteristics, time of the day, geographical area and congestion levels (if relevant);
- § Accident External Costs should be internalised by either changing insurance companies or by a differentiated kilometre charge.



Table 2-1 - External Costs Internalisation Strategies by Transport Mode

External Costs Transport Mode	Environmental Costs			Accident Costs	Congestion / Scarcity Costs
	Climate Change Costs	Air Pollution	Noise		
Road	Internalised by : § fuel taxes	Internalised by : § differentiated kilometre charges	Internalised by : § differentiated kilometre charges	Internalised by: § via insurance companies* or § differentiated kilometre charge	Internalised by: § congestion charges at bottlenecks, and § cordon charges for congested urban areas
Non-road modes	Internalised by : § fuel taxes or § ETS	Internalised by : § internalised upstream within the energy sector* or § differentiated mark-ups	Internalised by : § differentiated mark-ups	Internalised by: § differentiated mark-ups	Internalised by : § scarcity mark-ups differentiated according to the scarcity level.

\* Preferred Internalisation Strategy

Source: TIS setup on the basis of IMPACT results

## 2.5 Challenges to conciliation of SMCP with private involvement.

Private involvement in the provision of transport infrastructure and services has been growing in Europe. The main drivers for this trend have, on one hand, (i) the need by the public authorities to find financing sources from outside the public budget and, on the other hand, (ii) the attempt to achieve a better productive efficiency (value for money) than what is achievable with public provision.

The introduction of SMCP in transport provision may interfere with the successful prosecution both of these goals. There are three reasons of economic nature for such:

1. Cost coverage: The revenues generated by user charges based on SMCs may not be sufficient to cover for the necessary remuneration of the private operator
2. Risks of revenue: The formation of revenues from SMCP may introduce high risks of revenue



3. Incentives: The formation of revenues from SMCP may introduce undesirable incentives on the performance of the private operator

The two later issues arise when the private operator is remunerated through user charges. This is, however, the case in most PPPs in the transport sector, where the operator is financed through the commercial revenues of the service. It is thus important to understand whether it is possible to keep this practice when SMCP is implemented.

Besides the reasons of economic nature above, ENACT covered reasons of non-economic nature that may conflict with the implementation of SMCP under the presence of PPPs. These comprise barriers of legal, institutional and implementation nature.

ENACT studied in detail these sources of interference between the goals of SMCP and those of public private partnerships. A description of the problems is provided in the following sections.

### **2.5.1 Cost Recovery**

Cost recovery is an issue, independently of the existence of a PPP for the provision of the transport infrastructure or service. However, for the private sector to be involved, cost coverage of the PPP is imperative<sup>3</sup>. Hence, issues related to cost recovery have a relevant role within the SMC pricing application in view of the participation of private sector in the provision of transport services through PPP.

Social marginal costs pricing is oriented to maximize social welfare and is not, in opposition to conventional pricing schemes, oriented to ensure cost coverage. Therefore, it is possible that in some pieces of transport infrastructure the revenues obtained through SMCP are not sufficient to cover all costs. In these situations, complementary approaches are required to achieve the desired levels of cost recovery. The required additional resources can be raised through second-best pricing schemes (user charges), through public funding (taxes) or through a combination of the previous two instruments.

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<sup>3</sup> The term cost recovery usually refers to the full recovery of all investment and operation costs. However, in ENACT we are focusing on cost coverage PPPs, which do not necessarily involve investment costs and which include other types of costs (capital remuneration, risk premiums, financing costs). In this document we will use the term cost coverage to refer to the coverage of the private costs of a PPP.



## Second-Best Pricing Schemes

The distinction between first-best and second-best pricing relates to the fundamental distinction in economics between first-best and second-best optima. The former defines a full optimum; the latter is based on realistic representations of available or existing technologies, legal and institutional frameworks (structures, systems) as well as barriers and all other conceivable constraints on practical pricing policy. The ENACT Project adopts the MC-ICAM (MC ICAM, 2001) interpretation that second-best pricing can be viewed as marginal cost pricing: it is marginal cost pricing under second-best constraints.

Substantial technical literature has emerged that addresses various types of second-best pricing, and considers questions towards the optimal design of second-best pricing schemes and towards the relative efficiency of these schemes:

- § Mark-ups can be added to the marginal costs in order to achieve cost coverage. One particular form of a mark-up to allocate common fixed costs is, for instance, Ramsey pricing. This mark-up is estimated by increasing prices inversely proportionally to the price elasticity. The basic goal of Ramsey Pricing is to recoup the fixed costs from those customers who have the fewest alternatives, while minimizing the distortion associated with prices in excess of marginal costs. It should be noted, however, that this form of price discrimination has itself often been regarded as unfair and unequal. However, its applicability may be impossible in practice, due to information constraints concerning elasticity variations;
- § Multi-part Tariffs consist of fixed, blockwise variable and variable parts. This pricing solution can flexibly be adjusted to the cost and demand characteristics, and can be Pareto-superior to linear tariffs, once a defined level of cost recovery is desired. The tariff discrimination derives from offering a same menu of options to all consumers and pricing the menu so as to induce consumers to reveal their demand preferences. Consequently, in this case the differentiation leaves the users free to decide where collocate themselves on the demand curve;
- § Fully Allocated Cost schemes (FDC) are another form of second-best pricing, which take SMC as a starting point and allocate the remaining costs according to selected parameters. This can involve high differentiation and additional incentive elements;
- § Peak Load Pricing schemes are a form of second-best pricing, where fixed costs are charged to peak-hour users, as they are responsible for the capacity provision,





whereas off-peak users are charged for their marginal costs to avoid crowding out effects.

It must be noted that any form of second-best pricing aimed at achieving cost recovery will always have some negative consequences on welfare within the mobility market. The issue about designing a second-best pricing solution for that aim is achieving the least possible welfare losses while maintaining equality concerns. The extent of theoretical welfare losses may vary from case to case, but perhaps even more critical is that the application of second-best pricing solutions faces difficulties of implementation much higher than pure SMCP. As reported by Verhoef (2001) on the results of MC-ICAM:

1. Second-best optimal tax rules are a lot more complicated than the simple Pigouvian 'tax-equals-marginal-external-costs' rule
2. The informational requirements for the regulator, necessary for applying second-best taxes optimally, are considerable higher
3. Elements 1 and 2 together imply that the risk of 'government failures' - i.e., the setting of wrong prices - becomes considerably larger under second-best pricing

These points highlight likely significant costs for welfare of trying to apply second-best pricing.

### Public Funding

The deficit of a transport sector or facility may be financed from the public budget. Taxes are the instrument of Governments to raise money to finance public spending. However, taxes may impose distortions in the allocation of resources through substitution effects, i.e. by changing consumption, labor and investment decisions. The efficiency loss resulting from funds raised through the tax system is the marginal cost of public funds (MCPF) and depends on the efficiency of the overall tax system.

Broadly, MCPF measures the loss incurred by society when a government raises additional revenues, namely the dead-weight loss of taxation and the burden on society that results from public funding management.



The issue of marginal cost of public funding has widely been studied in the literature and is currently an important concept in the field of public economics, which considers it a fundamental concept when evaluating public policies and public expenditure programs.

Trade-off between market efficiency and costs of public funding

As follows from the above, the choice between the two possible solutions for cost recovery face a trade-off between mobility market efficiency (the goal SMCP) and marginal costs of public funding:

- The public funding solution ensures mobility market efficiency but usually imposes tax deadweight losses and budget management costs (marginal costs of public funding) on society;
- Second-best pricing may lead to market inefficiencies but does not impose public funding costs since it depends only on user charges.

An economic decision on which instrument to use for covering those costs requires the assessment of the costs associated to each of the possible solutions.

## **2.5.2 Risks of revenue**

Because the risk factor is a determinant element for the definition of PPP projects (see also Chapter 3), the possible introduction of SMCP poses questions on its consequences over the possible financial risks of transport projects. SMCP affects the revenues derived from user charging and consequently any risks involved in it. In conventional pricing, the risk associated with revenues from user charges is directly associated with the uncertainty of future demand. But when marginal cost based pricing is introduced, two additional risk determinants are introduced:

- § Demand based revenue risk: risk associated with the non-linear variation of social marginal costs with demand; according with the principle of SMCP, user charges should be equal to the social marginal costs caused by the correspondent transport activity, and because SMC's depend on demand, so will the price. This risk is mostly caused by congestion/scarcity costs.
- § Future evolution of SMCs: risk associated with the external uncertainty of evolution of SMCs; the level of some marginal costs is uncertain for the future. For example, environmental costs will certainly change for the better in the future, but their variation in the medium and long term is high.



The possible introduction of additional revenue risks to the operator will be translated in it asking an additional risk premium to bear them. As described in the following chapter, this may justify a change of approach in the funding scheme of the operator.

### **2.5.3 Incentives**

The difference in objectives between the public (social welfare) and the private parties (profit) in a PPP arrangement puts a challenge on how to make the later work in the same direction of the former. Contractual design is the key to this task, particularly on the positive and negative incentives it places on the private party for it to perform consistently with social goals. It is common in PPPs to attribute commercial risks (demand based revenues) to the private party, with the aim of bringing the incentive in the operator to take actions - like quality of service and information - to attract demand. However, the introduction of a price based on social marginal costs may interfere severely with this aim. The possible power of the concessionaire to influence social marginal costs and, in that way, revenues, could lead it to behaviour prosecuting the maximization of revenues.

Unlike in conventional demand based revenues, revenues occurring under a SMCP scheme are not linearly proportional to demand, because social marginal costs vary according to demand and/or capacity changes, particularly congestion/scarcity costs. Therefore, one of the ways SMCs may change is through changes in the congestion/scarcity ratio, affecting the way how the demand incentive functions. In fact, the possibility of increasing revenues through capacity restrictions (to increase congestion /scarcity costs) may lead it to prefer providing a reduced level of service.

On the other hand, the operator has an interest to see SMCs be kept at a high level to maximize its incentives. Therefore, if its powers allow it in some way to influence the real or apparent level of SMCs, then it is expectable that it will try to move them upwards. For example, if price has a component proportional to the accident risk, it will be a profitable interest of the operator to see that risk increase.

The possible existence of incentives will jeopardize the desirable income of the PPP arrangement, and must be solved either by appropriate funding schemes or contractual performance drivers.

### **2.5.4 Legal, Institutional and Implementation issues**

Several issues of non-economic nature may conflict with the introduction of SMCP under the presence of PPPs. The most important identified and analysed in ENACT were:



Public budget constraints: A part of the motivation behind the execution of PPP's - particularly in roads - and of funding them through user charge revenues, is the willingness of governments to remove costs from the public budget balance. The Stability and Growth Pact obliged Member States in the Euro area into fiscal discipline meeting the Maastricht convergence criteria. This has put a pressure on public expenditure control, and PPP's provided an opportunity. SMCP may introduce face this barrier due to the cost coverage problem.

Previous existence of PPP contracts / contract renegotiations: If there is a previous existence of a PPPs, the introduction of SMCP will require a renegotiation of the PPP contracts, which in most cases are set for the long term. The circumstance of the private party having the power to veto the renegotiation by the public party may lead it to strategic behaviour in pursuit of a better remuneration. The possible introduction of additional revenue risks of SMCP may aggravate the problem, due to the additional revenue risks caused by SMCP.

Public acceptability: public acceptability is a core issue of social marginal cost pricing. In the scope of PPP contracts, specific concerns are raised with regard to public acceptability mainly dealing with the rules and principles governing revenue use.

Institutionalized governance practices / financing paradigms: Institutionalized financing practises may carry institutional/political acceptability barriers, and real costs of change, to the introduction of a private funding scheme that does not directly rely on user charges.



### **3 CONTRACTUAL DESIGN ALTERNATIVES**

In this Chapter we discuss the various alternatives in contractual design of Public-Private Partnerships, when combining PPP and Social Marginal Cost pricing. This Chapter takes a theoretical approach; in the next Chapter this will be supplemented with our empirical results.

The guiding principle in this Chapter is that optimising ‘value-for-money’ (i.e. better quality for less money) should inform the various decisions when applying PPPs (see ENACT D3 - Incentive and Contract Theory). This value-for-money will only be realised when the PPP-contract contains the right performance drivers.

In section 3.1 we will hence begin with discussing the performance drivers that are important within PPP-contracts: which elements within the PPP-contract will produce value-for-money and how? This will then inform an analysis of potential problems that may arise, when trying to incorporate SMC pricing within a PPP-contract. In 3.2 we present an overview of the various alternatives in contractual design when combining PPP and SMC pricing. Section 3.3 then examines relevant considerations when choosing between these contractual design alternatives. In Section Error! Reference source not found. we provide some conclusions.

## **3.1 Performance drivers in Contractual Design Alternatives**

### **3.1.1 Types of PPP contracts**

Public-Private Partnership is a broad concept that encompasses many different kinds of contracts. In Table 3-1 we have outlined the most important types of PPP-contracts that are applied in the provision of transport infrastructure and transport services.



Table 3-1 - Overview of PPP contract types

Type of PPP contract	Brief description	Application in transport sector
B(O)OT - Build-(Own)-Operate-Transfer	In a B(O)OT-contract, the private party invests in an asset, builds it, and operates it for a certain period of time while retaining ownership. At the end of the contract period, the asset is transferred to the public party ("transfer"); the government then pays a sum for the residual value of the assets. Revenues to earn back the initial investment are generated through exploitation, and through the transfer payment at the end of the contract period.	Infrastructure projects in all modes of transport (road, rail, ports, airports)
BTO - Build-Transfer-Operate	In a BTO-contract, the private party invests in an asset and builds it. Ownership of the asset is transferred to the government after construction is finished. The asset is however operated by the private party, who can earn back its investment this way. Revenues are generated through exploitation.	Infrastructure projects in all modes of transport (road, rail, ports, airports)
BOO - Build-Own-Operate	In a BOO-contract, the private party invests in an asset and builds it. It is then owned and operated by the private party, who can earn back its investment this way. Revenues are generated through exploitation.	Infrastructure projects in all modes of transport (road, rail, ports, airports)
DBFMO - Design-Build-Finance-Maintain-Operate	In a DBFMO-contract, the private party invests in an asset, which it designs and builds, and then maintains and operates. Revenues are generated through exploitation.	Infrastructure projects in road and rail
DBFM - Design-Build-Finance-Maintain	In a DBFM-contract, the private party invests in an asset, which it designs and builds, and then maintains. Revenues are generated through performance based funding from the government (e.g. shadow tolls, availability payments)	Infrastructure projects in road and rail



Type of PPP contract	Brief description	Application in transport sector
Concession	A more general term for contracts that award a private party for a certain period of time an exclusive right to carry out an investment and then maintain and operate it, under public responsibility. All types of PPP that generate revenues directly from exploitation can be considered concessions.	Infrastructure projects in all modes of transport (road, rail, ports, airports) Public transport services.



Common to all types of PPP are the following features:

- Public responsibility is retained. This distinguishes PPP from privatisation, in which public responsibilities go over to the private sector. However, as in the case of privatisation, a commercial private party is given an opportunity to deliver a 'public service' and is allowed to make a profit doing so.
- Multiple tasks are integrated in one contract. Whereas in traditional forms of procurement there is a separate contract for e.g. design, for construction, for maintenance, for operation, etc., in case of PPP several of these tasks are integrated in one contract.
- Along with the integration of multiple tasks, there is a substantial transfer of risks to the private party. For example the risks of cost overruns, delays in construction, the height of operational and maintenance expenditures, etc. may be devolved upon the private party. This distinguishes PPP from more traditional forms of procurement, in which most of the risks are usually borne by the public party. In the PPP-contract risks are allocated between the public and private party, and this will determine e.g. ownership of the asset, liability, restrictions in operation for the private party, etc.

Of particular importance in the context of whether the application of Public-Private Partnerships can be combined with SMC pricing in the transport sector, is the fact that PPP-contract types exist in which revenues are not generated directly from exploitation, but instead are generated through performance based payments paid by the government. Thus PPPs do not necessarily rely on payments by users through ticketing, charges or toll. PPPs may just as well depend for their revenues on the government through payments based on certain performance measures, such as actual usage (e.g. shadow tolls) or availability (see box below). When PPPs are based on performance based payments, the private party does not price users directly and hence no problems will emerge when SMC pricing is implemented.

The discussion on combining PPP with SMC pricing, affects different sections of the transport sector in different ways:

- In road and railway infrastructure PPPs, performance based payment mechanisms are already widespread. PPPs for inland waterways - i.e. canals - do not currently exist as such in Europe. However a payment mechanism based on availability or usage may be easily conceived, as the situation is similar to road and railway infrastructure. However, for port and airport infrastructure, PPPs based on availability or usage payments will not be straightforward to implement, and do not presently exist. Hence, it should be





noted that an alternative PPP-model depending on performance based payments, is not readily available. This will be further discussed in sections 3.2 and 3.3.

- Users will have to pay the SMC-price to ensure socially optimal decisions concerning all 'products' they consume with regard to transport. This means that for transport infrastructure, the question arises what contractual model will be best when implementing SMC pricing in PPPs. For public transport services (e.g. urban public transport or railway services) PPPs (usually concessions) will also be affected as risks and incentives will change as a consequence of applying Social Marginal Cost pricing. At the same time public transport operators will also be faced with higher costs due to higher infrastructure charges (e.g. the introduction of universal road pricing, or higher infrastructure charges on railway lines).

The SoPC (Standardisation of PFI Contracts) by HM Treasury of the UK, and the standard DBFM contract of Rijkswaterstaat (Highways Agency) of The Netherlands each describe a payment mechanism based on availability. The one in the Rijkswaterstaat standard DBFM contract works as follows. From the moment the road is operational until the end of the contract period, the private operator receives an availability payment every quarter of a year. This availability payment is a fixed payment of which a reduction is subtracted depending on whether lanes of the road can be (fully) used or not during the reporting period. The following conditions can apply: a lane needs to be closed, a lane needs to be narrowed, or the speed is limited for a lane. For each of these categories a fee applies which also depends on whether the closure, narrowing or reduction of speed causes much inconvenience to road users. This latter is determined by the traffic intensities for different moments for each day in the week. When a lane is closed during a point in time that traffic is normally very intensive the fee is high, when the speed on a lane is only reduced at a point in time that there is little traffic, the fee is low. These fees are multiplied by the number of hours this condition holds. In this way the total amount of reduction to the fixed amount is calculated for the period. In addition to the reduction due to diminished operation of lanes, the payment may also be reduced because of a failure from the part of the operator that leads to a traffic accident or a hazardous situation, or an observed non-conformity to the contract (e.g. in the reporting demands). (Source: Rijkswaterstaat (March 2006): DBFM Basis Overeenkomst, version 1.1; and HM Treasury (March 2007): Standardisation of PFI Contracts, Version 4)



### 3.1.2 Performance drivers within PPP contracts

In a PPP-contract there is a tightrope balance between the interests of the contracting government and those of the contracted private party. Both parties will need assurances: the government wants to have certainty that the private party is 'up to the job' and does what is required to deliver an adequate service, and the private party needs to be confident that the government will abide by the contract and allow it to generate sufficient returns on its investment.

Achieving this balance between the interests of the public party and private party is complicated by the asymmetry of information that exists between both parties. The private party ('the agent') has information on its skills, effort and input, that the public party ('the principal') does not have. This information asymmetry can lead to two types of inefficiencies: ex ante inefficiencies and ex post inefficiencies. Ex ante inefficiencies refer to the fact that the principal may not be able to select the most appropriate agent for a specific task, because the information regarding the abilities of the agent are not completely known to the principal. Ex post inefficiencies occur when the agent benefits from his abundance of information by pursuing goals of his own at the expense of the principal, because the principal does not have all the information about the effort of the agent in a particular job (so-called 'moral hazard'). With regard to PPP-contracts, this implies that the contracting government will have to select the right private party through a well-designed tender procedure to overcome the ex ante inefficiencies. The ex post inefficiencies (issues with moral hazard) need to be dealt with by formulating a contract that contains adequate incentives, and by strictly monitoring and enforcing the provisions in the contract.

Despite the inherently complicated nature of Public-Private Partnerships, studies<sup>4</sup> have found that through PPPs a substantial amount of value-for-money can be realised: PPPs can lead to cost efficiency gains of 10 to 20 percent<sup>5</sup>, and to a significant reduction of time and cost overruns<sup>6</sup>.

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<sup>4</sup> These studies not only encompassed PPPs in the transport sector, but also PPPs in government housing, hospitals, schools, water supply, water treatment, etc.

<sup>5</sup> Cost efficiency here not only relates to a reduction in costs, but also to a reduction of risks (of which a valuation is included in the different estimates). The National Audit Office of the UK (1999) found a 10 to 20 percent cost efficiency for 7 PPP projects in the UK. Arthur Andersen and Enterprise LSE (2000) found that PPPs are 17 percent more cost efficient in a study of 29 projects in the UK. A statistical analysis of 21 PPPs and 33 traditionally procured contracts in Australia by The Allen Consulting Group (2007) found an average cost efficiency of 11 percent in the period between signing the contract and realisation of the contract and even 31 percent if the period is extended from the project inception to realisation.

<sup>6</sup> Mott MacDonald (2002) showed that PPPs in the UK on average do not experience time or cost overruns, while traditionally procured projects do experience overruns of several tens of percents. The National Audit Office (2003) found in a study that 78 percent of the PPP-projects in the UK are realised within the scheduled costs and 76 percent within scheduled time, while this is 27 and 30 percent respectively for traditionally procured contracts.



Key in realising value-for-money is performance driving elements within PPP-contracts. The main performance drivers can be subsumed under three headings:

- Integration of tasks;
- Allocation of risks;
- Supplying adequate incentives.

The tender procedure should be set up in such a way that competitive pressures within the procedure ensure that private parties submit bids in which these three performance driving elements are enhanced. Ideally this will lead to a PPP-contract with an optimal integration of tasks, allocation of risks, and supply of incentives. Especially the allocation of risks and supply of adequate incentives are of great importance with regard to the question how SMC pricing may be feasibly incorporated within PPPs.

#### Integration of tasks

Characteristically, a PPP contract is written over the flow of services rather than the build process (Grout, 1997). Specification of required services instead of specification of the building process implies integration of tasks: the design and construction of an asset are integrated with maintenance, operation and/or exploitation (i.e. delivery of certain services by means of the asset concerned). Integration of the design and construction with maintenance and operation can lead to increased incentives for life cycle optimisation when compared to a situation where design/construction and maintenance/operation are separately procured. This is because externalities may exist between design/construction and maintenance/operation (Dewatripont and Legros, 2005; Iossa and Martimort, 2008). These externalities may exist because an extra investment in the design/construction phase may lead to a decrease in operating costs in the operational phase (e.g. better quality of the asset will lead to reduced costs of maintenance) (Hart, 2003; Bentz, Grout and Halonen, 2004; Martimort and Pouyet, 2006; Iossa and Martimort, 2008) and/or an increase in the residual value of the asset (Benett and Iossa, 2005; Iossa and Martimort, 2008). When design/construction and maintenance/operation are separately procured such an extra investment will not be made, because the private party contracted for design and construction will not yield any benefit from it; these benefits will all go to either the

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The Allen Consulting Group (2007) concluded that PPP-projects are completed slightly ahead of time on average, while traditionally procured projects are subject of a time overrun of 24 percent on average.



government (when the benefits of the extra investment are verifiable) or the private party contracted for maintenance/operation (when the benefits are not verifiable).

#### Allocation of risks and Supplying adequate incentives

In a PPP it is possible to effectuate a more efficient distribution of risks than in traditional procurement. Risk is made up of two components: chance of occurrence, and total consequences when the risk occurs. A party may be able to influence the occurrence, or may be in a better position to control the consequences when a risk occurs.

With regard to the occurrence of a risk, we can discriminate between two types of risk (Dewatripoint and Legros, 2005; Sadka, 2007):

1. Exogenous risk is risk of which the occurrence is entirely beyond the control of both contracting parties (risk due to external events), nor is either party better informed about this risk than the other. For example adverse site and weather conditions during construction, changes in material costs, exchange rate fluctuations, etc.
2. Endogenous risk is risk of which the occurrence can be influenced by the contracting parties, and/or risk that one party is better informed about. Examples include inadequate cost management, poor maintenance schedules, tariff-setting rules, etc. By creating the right incentives endogenous risks may be prevented from occurring.

In general, an efficient allocation of risks (i.e. an allocation that optimises value-for-money) will be accomplished when the following two principles are followed (Iossa, Spagnolo and Vellez, 2007):

1. Given partners with similar risk-aversion, a particular risk should be allocated to the party that has relatively more control over the occurrence and/or consequences of a the risk;
2. Given partners with similar responsibility or control over occurrence and/or consequences of a particular risk, the risk should be allocated to the party that is more able to bear it, i.e. the less risk-averse party.

This implies that it is suboptimal to transfer exogenous risks to the private party which is also not in a better position to reduce the consequences (Dewatripoint and Legros, 2005; Sadka, 2007; Iossa, Spagnolo and Vellez, 2007). If the private party is required to bear such risks, it will just require a higher return to compensate for increased risks (and thus the



cost of capital will go up, see ENACT D4 on “Financing and Risk Perception”), without any concomitant benefits in terms of higher quality or lower infrastructure costs.<sup>7</sup>

Many of the risks are however at least partly endogenous - one of the parties in the contract is in a better position to control the occurrence of a particular risk, or is better informed - or one of the parties is in a better position to abate the consequences of a risk. Many of the risks that are related to the statutory / planning process and legislation and regulation may be (partly) controlled by the government, hence in theory they should be distributed to the public party.<sup>8</sup> Likewise, the private party is in a better position to manage many of the risks associated with the design, construction and operations; these should be borne by the private partner therefore.

To move the private party to actually manage the risks with regard to the design, construction and operations to the best of its capabilities (ensuring that costs are saved and a better quality in provision is achieved), it is crucial that adequate incentives are supplied. Within the PPP-contract, these incentives are chiefly provided through:

- The payment mechanism: the way the private operator gets rewarded for the services it provides. As outlined earlier, the payment mechanism may be based on actual use, or may be performance based, tying payment to a particular performance. In many PPPs these main payment mechanisms are complemented by bonuses and penalties for specific objectives: keeping the time schedule for construction, good traffic management during construction, user satisfaction, traffic safety, etc (Abdel Aziz, 2007).
- Provisions with regard to non-conformity and early termination. These provisions determine what happens when the private operator breaches the contract (e.g. penalties), and when the contract is terminated before the contract period;
- Provisions surrounding the transfer of the asset. Provisions may be included in the contract setting out what occurs when the asset is transferred at the end of the contract period: does the private party receive a price for this, and in what should then be the state of the asset?

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<sup>7</sup> Only when a private party is very big and carries out multiple contracts, exogenous risks of the same type may be pooled together. In that case the private party could act as an ‘insurance company’, and hence the private party would be less risk averse as the public party. However, this is generally an exception.

<sup>8</sup> Though it should be noted that the contracting public party concerned may not have much influence on these risks as other parts of the public sector may be responsible for the statutory / planning process and legislation and regulation. In that case these risks are exogenous. Then they should normally nonetheless be borne by the government because transferring these risks to the private party would not be efficient.



In practice it is often difficult to determine exactly which to what extent the private party is able to influence the occurrence and consequences of certain risks. Hence, when attempting to transfer endogenous risks to the private party (many risks associated with design, construction, operation, etc.), some exogenous risks will be transferred as well (e.g. bankruptcy of important suppliers, adverse weather conditions, quicker wear and tear than expected, etc.). There will thus be a trade-off between on the one hand the increased incentives generated by transfer of risks to the private party, and on the other hand the higher risk-premium the private party will charge due to its risk aversion from exogenous factors that are concomitantly transferred.

### **3.1.3 Effects of SMC pricing on performance drivers within PPP-contracts**

When SMC pricing is to be incorporated with PPP-contracts this will affect the performance drivers as discussed above. SMC pricing will affect the allocation of risks and the incentives supplied in the PPP-contract.

With regard to the allocation of risks, incorporation of SMC pricing within the PPP contract will have the following effects:

- Incorporation of SMC pricing within a PPP will imply that the demand risk is entirely borne by the private party. This is only efficient when the private party can actually influence demand, or when the costs for the private party are related to demand. In many cases however demand will be exogenous for the largest part, and the largest part of the costs (the investment) will not be related to demand. This will be true for most PPPs in road, rail and inland waterways, where demand for a particular piece of infrastructure is largely dependent on autonomous traffic flows and developments within the broader network, and a large upfront investment is required. Hence having the private party bear the demand risk will in most cases not lead to additional value-for-money, but will instead only lead to higher financing costs due to compensation of increased risks. In those cases private parties are able to influence demand (especially ports and airports), they can do so by the quality of its services, by marketing, or by price setting<sup>9</sup>. If SMC pricing is implemented as a rigid price regulation (based on a historic average of the social marginal costs), this will imply severe limitations with

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<sup>9</sup> By e.g. price discrimination (charging different prices for different types of groups), and / or yield management (price setting to influence capacity use (and through this maximise revenues)).



regard to the instrument of price setting. This will then mean that the private party will lose ways to affect demand, and the demand risk will become more exogenous.

- The SMC price includes components which are almost entirely determined by external factors. Environmental costs will depend for a large part on vehicle and fuel technologies. Also the marginal costs of congestion and accidents contain elements on which the private operator will not have much influence (e.g. the value of time lost due to congestion, or medical costs due to accidents). Changes in these cost components will constitute an exogenous risk for the private party, and hence it will demand a higher risk premium. This was termed the “risk of future evolution of SMC” in ENACT Deliverable 5.1.
- Price setting according to SMC pricing may also have non-linear effects on the revenues for the private party, i.e. with more users revenues do not rise proportionally but disproportionately. From a certain point a larger number of users will cause more congestion. Congestion costs will then go up, leading to a higher SMC price for every user; this price increase will then in turn adjust the number of users slightly downwards, until an equilibrium is achieved. Environmental costs (especially emissions) may also be affected: more congestion will mean a lower average speed, more stop and run activity and longer engine working times. So as the number of users increases, also environmental costs for each user will rise and hence the SMC price, and through the price elasticity the number of users will diminish somewhat. Because of these non-linear effects the uncertainty surrounding the revenue stream is increased and the private party may thus want a larger risk premium to be compensated for the increased uncertainties. In ENACT Deliverable 5.1 this was labelled the “demand based revenue risk”.

With regard to incentive effects, incorporation of SMC pricing within the PPP contract will also have consequences. As part of the SMC-price a private operator will also receive a ‘compensation’ for the external costs: environmental costs, cost of congestion, and costs of accidents. This may give rise to perverse incentives:

- When the external costs of one type of user (e.g. older airplanes which have high emissions and are noisy) are higher than of other types of users (e.g. newer airplanes), the former kind of user would be more profitable for the private operator than the latter. This may influence its behaviour towards the two types of users (e.g. by favouring older airplanes to newer airplanes in case of tight capacity). From a social point of view, this is undesirable. In ENACT Deliverable 5.1 this has been called the “user discrimination incentive”.

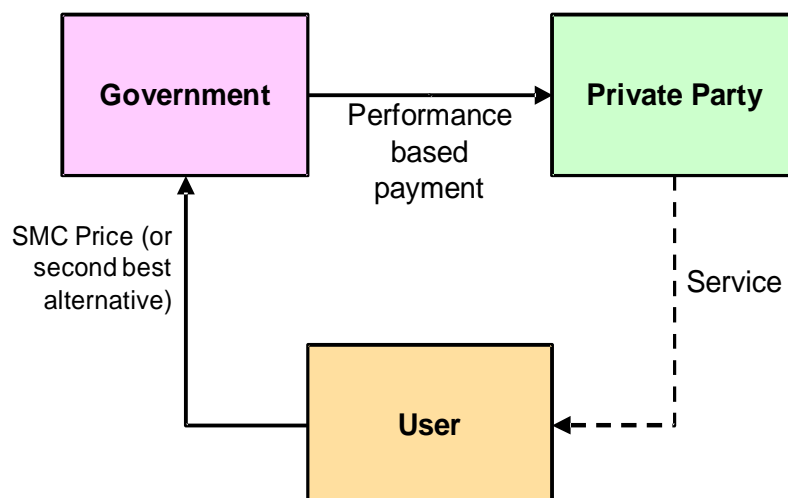


- On the long run the private party operating a PPP will have an incentive to keep the external marginal costs as high as possible. Hence, when the level of the SMC price is regularly reviewed and adjusted, the private party has an incentive to attempt to drive up environmental costs per user, create extra congestion, and neglect to prevent accidents as to ensure that the SMC price is adjusted upwards. In ENACT Deliverable 5.1 this was named the “high externality incentive”.
- Because of a higher SMC-price in case of much congestion, the private operator may have inadequate incentives to invest in capacity expansion when this would be socially desirable: i.e. an investment in order to accommodate more users, may not be interesting for a private party because it prefers fewer numbers of users paying a higher SMC-price (because of high congestion). In ENACT Deliverable 5.1 this has been described as the “demand incentive”.

### 3.2 Possible alternatives of contractual design

As discussed in section 3.1.1, there are also PPP-contract types in which the private operator does not depend on charging users for its revenues, but instead on a performance based payment by the government. SMC pricing can then be implemented by having users pay the SMC price to the government, while the government pays a private party for the provision of infrastructure through performance based payments. The reward of provision is then separated from the income from charges. This is represented schematically in Figure 3-1.

Figure 3-1 - Separation of reward for provision and income from charges







A first choice with regard to contractual design when combining PPP and SMC pricing is hence: does the private party get its revenues from the government through performance based payments or does it get its revenues from charging users?

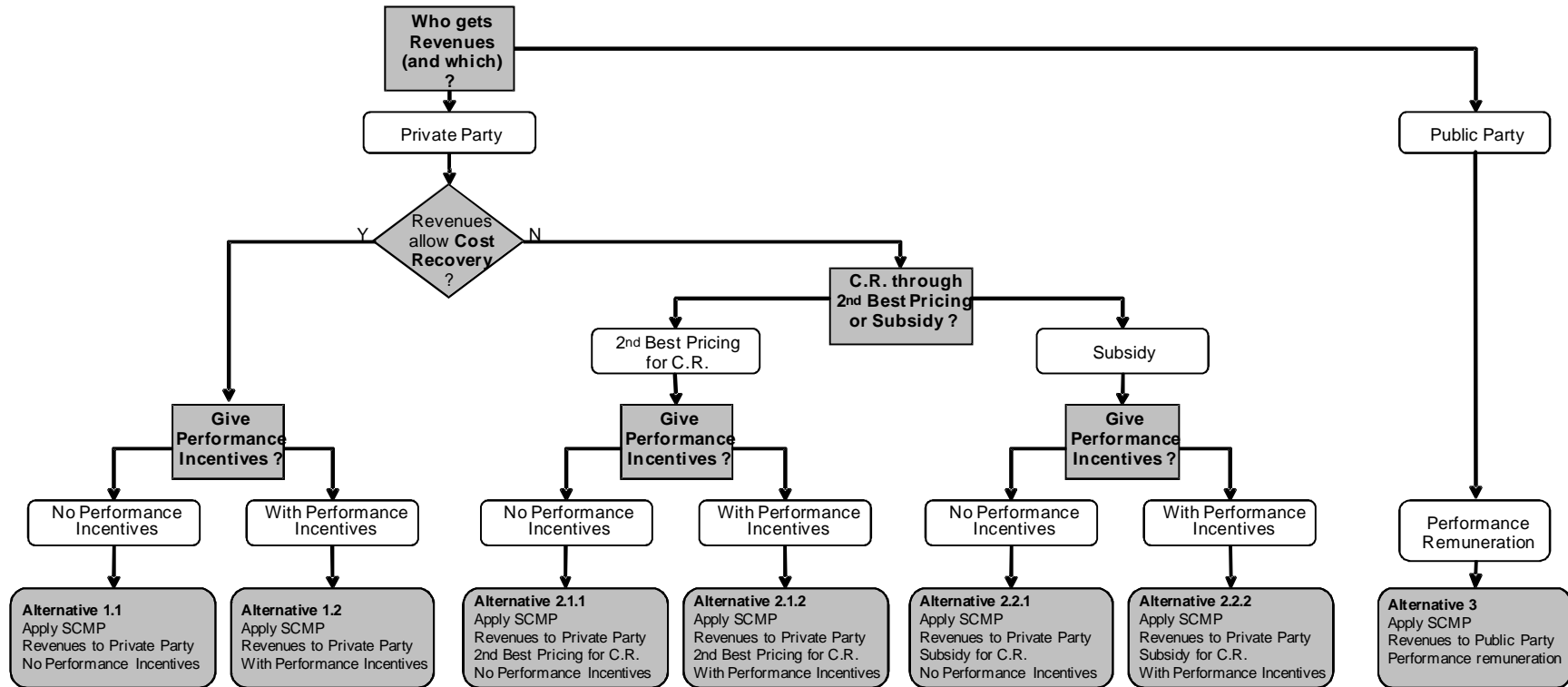
In case the private operator charges users directly a second choice may arise. Charging users the SMC price could yield insufficient revenues: in that case a choice exists between supplementing the private operator's revenues through additional subsidies, or by applying second-best pricing principles that do achieve cost recovery.

Thirdly there is a choice of building in additional performance incentives within the PPP-contract to incentivise the private operator to behave in ways that are desirable from a social point of view (and that counteract potential perverse incentives).

In Figure 3-2 it is shown how the different choices and situations outlined above, result in a large number of alternatives for contractual design when combining SMC-pricing and PPP.



Figure 3-2 - Possible Alternatives of Contractual Design





### **3.3 Considerations concerning alternative contractual designs**

Below we will discuss the considerations that are important with regard to the three choices, outlined in the preceding section:

- Who should get the revenues from SMC pricing: the private party or the government (who then pays a private operator through performance based payments)?
- If SMC pricing does not yield sufficient revenues to attain cost recovery, is cost recovery to be achieved by supplemental subsidies or by applying second-best pricing?
- Should additional performance incentives be built into the PPP-contract?

Who should get the revenues from SMC pricing: the private party or the government?

Relevant considerations regarding this question are:

- As observed in section 3.1.3, when demand is mostly an exogenous risk and costs are not closely related to demand, it makes little sense from a value-for-money point of view to have the private party charge users directly. This will only lead to higher financing costs because of increased risks to be borne by the private operator. It will in that case be better when the government collects charges from users (based on SMC-pricing), and pays the private operator according to performance based payments.
- Essential for a PPP based on performance based payments is that suitable performance indicators can be constructed as a basis of remuneration, which will incentivise the private operator to deliver good quality of service and be cost efficient. The performance indicators should be related as much as possible to aspects that the private party can influence. So if demand is exogenous and costs are not closely related to demand, a payment mechanism based on availability is preferred to one based on usage (such as shadow toll). But if the private operator does have influence on demand or costs are for a large part determined by demand, a payment system in which usage is taken into account may serve as a proxy for direct user charges, and provide incentives to attract users, provide good quality of service and keep costs low.
- In case a private operator is able to influence demand significantly, it can do so through quality of services, through marketing, or through pricing. If within the implementation of SMC pricing some measure of freedom in price setting behaviour is extended to the private operator, the abilities for the private operator to influence demand are unaffected. In that case it may actually be preferable when the private operator



charges the user directly, because the private operator will be able to apply yield management and price discrimination to optimise the use of available capacity. The government will probably not be good at applying yield management and /or price discrimination, because it does not have the same incentives as private parties to maximise revenues, and it will not be able to process information on capacity use and types of users and translate this in price adjustments with the same speed and cleverness. If, as mentioned before, SMC pricing is applied as a rigid price regulation based on historic averages of the relevant social marginal costs, this will however limit the private operator severely in the use of price setting to influence demand. This will then take away possibilities for yield management and price discrimination, through which the operator attempts to optimise use of available capacity. With severe restrictions on price setting, the private operator will furthermore put more focus on quality of service and marketing to attract users. Under these circumstances, having the private operator charge the SMC price to users directly, will only be preferable when users are very sensitive to quality of service and /or marketing (i.e. demand risk is still endogenous rather than exogenous), and when it is impossible to design adequate performance indicators to remunerate the private operator by (i.e. quality cannot be measured adequately, and the government is unable to ascertain number of users).

- When implementing a pricing system, network effects may be of great importance. Especially in the case of road infrastructure and to a lesser extent within railway infrastructure, pricing may be used to influence the size and the pattern of traffic flows within the network: through pricing users may be persuaded to choose certain hours and avoid other hours, and to use certain roads or railway lines rather than others. This way congestion may be diminished, or even avoided. Moreover, the excess revenues of certain parts of then network (which are very busy), may be used to offset losses in other parts (which are less busy). When PPPs are applied in which the private party charges the user directly for only a small part of the network, the abilities to influence traffic flows within the network will be very small. Coordination between different private parties and the government will likely be bothersome: private operators have a natural incentive to attract as many users to their part of the network, and hence may not cooperate in trying to distribute traffic flows more evenly.



From a value-for-money perspective, the only circumstances in which it is preferable to have private operators charge users directly (instead of charging by the government) is when:

- The private operator is able to effectively influence demand (i.e. demand is to a large extent an endogenous risk), or a large part of the costs are narrowly related to demand;

- And yield management / price discrimination are important for optimal capacity use;
- Or users are very sensitive to quality of service and/or marketing, and no suitable performance indicators can be designed (i.e. quality is hard to measure, and the number of users cannot be established);
- And network effects of pricing are not important.

In all other circumstances it is to be preferred when the government charges users and remunerates a private operator through performance based payments.

In road, railway and inland waterway transport the above mentioned circumstances will almost never hold: demand is usually largely exogenous (mostly autonomous traffic flows), and the largest part of costs (investment costs) are unrelated to demand, yield management / price discrimination for optimal capacity use is not important, and network effects are highly relevant. Hence in these modes of transport it makes more sense that the government collects charges (based on SMC pricing principle) from users over the entire network, while paying performance based payments to the private operator when applying a PPP.

For ports and airports, and for public transport services, however demand is often less exogenous. Ports and airports to some extent compete with each other, and hence pricing, quality of service and marketing do make a difference in the number of users they attract. The same is true for public transport service operators, although they rather compete with alternatives in other modes of transport (cars, bikes, walking); but usually they are well able to attract additional users with pricing, quality of service and marketing. Moreover forms of yield management and price discrimination are important for optimal capacity use for ports, airports and public transport services. Network effects are of less importance, as port and airport represent a node rather than a line in a network, and public transport operators will normally operate the whole network (instead of only a part). At larger ports and airports a substantial share of the users is foreign. Hence for ports, airports and public transport services there is a strong case to have the private operator charge the users directly.



Achieve cost recovery by supplemental subsidies or by applying second-best pricing?

This question will only be relevant for the purpose of integrating SMC pricing in PPPs, in case the private operator charges users directly, and SMC pricing will not yield sufficient revenues for cost recovery. Relevant considerations regarding the question whether to achieve cost recovery through supplemental subsidies or second best pricing in that case, are:

- There is an asymmetry of information between the public and private party: the private party will have more information than the government on the extent revenues fall short of costs, and hence will have better insight in the amount of subsidy that is needed to achieve cost recovery. Furthermore, the amount of subsidy will depend on infrastructure costs and on the number of users, over which the private operator has some control. In this situation it will be hard to properly incentivise the private operator to be efficient and to attract users (e.g. through quality of service), because the private operator will rather ask for a larger subsidy. In a tendering procedure, it may however be possible to elicit a bid from private parties on the amount of subsidies needed to achieve cost recovery. This may then introduce incentives for the winning private operator to be cost efficient and attract users. But within such a tendering procedure it will also be important to elicit information on the infrastructure costs, since this is the one component of the SMC price of which the private party has a better estimation as the government, and is therefore crucial to set a correct level for the SMC price. However, if both these elements - both the amount of subsidy and the infrastructure costs - are incorporated in the tendering procedure, bidders will make a trade off between both elements as to increase their chances of winning and it is then uncertain whether bidders will present fair information. Hence in case of supplemental subsidies problems will arise concerning incentives and information that will lead to extra transaction costs to resolve, and may be only imperfectly remedied in the end.
- When the government charges users by way of SMC pricing, and pays a private party for the provision of infrastructure through performance based payments, it may happen that revenues the government receives from SMC pricing will not be sufficient to cover all the performance based remunerations paid to the private operator. Hence a part of the performance based payments may come from the general government budget. This will be justifiable when the users of the piece of infrastructure are mainly within the 'tax paying community' (usually a country). However, when many of the users are not part of the 'tax paying community' (i.e. many foreign users) there is a good case for a tariff system that will fully cover all costs of the piece of infrastructure (also including the external costs): why would a 'tax paying community' pay for a piece of



infrastructure that benefits mainly users from outside that community? In that case a second best pricing alternative in which a private operator charges users directly to achieve full cost recovery, may be preferable.

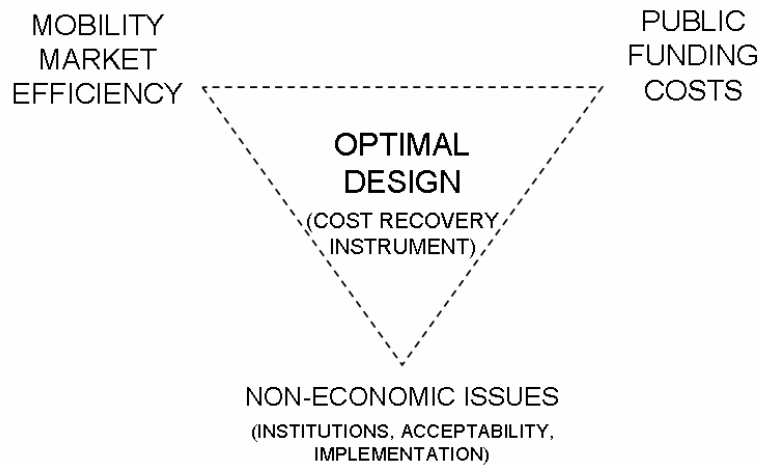
- In case of applying second best pricing to achieve cost recovery, it is important that the goals behind SMC pricing - fair competition between and within mode of transport, and internalisation of external costs (to incentivise users to make more responsible choices) - may nevertheless be taken into account. In other words, governments should then be able to establish a fair playing field in their own country and in Europe, and a uniform set of regulations, especially with regard to the principles for pricing that are then to be applied.

For larger ports and airports a large proportion of the main beneficiaries are from outside the country in which the port or airport is located. Moreover, estimating the amount of subsidies needed to achieve cost recovery, will be difficult to achieve in a tendering procedure for operators of ports and airports. Through harmonised competition and regulation policies for ports and airports, it will be possible to attain a level playing field and to further internalise external costs associated with maritime transport and aviation.

For public transport services, the amount of subsidies may be easier to estimate. Only the operational costs will be unknown to the contracting government, and some benchmarking information will usually be available. Whereas infrastructure costs will be very specific for each piece of infrastructure - especially when it concerns port or airport infrastructure - some standardised information on the operational costs for public transport services is often at hand. Hence for public transport services, supplemental subsidies seem the preferred solution. In many cases this is already standard practice, as many public transport operators receive Public Service Obligations.



Figure 3-3 - Core factors for optimal design choice on complementary cost coverage instrument



Build in performance incentives into the PPP-contract?

With regard to this question only one consideration is relevant: are existing incentives adequate or not? When perverse incentives exist that need to be counteracted, or insufficient incentives exist for a private party to realise socially desirable objectives (e.g. quality of service, prevention of congestion, accident prevention, environmental friendliness, etc.), then additional performance incentives should be build into the PPP-contract. As discussed in section 3.1.3, perverse incentives will exist when a compensation for external costs is included in the price the private party charges to users. The private party may then be disposed to favouring users with high external costs above those with low external costs, keeping external costs artificially high, and refusing to make necessary investments in capacity expansion. The implications of the observations above are as follows:

- In the case a private operator applies SMC pricing and does achieve cost recovery, additional performance incentives should be built into the contract to counteract perverse incentives as a consequence of external costs included in the SMC price. One way this can be accomplished is by requiring the private operator to pass the share of the SMC price related to external costs through to the government; the government can then use this money to provide incentives that are appropriate (e.g. incentives to further environmental friendliness, prevent congestion, promote traffic safety, etc.). Such an arrangement will also make it possible for the government to preclude the

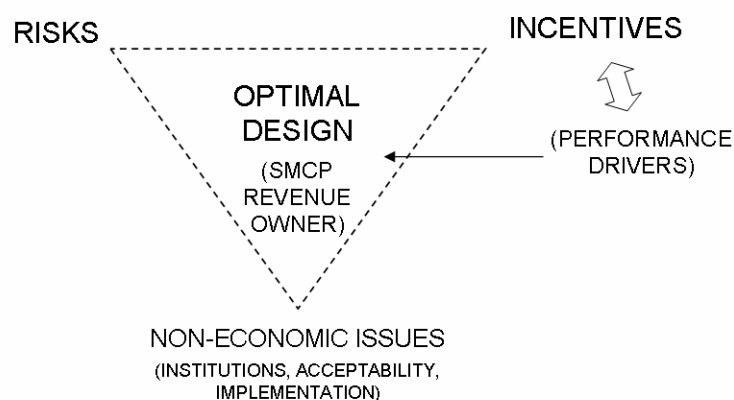




private party from making excess profits above cost recovery (including a normal profit).

- Also when a private operator applies SMC pricing and receives supplemental subsidies to attain cost recovery, it will be necessary to build in performance incentives into the PPP-contract. Also in this case perverse incentives as a result of the external cost component within the SMC price need to be offset. Furthermore, when the private operator would just receive a subsidy as a fixed amount without any further requirements, it will have insufficient incentives to pursue socially desirable goals. In this case it will be an option to require the private operator to pass through the share of the SMC price associated to external costs. The government can subsequently use this money, and in addition the money from the general government budget that constitutes the subsidy, to provide adequate incentives.
- In the case of second best pricing by a private operator in which users are also charged according to the external costs they bring about, perverse incentives may also be prevalent. So also in this case it will be necessary to build performance incentives into the contract (or to take such perverse incentives into account in regulations). If there are segments in the price related to external costs to the government, it may again be necessary to require the private operator to pass these through to the government, while at the same time allowing the private operator to recover all infrastructure and operational costs (so cost recovery will be achieved). The government may use the money it receives as a recompense for external costs and for policies and measures to induce the operator (or other relevant parties such as users or producers of vehicles) to pursue socially desirable objectives.

Figure 3-4 - Core factors for optimal design choice on SMCP revenue owner, and performance drivers





When pricing of ports, airports and public transport services by private operators should take external costs into account, this will likely give rise to perverse incentives. Governments can counteract these perverse incentives through regulations or by requiring that the parts associated with external costs are passed through. Governments may then supply additional incentives to ensure that the operator (or other relevant parties such as users or producers of vehicles) pursues socially desirable objectives, e.g. environmental friendliness, prevention of congestion, traffic safety, etc. The exact design of such incentive systems will have to be determined case by case.

For PPPs in road, railway and inland waterways, a PPP-model in which the income from charges and reward for provision are separated (i.e. the operator receives performance based payments from the government), is in most cases the best option when SMC pricing is introduced. Also then each PPP-contract should be designed to take the specific circumstances into account: e.g. some part of performance can be tied to actual usage to reflect the influence the private party may still have over traffic, or the cost components (maintenance) that are tied directly to demand.

For PPPs related to port and airports however performance based contracts seem a less attractive option, and a better option is to harmonise competition and regulation policies for ports and airports for the European Union to attain the goals behind SMC pricing: a level playing field within and between the modes of transport, and internalisation of external costs. Also in this case, PPP-contracts should take account of specific conditions. Moreover they should take into account the perverse incentives that may be generated when external costs are internalised in the price.

For public transport services, integrating SMC pricing into the PPP contract seems the best alternative, supplementing revenues with subsidies in case cost recovery is not achieved. This is not much different from current practice, in which additional subsidies are already supplied through Public Service Obligations. Again, adequate incentives need to be supplied in the contract to offset possible perverse incentives.



## **4 CROSS MODAL ANALYSIS: MODES, TYPES OF PPP AND CONTEXTS**

Correct approaches for design of PPPs with SMCP in transport infrastructures and undertakings vary according to modes, types of PPP and contexts and time. The ENACT work (ENACT 5.1) looked into how local characteristics of specific case studies affect the constraints of SMCP in PPPs, and in extent which would be the best approaches to conciliate these two institutions.

The ENACT work covered the main potential problems in the application of SMCP in PPPs, which can be summarized as follows:

- § SMCP revenues may not be sufficient for cost coverage of the PPP
- § SMCP may cause additional risks of revenue
- § SMCP may cause undesirable incentives on the operator
- § The application of SMCP in PPP's may face other non-economic constraints of legal, institutional and implementation nature

The ENACT case studies aimed to identify, analyse and, where possible, measure these elements. A Simulation Tool developed within ENACT partly covered the first three issues and helped to obtain quantitative measures. Qualitative analyses were produced where the ENACT Simulation Tool (EST) could not provide insight. On the basis of the analyses of the possible constraints on PPPs imposed by SMCP produced by the case studies, possible solutions of PPP and SMCP design to solve or minimize the problems outlined above were discussed in Deliverable 5.1.

This chapter provides insight into practical issues of implementation of SMCP under the presence of PPPs, providing some conclusions and guidelines. Its first four topics relate to PPP design. They address the way how PPPs should be designed when SMCP is introduced under particular circumstances related to mode of transport, type of PPP and context. The fundamental PPP design issues covered are ownership of user charge revenues and private operator funding, use of performance drivers and cost coverage. The framework used for assessment of PPP design alternatives is described in topic Error! Reference source not found.. Such assessment per mode of transport is synthesized in topic 4.1, leading to conclusions on optimal design per mode, particularly on PPP funding approaches and the use of contractual performance drivers. Different types of PPPs feature different challenges



for the introduction of SMCP; how so is described in topic 4.2, covering the issues of possible types of activity within the transport sector (infrastructure management or service operation), contracted duties and costs and, previous existence of PPPs and funding and regulatory practises. Although there are strong common characteristics within each mode of transport, there are local context particularities associated with each site that are important to the way in which SMCP affects how PPPs should be designed. These include contextual elements of demand level, social environment, market and competition and, public views and institutional background. This issue is covered in topic 4.3.

Outside the micro-scale scope of PPP design, this chapter further addresses SMCP implementation issues motivated by PPPs at the macro level. Firstly, the constraints to the introduction of pricing reform bring the question of how, when, where and in which pricing form to implement the SMCP principle in transport systems throughout Europe, i.e. which implementation path(s) will/should be followed. The present existence and future creation of PPPs causes its own constraints on implementation paths. Their nature and likely implications for the path of implementation are discussed in topic 4.4. Finally, the issues raised by the conciliation of SMCP with PPPs bring the need of finding integrated and coordinated solutions. This need is brought about particularly by the use of second-best pricing for PPP cost coverage purposes, by recourse to cross-subsidization between different pieces of infrastructure and by the possible previous existence of PPP contracts. How these factors call for integrated solutions, and the required scale of coordinated intervention, are issues covered in section 4.5.

## **4.1 Modes of transport**

Each mode of transport has intrinsic characteristics which bound the way SMCP may harm the objectives of PPPs. These common features include, most importantly, the size and uncertainty of evolution of SMCs, the dynamics of formation of pure SMC prices, the types of PPP, the powers and duties of the private party, and the institutional context. Although local contextual elements are non-negligible for optimal PPP/SMCP design (4.5), some intra-mode characteristics are sufficiently general to allow pointing to what seem to be appropriate solutions for each mode.

Intrinsic mode characteristics, their effects on risks, incentives and non-economic factors, and consequent arguments for optimal design solutions per mode, are reported in this topic. The results presented here are fundamentally drawn from Deliverable 5.1 for roads, railways and airports, and from Meersman et al. (Annex, chapter 7.3) for maritime transport.



### 4.1.1 Roads

The characteristics of SMC formation and PPPs in roads indicate that the appropriate choice on the owner of SMCP revenues should rest on the public party, with the private party being paid through public funding based on shadow tolls or availability payments. This funding solution eliminates several undesirable incentives on the operator caused by SMCP, promotes public acceptability, facilitates contract renegotiations and allocates severe exogenous risks caused by SMCP to the public party. Although the local context should be observed in this assessment - including the existence of congestion, the relative weight of other marginal costs in the price, risk attitudes of the parties involved, public views and political background - it seems that road PPPs will generally gather the conditions for a choice of a public funding solution.

Risk of road toll revenues with pure SMCP will generally be very high due to the disproportionate variations of congestion marginal costs with demand and (even if congestion does not occur) in the medium and long-run due to the future evolution of marginal costs, mainly those of environmental nature. If one assumes the public party to be risk neutral (see Chapter 3), then this extra exogenous risk pushes for an allocation of user charge revenues on the public party.

There will be severe undesirable incentives on road operators if their revenues rely on pure SMCP. The natural demand incentive will be highly affected under the presence of congestion costs, to the point that the operator would prefer to increase congestion costs through a lower level of service, even at the expense of losing demand. It would be possible to establish contractual performance drivers (monetary incentives) to neutralize this negative incentive, but in practise the financial balance between the two parties in that case would be just equivalent to a simple shadow toll situation. Other undesirable incentives, related to possible actions of the operator to increase SMCs (infrastructure costs, accidents, environmental costs) or make them apparently higher than in reality, would also be a reality. Performance drivers designed to neutralize these undesirable effects are theoretically possible and can in large extent be found on current road PPP's. However, they do require additional monitoring efforts by the public entity. Moreover, a public funding solution would not only remove undesirable incentives of SMCP to the operator, as it would even introduce an indirect incentive to keep SMC low, if the operator's revenues are dependent on demand (like with a shadow toll).

Public acceptability seems to be easier with public funding, because it would likely be incomprehensible for the public to see revenues related to externalities being used by the private infrastructure manager. On the other hand, SMCP revenues owned by the public



party allow the use of earmarking, improving acceptability, as has been largely made evident in previous research projects (e.g. PATS, REVENUE).

Finally, the solution of public funding also seems to have a better potential from the perspective of possible PPP contract renegotiations. The flexibility provided by the public funding solution allows adapting the remuneration model such that the margin for capture of the regulator is minimized, while the SMCP remuneration model inevitably introduces a higher degree of complexity in the negotiation.

Public funding is a type of funding solution already widely used in the road sector in Europe, as exemplified by the PPPs of Baixo Tejo in Portugal and Orkdalsvien in Norway, where in both cases it is the State that directly owns user charge revenues. Its applicability has been proven and it does not show any significant implementation constraints.

On cost coverage, it has been found by the ENACT case studies that road PPPs (including construction) will not be sufficiently financed through toll revenues based on marginal costs unless very significant congestion takes place. There will thus be a revenue shortfall by tolls to finance the projects, and complementary revenues must be generated.

One of the main reasons for the late growth of the use of PPPs in new road infrastructures has been the need of governments to find financing solutions to the construction of the new roads. The issue of financing is now more stressed by the Stability and Growth Pact, which obliged Member States to meet the Maastricht convergence criteria, including restrictions on deficit growth. This has put a pressure on public expenditure control, and PPP's provided an opportunity to remove transport infrastructure costs from the public budget. The introduction of SMCP in road PPPs undermines this political objective. Institutional/political resistance should thus take place towards the reintroduction of public funding approaches for roads, particularly in places where private financing was made a common practise (e.g. France, Italy, Portugal).

Previous pricing practises should also be crucial for public acceptability of the additional pricing set by second-best schemes. A country where most of the highways already apply the user-pays principle should show comparatively lighter acceptance barriers for the application of second-best pricing justified by the need to finance the infrastructure.

On the potential market inefficiencies of second-best pricing and its complexity of implementation, it is noteworthy that disparate PPP market contexts can be found in the road sector, from fundamentally isolated infrastructure to those with various alternatives for the users, intra or inter mode. A second-best pricing solution seems to be less complex to implement in the former type of infrastructure than the later.



### **4.1.2 Railways**

Private involvement in the railway sector has been applied more extensively in the scope of service operation. Service operation has a different framework of analysis than PPP's centred on infrastructure management (4.2.1). The emphasis of the analysis of risks and incentives caused by SMCP on timetabled service operation PPP's is put on the passenger tariff setting scheme used - since it is the factor determining risks and incentives faced by the service operator. The Tagus River Rail Crossing case study addressed the case of railway timetabled service operation PPPs.

The analysis put forward on the factors for an appropriate owner of SMCP revenues suggested that handing the SMCP revenues to the private party would be the better option in timetabled railway service operation PPPs, allowing the status quo of concession type partnerships. However, public funding is also an option to consider and that may be appropriate, depending on the degree of flexibility needed for price changes during the private granting timeframe.

An appropriate tariff setting scheme theoretically can simultaneously fit the SMCP principle for railway passengers and maintain the advantages of a conventional pricing scheme, which provide an incentive for good performance through attraction of endogenous demand - avoiding additional needs for contractual performance drivers. This conclusion departed from the assumption that passengers should be the ultimate bearers of the marginal costs caused by the operation of train, even though marginal costs are relatively independent of the number of passengers (see 4.2.1). Another assumption was that vehicle demand (train circulations) on the infrastructure was centrally determined in the beginning of the contract, and that therefore congestion/scarcity costs of the train service would be set a priori and not subject to changes during the contract timeframe. The alternative price formation rules allowed by the above principle were seen to have different implications on the revenue risk and incentive framework; tariffs can be set in the following terms: according to expected or actual social marginal costs; according to expected or actual number of users. An analysis of the effects of the four resulting price setting rule alternatives over risks, incentives and also price/demand stability resulted in that the alternative of having the price formed on the basis of expected SMC's and expected number of passengers would be dominant over the others. This price setting alternative maintains the risk and incentive framework of a conventional pricing scheme, while guaranteeing dynamic price/demand stability. Although such a tariff setting solution does not continuously follow the evolution of SMCs, it has still been considered an acceptable (or even the appropriate) marginal cost based price setting from the perspective of mobility market efficiency, since SMCs are determined a priori through centralized decision making. The tariff setting scheme suggested would thus allow maintaining the status quo of toll



based funding practises without affecting risks and incentives. Finally, the possibility of maintenance of current funding solutions in the railway sector based on user charging revenue should not carry significant additional non-economic barriers, such as public acceptability.

One reason that may justify the use of public funding is the possible need to allow price flexibility during the timeframe of the contract, to adapt the price to any changing circumstances. There are at least three ways why this need may arise: 1. Changes in the pricing framework of the transport system during the contract carrying the need to adapt (second-best) pricing to implementation of marginal cost based pricing in other pieces of infrastructure (see also 4.4 - Implementation Paths); 2. Demand of train circulations not entirely determined a priori, with the service operator or the infrastructure manager having the possibility of making changes during contract timeframe, and; 3. Existence of changes in technological elements of infrastructure or rolling stock during the contract timeframe that justify the change of prices.

Concerning cost coverage, it was seen that internalization of the marginal costs typically considered (IMPACT, 2008) for the use of infrastructure would not lead to cost coverage of service operation. In fact, the SMC price would stay considerably below currently practised passenger prices. However, the proper reflection of marginal costs on passenger or goods tariffs in the scope of service operation should include the consideration of marginal costs of service operation. Their inclusion in the passenger price could change the cost coverage picture, depending on the types of service operation costs considered as marginal. The issue of marginal costs of service operation in railways is a subject deserving further research in the scope of SMCP.

The possible need to have additional cost coverage in railway service operation PPPs is subject to the same kind of economic and non-economic constraints as the road sector, although the approaches used in the two sectors should be common. The competition between the two modes of transport is real and hence any pricing approach should be concerted for the sake of mobility market efficiency. The same is true between high-speed rail and aviation. This need introduces questions on implementation paths (4.4) and integration (4.5) of marginal cost based solutions.

Finally, a note on infrastructure management PPPs, which have not been covered by ENACT case studies. Their use in railways is still limited in Europe, and applied especially on lines dedicated to specific services or needs (like airport access lines or high speed rail). Yet, it is clear that railway infrastructure management the need for price flexibility is imperative. Contracts for infrastructure provisions last for the long term, where demand, technology and transport network-price development are very difficult to predict. The risks and incentives that thus take place are of similar vein to those in other transport





infrastructures. Moreover, unlike the airport sector (see next section), there is nothing like a financial self-sustainability paradigm in railways. It seems therefore that the most appropriate way of funding the private party is public funding, in order to exclude excessive revenue risks and undesirable incentives from the operator. In fact, public funding is already a common practise in various existing railway infrastructure management PPPs in Europe. Concerning cost recovery, it is noteworthy that the situation of infrastructure management should not suffer a significant relative change by the introduction of SMCP, comparing to the present state where revenues derived from infrastructure use fees are already extensively short of cost recovery.

### **4.1.3 Aviation**

The broadly institutionalized practise in the commercial airport sector throughout Europe pertaining to funding of infrastructure management operations is one of self-financing, with the infrastructure managers relying on aviation charges to finance its operations. A possible change of the status quo would likely lead to strong institutional and political opposition, as well as real costs of change.

In this context, the question on the owner of SMCP revenues should perhaps not be which of the funding options is the better from an economic perspective, but whether possible benefits of a transition to a new financing paradigm would compensate for a massive disturbance of the currently institutionalized practises. On this, the findings of WP5.1 suggest that there are not enough arguments for a major change in aviation charging ownership practises.

The risk of demand can be significantly aggravated by congestion/scarcity costs as compared to a conventional pricing scheme. However, it would be rather similar to that of an airport slot auction procedure, where scarcity costs already play a crucial role. The changes introduced in the demand risk produced by SMCP therefore might vary from airport to airport, depending on its current slot allocation procedures. Generally speaking, additional risks introduced by pure SMCP should in no way be as severe as in the road sector, on the grounds that present pricing practises already take into account the value of scarcity. On the other hand, exogenous risks of future evolution of SMC's have been assessed as moderate, and mostly centred on the development of future congestion mitigation technology. Overall, the risks introduced by SMCP do not seem to be an all-important impedance to maintaining a remuneration model of the infrastructure manager based on aviation charges.



Concerning incentives, an undesirable effect on the demand incentive may be a reality under congestion/scarcity costs (depending on the particular demand-capacity situation), although airport managers seem to have a somewhat lower scope for taking actions to limit capacity (compared to the road sector) given that congestion is in great extent managed by air traffic control. Additionally, several other incentives may be real in airports under SMCP, namely those related to cost efficiency, information asymmetry and user discrimination. However, it seems that there are fully available contractual performance drivers to avoid the undesirable incentives created by SMCP. Such types of performance drivers are indeed even already used in airports, like capacity expansion obligations, cost and congestion information auditing, quality and safety regulation and price-cap and/or benchmark regulation. Earmarking of environmental cost revenues could also transpose incentives from a bad to a good practise towards externalities. Like for risks, it seems that the incentives potentially produced by SMCP revenues are not a sufficiently strong barrier to the simple transfer of current charging practises to SMCP.

Public acceptability towards SMC charging should be no major issue in airports, since, on one hand, charging of similar size already exists, and, on the other hand, SMC charges do not directly fall upon passengers. On the contrary, as mentioned above, institutional acceptability may be a crucial barrier if a public funding solution were to be implemented. The existing airport management systems have a long standing practise of financial self-sustainability. The inversion of this paradigm would, unlike in other transport sectors, probably face difficult political, institutional and economic barriers. Mainly for this reason, and because risk and incentive problems do not seem to pose an unbridgeable obstruction, the user charge based operator funding solution seems to be the appropriate one for most airports and countries.

Mixed SMCP revenue allocation solutions have also been pointed by case studies as a possible good practise, particularly by earmarking environmental costs. Environmental costs represent a relatively small portion of SMCP revenues in airports, and their constrained use in reduction of externalities could promote good practises, remove undesirable incentives and promote acceptability. On the other hand, removing congestion/scarcity costs from the operator's revenues would eliminate negative risk and incentive problems, but that will in many cases demand the attribution of additional funding sources to the operator.

For the same institutional reasons as above, the possible need for complementary PPP cost coverage revenue sources would be simplified by the use of second-best pricing. However, required deviations from pure SMCP should generally not be significant, if necessary at all. The ENACT airport case studies have estimated that SMCP revenues would be enough to cover operation costs and a part of new construction costs.



In case of need of an additional revenue source, on one hand the use of public funding seems to be more easily acceptable from the institutional/political perspective if it is not required for infrastructure operation but solely to new investments, yet on the other hand, the existence of a very high share of foreign users puts a pressure on governments to have new infrastructure fully paid by its users instead of national tax payers money (3.3).

Possible second-best pricing schemes should be coordinated between competitor airports and between airports and high-speed rail lines.

## **4.2 Types of PPP**

### **4.2.1 Type of activity**

PPPs in transport exist for different types of activity, i.e. infrastructure management and service operation. The two possible types of activity under PPP arrangement face different challenges by the introduction of SMCP.

Infrastructure management PPPs are by far the most representative in number and financial weight. In Europe, they exist in roads and airports. The few existing European experience in railway infrastructure management has had an unsuccessful outcome, due to incentive problems (Vickeman, 2004). No PPPs in the maritime sector are reported in Europe or expected for soon (Meersman et al, 2009).

Service operation PPPs occur in the railway sector. Since infrastructure capacity for rail is more limited and features network restrictions, the service operation of railways generally requires to be highly regulated. Whether the attribution of service operation to a private entity can be considered a PPP is a matter of definition, but the relevant fact is that the introduction of SMCP has consequences for the formulation of the granting of the service to the private party.

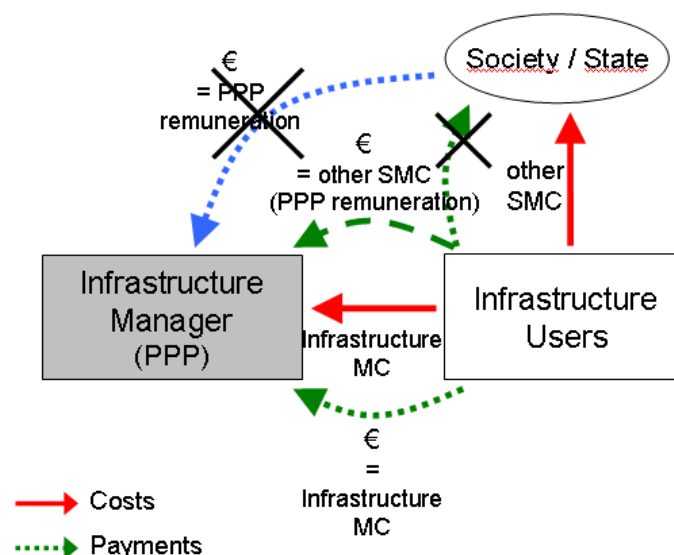
The first issue to clarify is who pays what to who, i.e., which types of costs should be imputed to each of the involved parties (infrastructure manager, final users, society/state and service operator) and who should be compensated for them.

It is efficient and fair that the party causing the external cost compensates the party affected for the burden caused. The application of this principle when using SMCP in infrastructure management PPPs would imply that the users of the infrastructure pay the affected parties for the social marginal costs of their activity in the infrastructure. In this sense it would be appropriate for the infrastructure user to pay the marginal costs (MC) of infrastructure use to the infrastructure manager and the external costs - congestion/scarcity, environmental, accident - to society. However, in the context of PPPs,



and since the infrastructure manager is the entity responsible for collecting infrastructure use fees, it would simplify the process of transference of funds that the infrastructure manager would be entitled to the payments for external costs, for its own remuneration. In this way, the external costs caused by the infrastructure users would be internalized and the State would be partly or totally excluded from funding the infrastructure manager, as expressed in the figure below.

Figure 4-1 - Infrastructure management concessionaire remuneration under a SMCP scheme



Source: Tagus river rail crossing - ENACT Case Study B

A service operation PPP requires a different approach. Should it be the service operator paying for social marginal costs to the infrastructure manager and/or the State, or should those be borne by the final users of the transport service (passengers or goods)?

Social marginal costs are, in all sectors, essentially vehicle dependent, i.e. they vary with features associated to the vehicle, namely its characteristics, distances covered, time of day of operation or the possible presence of other vehicles in the infrastructure. The number of passengers inside the vehicles is fairly irrelevant for the amount of SMCs caused. Social marginal costs do not depend directly on the number of passengers inside the vehicles, except to some extent in the use of stations/airports/ports. For this reasons, the internalization of costs must primarily be targeted on vehicle operation rather than passenger numbers. Such premise implies that, for all transport sectors, it should be vehicles, not passengers, to be priced for the use of the infrastructure.

However, the aim of optimizing social behaviour behind the principle of social marginal cost pricing should hold that the final users (those making the travel decisions) of the transport service pay for the social marginal costs of their decisions. This implies service users to be



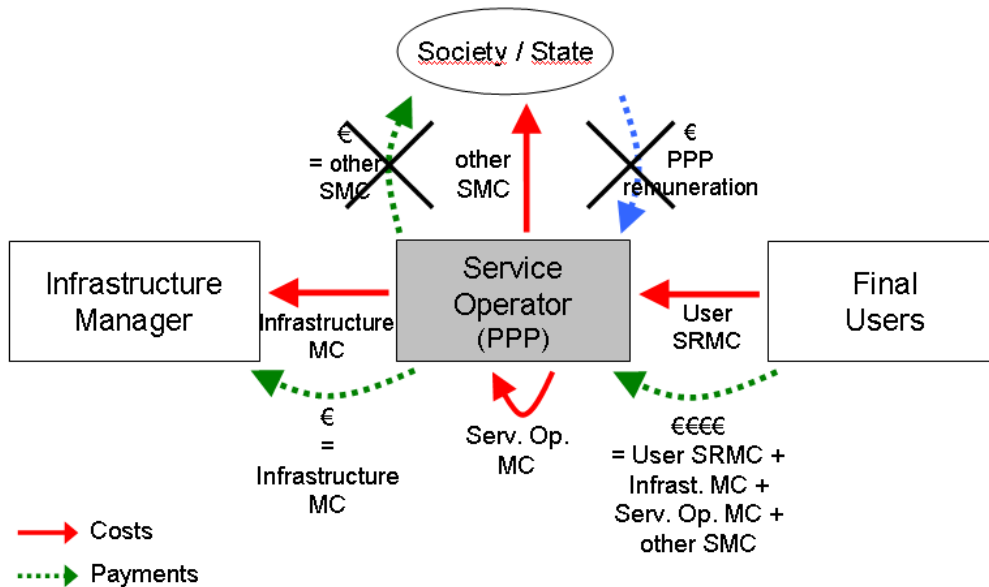
priced in accordance to social marginal costs. Yet, whereas in the scope of private transport this is straightforwardly done due to the non-existence of an intermediary service operator, in timetabled transport the application of pure passenger short-run social marginal costs (SRMC) does not make users face the marginal costs of the vehicle operation because vehicle circulations will occur independently of travellers' instantaneous decisions. The more proper alternative, for dynamic efficiency of provision and utilization of transport services, should be to make the user pay for its correspondent share of the marginal costs caused by the vehicle operation.

According to classical economics theory, in a competitive mobility market user prices would be set by the operator equal to the marginal costs of the service operated. Therefore, if service operators were charged according to SMC, then SMCP would be passed on to users and their behaviour will consequently return an efficient infrastructure use. This would be the case of road as well as airport management PPP's where transport service providers (buses and airlines) are allowed to freely set prices to passengers on the basis of the assumption that markets are competitive. But if the service operator has market power and is able to determine user prices, the intended effects of operator SMC charging will be distorted, a case in which the state would have to intervene to set user prices equal to SMC. In the context of railway service operation, although generally there are alternative mobility options available to railway service users, the specific features of the railway service - comfort, speed, network coverage, non-exposure to congestion and specially its availability to public transport captives - cannot be fully replaced by the available competitors, and in such case the tariffs set should be regulated. Either way, it should be assumed, for the sake of market efficiency, that final users are supposed to face the social marginal costs of the timetabled transport service.

Like in infrastructure management PPP's, in service operation PPP's the above stated principle of economic efficiency and fairness under externalities should hold that each party pay the other for the costs inflicted. In this sense, the service operator should pay the infrastructure manager for infrastructure marginal costs caused by the service, and the State/society for the other social marginal costs. In addition, as suggested above, for the sake of transport user behaviour optimization, the final users of the service should pay the service operator not only for the short-run marginal costs (SRMC) caused by themselves (which probably are negligible in the railway mode) but also for the social marginal costs incurred by the operated service.

Similarly to infrastructure management PPP's, the process of financial flows could be simplified if the service operator would fully keep the tariffs paid by the users (instead of directing social marginal costs to the State) as form of compensation for their activity.

Figure 4-2 - Service operation concessionaire remuneration under a SMCP scheme



Source: Adapted from ENACT Case Study B - Tagus River Rail Crossing

In consequence of the settled model of financial flows there are different potential effects of SMCP on the consistency of the PPP and its social objectives. Their examination for railways and other modes was already provided above (4.1).

#### 4.2.2 Contracted duties and costs

The duties and costs under private responsibility vary per PPPs, as described in 3.1.1. The assurgency of the cost coverage problem will be more likely in PPPs including new investments (Greenfield PPPs), as opposed to PPPs for operation and maintenance (Brownfield PPPs). As we have seen above, there are cases of both types of PPPs in roads and airports.

The long term tendency in Europe should be for the increase of the later type of PPP relatively to the former, as the needs for new infrastructure are progressively fulfilled and the marginal benefits of new infrastructure decrease. Under this context, it seems that the problem of cost coverage will be progressively reduced for the share of infrastructure to be paid for will be progressively lower.

This stage of this tendency obviously varies greatly between countries and regions, depending on their relative economic and infrastructure development. Less developed regions will face higher cost coverage problems, although Community funding for projects in less developed regions will rebalance the issue.



### **4.2.3 Previous existence of PPPs and funding/regulatory practises**

The introduction of SMCP in infrastructures with PPPs in effect will bring the problem of the need to renegotiating the current contracts, provided that their cancellation is not a valid option.

In the case of a possible renegotiation launched by the State with the aim of introducing SMCP, the predictable rational behaviour of the private party is trying to benefit from the renegotiation. The circumstance of the private party having the power to veto the renegotiation by the public party may lead it to strategic behaviour in pursuit of a better contract. If the operator relies on revenues generated by user charging, then the problem of the need for renegotiations may be aggravated by the lower objectivity of SMCP in the definition of revenues based on user pricing; the possible introduction of additional revenue risks of SMCP should provide the private party with a strong argument to claim generous compensations. This particular problem could be potentially neutralized in two possible ways. First, SMC pricing could be established in a non-risky way, i.e. with fixed prices based on expected SMC's. This solution could be feasible in railways and possibly in airports due to greater predictability of future social marginal costs and top importance of infrastructure costs. The second possible way to the margin for capture of the regulator, and perhaps the most practical one (foremost in the road sector), is to simply substitute any previous revenues from user charges by correspondingly equal performance payments proportional to demand. E.g. toll revenues would be substituted by similar shadow-toll revenues.

Since, from a policy perspective, it would be unacceptable in most cases that SMCP is applied in an ad-hoc manner to a single PPP, the challenge of having to renegotiate contracts could multiply in complex transport networks. Because of this difficulty, a possible dissemination of SMCP throughout Europe should require an extensive set of central regulations and guidance - for the sake of political acceptability, operationalization and social welfare protection (see also 4.5).

## **4.3 Contexts**

Although each mode of transport has intrinsic characteristics, there are contextual elements which differ from case to case that are relevant to the way SMCP will affect the objectives of a PPP. Context will thus be relevant to the definition of optimal design in practise. We highlight the following contextual elements:

- § Demand level



- § Social environment
- § Market and competition
- § Public views and institutional background

### **4.3.1 Demand level**

The demand level and its peak dynamics (daily distribution of traffic, seasonality) in the piece of infrastructure under a PPP is crucial in the definition of risks and incentives faced by the operator, if its remuneration is based on user charges. An infrastructure with a high demand/capacity ratio will generate more congestion cost revenues, but also cause more revenue risks and undesirable incentives on the operator. For the later reason, it will be more advisable to have a public funding remuneration solution when demand level is high.

### **4.3.2 Social environment**

The size of social marginal costs, and their risk and incentive effects, depend on the social environment of the infrastructure site. The circulation of vehicles will typically cause higher environmental costs (air pollutants and noise) in an urban environment than in an rural environment, disregard of the mode of transport. As regards congestion costs in roads and rail, the human density of urban environments usually implies the existence of high congestion, as opposed to rural or interurban areas. In general, PPPs for infrastructure in urban areas will tend to generate higher revenues, but also higher risks and more severe undesirable incentives on the behaviour of the operator.

### **4.3.3 Market and competition**

Disparate market and competition contexts exist in pieces of infrastructure in all modes, as was exemplified by the nature of the ENACT case studies. The market context of a site is crucial for the how mobility market efficiency can be affected by deviations from pure SMC pricing.

Sites with stronger competition between modes have a higher potential for mobility market distortions. In consequence, in sites with strong enough competition, it would be unacceptable to implement SMCP in an isolated way in a single infrastructure, because it would undermine the fundamental objectives of SMCP. The same is true for any form of second-best pricing designed to achieve a higher level of revenues. In synthesis, the higher is the competition level in a site, the higher is the need for integrated solutions of SMCP and second-best pricing. High level integrated solutions to guarantee market efficiency will





likely be complex and costly, and their practical feasibility within acceptable efficiency standards is yet to be proven. Therefore, the denser is the market, the more likely to be that a public funding solution for cost coverage is the most satisfactory one.

This issue has implications for policy on SMCP, particularly on the phasing and coordination of implementation of SMCP across modes and regions. The need to apply SMCP in an integrated way thus poses an even bigger challenge in sites with a high density of mobility alternatives (see also 4.4 and 4.5).

#### **4.3.4 Public views and institutional background**

Public views on pricing and use of revenues, and political and institutionalized practises, may vary from region to region, with relevant consequences for PPP revenue flow solutions and pricing arrangements. The most relevant factors, as expressed above (reference, Error! Reference source not found., 4.1), are public acceptability, public budget constraints and financing paradigms.

The previous pricing and revenue flow practises is the core factor affecting the way how the public and the political and institutional sphere will view a change of pricing philosophy in PPPs. Sites in which the user-pays principle is already applied should face less public acceptability problems as compared to places in which infrastructure is still used for free, unless second-best pricing is applied. Contextual variations across regions in previous pricing and revenue flow practises seem to take place mostly in the road sector.

The barrier of budget constraints will surge in countries with high deficits, especially where tolls are already used to fund infrastructures. The issue of financial self-sustainability is expected to be relevant in airports, as described above.

### **4.4 Implementation paths**

Implementation paths relate to the phasing and packaging of pricing reform. The need to conciliate SMCP with PPPs has important implications for the definition of implementation paths. As stated by Goodwin (2001), “an instantaneous implementation setting all transport prices equal to social marginal costs, on the same day, is quite outside the administrative, scientific, legal and economic capacity of Member States and the European Union as a whole. (...) If not everything can be done at once, it is necessary to develop a staged implementation strategy. This means that some changes will be implemented, in one part of the transport sector, while not in other parts. Enormous sensitivity and care will be necessary to ensure that during the transitional period, partial implementation does not make things worse rather than better”.



The MC-ICAM project (Verhoef, 2003) examined optimal implementation paths from a situation with low pricing of transportation to a situation with socially optimal pricing, in which users bear the full marginal social cost of their activities. As reported by Menaz et al (2004), it introduced the idea of an implementation path as a sequence of second best optima, resulting from constraints on the implementation of marginal social cost pricing. MC-ICAM found that starting with simple pricing reforms was likely to be the best first step, before the later application of more sophisticated systems. Nonetheless, it warned that second best policies should be treated with caution, as they carry costs and difficulties of implementation which tend to be worse than the simple application of SMCP; wherever possible, it is better to remove the barriers that are causing the constraints rather than accept them and deal with them through second-best pricing. MC-ICAM identified three main types of barriers to implementation of SMCP:

- § Institutional (organizational structures, government levels, political, legal)
- § Technological
- § Acceptability (public, political, business).

These barriers can cause actual constraints to SMCP implementation, which may take different forms, as distinguished by MC-ICAM:

- a. coverage or scope of the pricing system
- b. composition and level of pricing measures
- c. degree of differentiation of pricing measures
- d. rules and principles governing revenue use
- e. use of supplementary non-price measures

ENACT identified barriers and constraints related to the application of SMCP in transport infrastructures or services under PPP arrangement. The central issue of ENACT, which deals with the conciliation of the goal of allocative efficiency of SMCP with the goal of productive efficiency of PPPs, refers directly to several of the constraints outlined above.

Constraints b and c refer respectively to “constraints on the use of certain marginal cost based pricing measures (optimal price combinations), on their maximum levels and/or the minimum total revenues” and “constraints on the degree of differentiation” of prices. We have seen in ENACT that the application of SMCP in a pure form in transport undertakings under PPP would, firstly, introduce revenue risks and incentives that degrade productive efficiency. To overcome these constraints, ENACT sought to define contractual design solutions that allow as much as possible eliminating burdens over productive efficiency of PPPs, while maintaining the full reach of SMC pricing. These contractual design solutions consisted either of splitting private remuneration from user charging, - alternatively paying the private party through public funds in forms such as availability payments or shadow



tolls - or of introducing additional contractual performance drivers to neutralize negative effects of SMCP on productive efficiency. The ENACT results show that, generally, it will be possible to overcome the barrier of conciliating allocative with productive efficiency (we may call it a “technological” barrier) by using appropriate contractual design solutions which avoid constraints b and c.

Another fundamental barrier to marginal cost based pricing implementation is the possible pre-existence of PPP contracts on targeted infrastructure. The need to carry out contract renegotiations poses a risk of capture of the regulator, a risk that can be even more intense under the need to introduce marginal cost based pricing with its possible additional revenue risks and incentives (4.2.3). This institutional legal barrier causes constraints a, b and c. As has been made clear within ENACT, this barrier can be softened through appropriate contractual design. PPP contracts for transport infrastructure management may amount to 30 or even 50 years, and waiting for their end to introduce SMCP will in many cases not be a consistent option. The most appropriate way to cope with contract renegotiations for introduction of SMCP without giving margin for subjectivity, complexity and, consequently, for risk of capture, seems to be by mirroring previous revenues of the private party through structurally equal public funding payments. This solution seems to be well feasible in the road and railway sectors. Nonetheless, although contract renegotiation risks are theoretically possible to minimize, they will in any case require time and resources which cannot be avoided. In the spirit of the conclusions of MC-ICAM, whereby it seems to be an appropriate approach towards paths of implementation to start implementation of SMCP with simple reforms rather than through a big bang approach, the better approach here should be to start implementing SMCP in sites where PPP arrangements are not yet present or are close to its end. However, as was also concluded in MC-ICAM, there are cases in which barriers should, sooner than later, be overcome, since the implementation of transitional second-best regimes may also have severe difficulties and costs. Therefore, in the transitional period to first-best pricing in cases where the existence of a PPP contract conflicts with the appropriate setting of pricing regime in the wider transport system, there is a balance to be made between risks and costs of renegotiation with those of second-best pricing.

Public acceptability, in the particular scope of PPPs, has been identified as a possible barrier to implementation of SMCP. Apart from the strict acceptability of pricing for the use of infrastructure, the issue concerned here is the use of those revenues (constraint d). As identified by several European studies, people are sensible to the destination their money. The issue is relevant in the scope of PPPs, since the most typical funding scheme of PPPs is to remunerate the private operator through user charges. This solution may not be well accepted by the public with marginal cost based pricing, since the price inputted on them



is justified on the basis of their social costs, not financing of the private operator. Therefore, it seems more appropriate from an acceptability perspective to have user charge revenues resultant from externalities destined to the public authorities (preferably earmarked to solve the associated externality problems), with the private operator being funded through other public sources. The public acceptability barrier should be, mostly, potentially relevant in the road sector, where final users are directly charged and where pricing is presently still absent in most roads. However, as described in 4.1, the public funding solution already clearly seems to be the preferable solution in this sector from the value for money perspective. Therefore, the acceptability barrier should not cause all-important in the scope of road PPPs, as the constraint it causes on rules and principles of revenue use is coincident with the most appropriate contractual design to face the technological barrier referred above. In other modes of transport, charges for use of transport infrastructure are not directly levied on the general public, but are instead paid by intermediaries such as public transport companies, airlines, and shipping companies. Public acceptability issues will be less prominent in railways, aviation and maritime transport. Overall, the joint application of SMCP and PPPs does not seem likely to cause significant acceptability based constraints on implementation, in addition to those motivated by SMCP alone.

Finally, institutional barriers of political and organizational nature may take place when introducing SMCP in PPPs; particularly budget constraints and self financing paradigms have been identified. Both of these barriers reflect impediments to the use of public funding to achieve the necessary funding of the PPPs, and may impose constraints of type b and e. These barriers can be totally or partially overcome in two possible ways: cross-subsidization and second-best pricing. Both solutions involve costs of administrative and coordination nature; therefore, like above, it should be analysed if postponing the overcoming of these political and organizational barriers is advantageous compared to the costs of transitional remedies.

As a summary of the barriers and constraints imposed by the integration of SMCP in PPPs:

- § Constraints imposed by “technological” barriers related to the conciliation of allocative with productive efficiency seem to be avoidable through appropriate contractual design, and should thus not be perceived as projecting constraints on implementation.
- § Legal barriers imposed by PPP contracts presently in force cause strong constraints on SMCP implementation; they may be partly, but not totally, avoidable through appropriate contractual design. It should be judged whether postponing the implementation of SMCP in sites with PPP contracts



in force is, or not, advantageous in relation to the possible costs and difficulties of introducing second-best pricing in transport substitutes.

- § Acceptability barriers do not seem to imply relevant additional constraints, as compared to those caused by SMCP alone.
- § Institutional barriers related to the use of additional public funding pose constraints, which may yet be partly or fully surpassed through cross-subsidization and/or second-best pricing.

Implementation paths, in what does respect to introduction of SMCP in PPPs, seem therefore to be constrained mostly by PPP contracts presently in force and institutional barriers related to the use of additional public funding.

## **4.5 Integration and coordination of solutions**

For various reasons, the introduction of SMCP in general, and in PPPs in particular, calls for integrated and coordinated solutions across different pieces of infrastructure. In the scope of PPPs, three main motives cause this need:

- § Use of second-best pricing
- § Cross-subsidization
- § Previous existence of PPP contracts

For reasons of market allocative efficiency, the possible use of second-best pricing schemes designed to achieve a minimum level of revenues for cost coverage must be carried out in an integrated way across competing transport alternatives. On this, it is relevant to understand which is the correct scale of integration. Two extreme worlds may be conceived, as regards the connections and interdependency in transport markets. An extreme would be a world with atomistic markets where each market was independent of all others, in terms of competition (i.e. there is no competition between elements of one market with elements of the other market). In this world, an integration of solutions would be required only separately for each transport market, and SMCP could be implemented in one market independently of the pricing practises in all other markets. The other extreme would be a seamless transport market world, where no discontinuities between markets existed, i.e. each and every conceivable market perimeter was in some way in competition with another element outside the perimeter. In this world, pure SMCP would only fully work if it were applied in the entire transport world. The real world seems clearly closer to the later situation, both across regions and across modes of transport. Exceptions of isolated markets may be single bridges over a river, or single roads or airports in remote regions. Therefore, in our world, an ideal application of SMCP or second-best pricing solutions would require very large scale integration and coordination. However, due to various types of



barriers and related constraints (some related with PPPs) described in the previous topic, this will not be possible in the short and medium run. In this time spectre, it would be desirable and reasonable to expect local or regional transport authorities regulating prices and planning local/regional pricing schema.

Alternatively or complementarily to second-best pricing, cross-subsidization between infrastructures allows remunerating PPPs with lack of revenues through excess income of other transport infrastructure. In this way, some PPPs could be partly financing by excess revenues from other PPPs, or even from user charge revenues from pieces of infrastructure under public provision. Cross-subsidization may be extended across regions and modes of transport.

Cross-subsidization would also require integrated solutions. Here the scale of implementation is less constrained, at least from an economic rationale perspective. The set of pieces of infrastructure to gather in a cross-subsidization pool must only be large enough to allow a sufficient diversification of cases in deficit and cases in surplus of revenues. The ENACT case studies and papers reported SMCP revenues below present user charge revenues in almost all sites and scenarios. However, most existing roads are still not charged at all, and would under SMC pricing provide additional revenues. Moreover, urban roads have not been covered by the case studies and this type of infrastructure would provide a high amount of extra revenues derived from the existence of high congestion levels (Roy, 2002). Generally, PPPs would be subsidized by revenues in roads under public management, especially urban roads.

Besides economic factors, acceptability and institutional factors are also relevant for the scale of cross-subsidization solutions. The possible need to find revenue allocation schemes consistent with public perceptions on what is fair, as well as the structural framework of public administration institutions, may constrain the required scale of integrated cross-subsidization schemes.

The possible previous existence of PPP contracts will affect the need for integrated solutions for two types of reasons. Firstly, if a PPP or another institutional arrangement where the price for the use of the infrastructure or service is not changeable when SMCP is to be implemented in the system, there will be the need to find a second-best pricing solution for the system. As was mentioned above, this is expected to require additional efforts in relation to a simple SMCP solution.

Secondly, if, instead, the contractual arrangement of existing PPPs is to be changed to incorporate SMCP, this will call for coordination of efforts in terms of renegotiation practises. Renegotiations are a difficult task, with high risks for public interests, and the success of their execution should benefit a lot, just like for the design of new PPPs, from



previous experience and guidelines (see e.g. Forward, 2006; Hensher, Stankey, 2009). For this reason, a hypothetical massive and unprecedented practise of PPP renegotiations in Europe motivated by the introduction of SMCP would benefit from centralized information gathering on previous experience, provision of guidelines and common use of proven approaches.



## **5 PURSUING EU POLICY**

For the sake of operationalisation and good fulfilment of the objectives of SMCP, common strategic options may have to be taken. This section discusses these options at the light of the EU policy (see annex 7.4). For SMCP to be implemented in a planned way (as it should) a number of implementation planning strategies are possible. The following issues will be discussed as determinant for the definition of those strategies:

- Widescale VS Discrete implementation;
- Identification of adequate conditions for possible pilot implementation trials of SMCP;
- Public Acceptability problems and ways to enhance it;
- How should predictable technological evolution affect strategic planning;
- Relation between cost for provision and charge of infrastructure in scenarios of low and high willingness to pay
- The role of the regulators and barriers to its compliance

### **5.1 Policy and Legislation – Status and Future Requirements**

European legislation and policies on the following subjects are relevant when combining Social Marginal Cost Pricing and Public-Private Partnerships and are briefly discussed in the next sections:

- Public procurement;
- Government deficit accounting;
- State aid and Public Service Obligations.

#### **5.1.1 Public-Private Partnerships and Public Procurement**

The EU has consolidated its rules on public procurement into two directives: the Directive 2004/18/EC and the Directive 2004/17/EC.





- § The Directive 2004/18/EC, the so-called "Classic Directive", addresses the coordination of procedures for the award of Public Works, Supply and Service contracts;
- § The Directive 2004/17/EC deals with the coordination of the procurement procedures of entities operating in the Water, Energy, Transport and Postal Services sectors.

Under these directives, public contracts above a certain value are subject to EU public procurement rules and must publish their calls for tenders across the entire EU (through the Official Journal of the European Union). Directive 2004/18/EG stipulates that the criteria used by the contracting authorities when awarding for their public contracts can be either by the lowest price, or the Most Economically Advantageous Tender.<sup>10</sup>

Directive 2004/18/EG only recognises the following public procurement procedures:

- The Open Procedure. In an open procedure, any interested economic operator may submit a tender;
- The Restricted Procedure. The restricted procedure differs from the open procedure in that it includes an initial pre-qualification stage. Only bidders who have pre-qualified based on their economic/financial standing and on their technical and/or professional ability will be invited to bid. Potential bidders can also be disqualified based on their personal situation (e.g. insolvency). The contracting authority then, simultaneously and in writing, invites the selected candidates (a minimum of five) to submit their tenders.
- The Negotiated Procedure. In a negotiated procedure, the contracting authority consults the economic operators of its choice and negotiates the terms of the contract with them. The contracting authority, simultaneously and in writing, invites the selected candidates (a minimum of three) to negotiate. The invitation document comprises all the specifications (deadlines, addresses, languages, relative criteria, etc) that the invitee must consider when submitting a proposal.
- The Competitive Dialogue (a new procedure). The contracting authority publishes a contract notice that includes the award criteria. The contracting authority then, simultaneously and in writing, invites the selected candidates (a minimum of three) to conduct a dialogue. The discussion commences, may take place in stages and continues until the (technical and/or economic and legal) solutions have been defined. At the end of the dialogue, the candidates submit their final tenders. These tenders may be specified (in a post-tender discussion), but without changing the basic features of the

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<sup>10</sup> Award criteria are then topics (which are to be specified beforehand, together with the relative weights between them) which are linked to the subject-matter of the contract, such as price, quality, technical merit, functional characteristics, delivery date and completion date, aesthetics, etc.



contract. The contracting authority awards the contract in accordance with the award criteria set and on the basis of the most economically advantageous tender.

In two documents the European Commission has further clarified how legislation on public procurement relates to Public-Private Partnerships.

The commission published the Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions (COM(2004) 327), to explore how procurement law applies to the different forms of PPP developing in the Member States, in order to assess the need to clarify, complement or improve the current legal framework at the European level.

As part of the analysis of this Green Paper, it is proposed to make a distinction between:

- PPPs of a purely contractual nature, in which the partnership between the public and the private sector is based solely on contractual links, covering a variety of set-ups assigned to the private partner that can include the design, funding, execution, renovation or exploitation of a work or service. This PPP setup falls within the scope of European Directives on public procurement, in particular for the Competitive Dialogue Procedure when certain requirements are met;
- PPPs of an institutional nature. Involves the cooperation within a distinct entity and may lead to the creation of an ad hoc entity held jointly by the public sector and the private sector or the control of a public entity by a private operator.

The Green Paper describes the ways in which the rules and the principles deriving from European legislation on public procurement procedures are applied when a private partner is being selected, in the context of PPPs with a purely contractual nature<sup>11</sup>. It gives special emphasis on the advantages of the Competitive Dialogue Procedure introduced by the Directive 2004/18/EC to tender in such a context. The Paper states that dialogue provides a legal basis for certain forms of PPPs in the case of very complex projects for which a competent authority has a specific need and seeks the economic operator offering the optimum technical solution. The Green Paper also asks a set of questions intended to find out more about how these rules and principles work in practice, so the Commission can determine whether they are sufficiently clear and suitable for the requirements and characteristics of PPPs.

The Communication from the Commission on Public-Private Partnerships and Community Law on Public Procurement and Concessions (COM(2005) 569) reflects the outcome of the public consultation on the questions raised in the Green Paper. The ideas, opinions and

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<sup>11</sup> Due to the scope of the ENACT project, only PPP of a purely contractual nature will be analysed without any prejudice for the PPP of an institutional nature content also analysed in the Green Paper.



suggestions made in the public consultation contributions were presented in the Report on the Public Consultation on the Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions (SEC (2005) 629 issued in May 2005).

The responses from stakeholders participating in the consultation suggest that only a few of the subjects discussed in the Green Paper require follow-up initiatives at EC level. Many of the consultation respondents asked for full protection of intellectual property and for limiting the resources that bidders have to invest in the several-stage procedure. "The Commission is confident that practical experience with this procedure, not yet implemented in most of the Member States, will dissipate these concerns." Although it has agreed, as requested by a number of stakeholders, to provide an explanatory document on Competitive Dialogue accessible on the Commission's website<sup>12</sup>.

### **5.1.2 Public-Private Partnership and Government Deficit Accounting**

To ensure the stability of prices and respect for the market economy, the Maastricht Treaty has defined a set of "Convergence Criteria" that specified the conditions under which a Member-State would qualify for participation in the common currency. One of these criteria is that the ratio of the annual government deficit to Gross Domestic Product (GDP) must not exceed 3% at the end of the preceding fiscal year. If not, it is at least required to reach a level close to 3%. Only exceptional and temporary excesses are allowed in exceptional cases.

The Maastricht Convergence Criteria and other budget constraints have pushed governments to look for alternative resources for developing collectively-used infrastructures. PPPs are a very attractive option from this point of view. When a private operator draws revenues from users directly, no contributions are needed from the government budget. But also when a PPP-contract is performance based and the private operator hence received money from the government, PPPs will allow to spread the cost of new assets over time.

With the recent spread of PPP arrangements to avoid large initial up-front public expenditure, the concerns regarding the National Accounts sector classification of PPPs increased. The key issue here lies on the classification of the assets involved in the PPP contract - either as government assets (thereby influencing government deficit and debt) or

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<sup>12</sup> Document already available: Explanatory Note - Competitive Dialogue - Classic Directive(CC/2005/04\_rev 1 of 5.10.20045)



as the private's assets. The EUROSTAT decision on 11<sup>th</sup> February 2004 covered explicitly and exclusively the method to classify Public-Private Partnerships in ownership terms. Later, the European System of Accounts (ESA 95) Manual on Government Debt and Deficit published in August 2004 took a decision on the accounting treatment in national accounts of contracts undertaken in a PPP framework.

The general principle underlying the PPPs account treatment was the following: the assets involved in a PPP can be considered as non-government assets only if there is strong evidence that the private partner is bearing most of the risk attached to the specific partnership. Following this decision, which specified the impact on government deficit/surplus and debt, EUROSTAT recommended that the assets involved in a Public-Private Partnership should be classified as non-government assets, and therefore recorded off government balance sheet if both of the following conditions are met:

- The private partner bears the construction risk and;
- The private partner bears at least one of either availability or demand risk.

The construction risk here entails events such as late delivery, non-respect of specified standards, additional costs, technical deficiency, and external negative effects of the construction phase.<sup>13</sup> The private partner bears the availability risk if it is penalised for not meeting the required volume and quality standards of the contracted service, i.e. the periodic payments to the private party are reduced as a consequence of the private partner failure. The demand risk refers to the volatility of demand: higher or lower than expected when the contract was signed.

The EUROSTAT rules have the merit of bringing some discipline to public accounting of PPP investments, especially in a context where governments are trying to minimise fiscal deficits and debts in order to meet Stability Growth Pact thresholds. However, given the pressure to show low deficits in the present, these rules may create "perverse" effects as governments may be tempted to design risk sharing in PPPs so as to move them off the public balance sheet, even at the cost of reducing the project's value-for-money. This financial engineering might end up violating the Convergence stability rules, as the Member-State PPPs obligations are only broken down into small instalments in the future.

### **5.1.3 State aid and Public Service Obligations**

Article 87 (1) EC declares state aid to be incompatible with the common market. The four criteria's for existence of state aid are: (i) the transfer of state resources, (ii) which results

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<sup>13</sup> However responsibility of the private partner can be excluded for unexpected exogenous events, beyond normal coverage provided by insurance companies.



in economic advantage favouring certain undertakings, (iii) which lead to distortion of competition and (iv) affect trade between Member States.

A 'transfer of state resources' entails the use of funds belonging to, or being controlled by and imputed to public authorities. Furthermore, whether an economic advantage has been conferred upon the beneficiary by a member state depends on whether the state did not act in the same way as a private investor would have acted.

According to Article 87 (2) EC, state aids that are compatible with the common market are state aids:

- with a social character;
- to individual consumers;
- in case of natural disaster;
- or exceptional occurrences.

State aids can under certain circumstances be compatible with the common market. They have to fulfil the following conditions:

- with respect to developments in certain areas;
- important projects of common European interest;
- developments of certain economics activities or areas (for instance transport);
- other types of aid established by the council.

More specific, pursuant to Article 73 EC, aid in the rail, road and inland waterway transport sector is considered to be compatible with the Community's state aid regime if it is granted for coordination of transport purposes or if it concerns Public Service Obligations.

On the basis of Article 73 EC, a set of secondary legislation has been adopted which further specifies the exceptions laid down in this article. Regulation 1370/2007 applies to regular and non-limited access, national and international public passenger transport services by rail and other track-based modes and by road. Member States may also apply this Regulation to public passenger transport by inland waterways and applying the principle of freedom to provide services to maritime transport within Member States, national sea waters.



### 5.1.4 Public Service Obligation

A Public Service Obligation is an arrangement in which a governing body or other authority offers an auction for subsidies, permits the winning company a monopoly to operate a specified service of public transport for a specified period of time for the given subsidy. This is done in cases where there is not enough revenue for routes to be profitable in a free market, but where there is a socially desirable advantage in this transport being available.

According to Regulation 1370/2007, the competent authority is obliged to conclude a public service contract with the operator to which it grants an exclusive right and/or compensation in exchange for discharging public service obligations. Obligations which aim to establish maximum tariffs for all or certain categories of passengers may be subject to general rules.

To define the framework for the competent authority, the latter grants compensation for the net positive or negative financial impact on costs and revenue occasioned by compliance with the pricing obligations established in the general rules.

The public service contracts and general rules define:

- the Public Service Obligation to be fulfilled by the operator and the areas concerned;
- the parameters based on which compensation must be calculated and the nature and scope of all exclusive rights granted to avoid any overcompensation;
- the means of distributing the costs linked to service supply (staff costs, energy, infrastructure, maintenance, etc.);
- the means of distributing income from the sale of transport tickets between the operator and the competent authority.

The duration of public service contracts is limited and must not exceed ten years for bus and coach services, and fifteen years for passenger transport services by rail or other track-based modes. This period may be extended by up to 50% under certain conditions.

Any competent authority who uses a third party other than an internal operator must award public service contracts by means of transparent and non-discriminatory competitive procedures which may be subject to negotiation.

The obligation to instigate competitive procedures does not apply to:

- low level contracts, the average annual value of which is estimated at less than EUR 1.000.000 or which supply less than 300.000 kilometres of public passenger transport services;



- where emergency measures are taken or contracts are imposed in response to actual or potential service interruptions;
- regional or long distance rail transport.

Apart from the above, Commission Decisions suggest that for an aid to fall within the scope of the regulation, the following conditions are important: the state aid is necessary for achieving the activity in the interest of the Community, is granted on non-discriminatory terms and gives no rise to distortion of competition.

### **5.1.5 Enforcement**

The Directorate-General for Competition is the Directorate-General of the European Commission, responsible for establishing and implementing a coherent competition policy for the European Union. Articles 81 and 82 of the EC treaty and Council Regulation No 1/2003 determine the European competition law which notably sets the Commission's investigative power. Based on this law, the bodies of the EU, such as the DG for competition, take a central place.

The mission of the DG for Competition is to enforce the competition rules of the Community Treaties, in order to ensure that competition in the EU market is not distorted and that markets operate as efficiently as possible. The principal instruments available to DG for competition for accomplishing its mission are:

- The enforcement of competition rules on antitrust, mergers, State infringements and State aid control;
- Sector inquiries and market monitoring launched under Article 17 of Regulation 1/2003;
- Policy development such as the design and review of procedural and substantive competition rules;
- Competition advocacy as opposed to enforcement which refers to actions aimed at influencing regulatory processes both to ensure better and pro-competitive regulations;
- International cooperation by creating tools for bilateral and multilateral co-operation;

Based on article 81 and 82 of the EC treaty, national courts are also empowered to apply Articles 81 and 82 in full. If national courts apply national competition law, they have to apply EC competition law where there is an effect on trade. In order to attain a proper enforcement of Community competition law, Member States should designate and empower authorities to apply Articles 81 and 82 EC as public enforcers. The competition authorities of the Member States shall, when acting under Article 81 or Article 82 of the Treaty, inform the



Commission in writing before or without delay after commencing the first formal investigative measure. This information may also be made available to the competition authorities of the other Member States (article 11 paragraph 3, Regulation 1/2003). The initiation by the Commission of proceedings for the adoption of a decision under Chapter III shall relieve the competition authorities of the Member States of their competence to apply Articles 81 and 82 of the Treaty. If a competition authority of a Member State is already acting on a case, the Commission shall only initiate proceedings after consulting with that national competition authority.

## **5.2 Contribution for an harmonised framework for infrastructure charging based on SMCP principles**

The relation between prices and costs of transport infrastructure is still one of the areas where there is the need introduce some harmonization of concepts and procedures so that effective benchmarking can take place. Many factors have contributed to this situation from the dimension of sunk costs to the historical heritage of having transport infrastructure under public management. In fact, to face future needs the infrastructure cost accounting framework should not only deliver important background information for setting charges but also allow cost and revenues comparison by market segments underlying the decision on which services to focus business activities and what are the levels of public funding required to fulfill public service obligations agreements in the scope of multi-annual contracts with predefined levels of service. Finally, infrastructure cost accounting frameworks should also deliver accurate information for the regulator to ensure equity and fairness in market access for all modes and the regional effects produced by infrastructure development. That is, it seems to be fundamental that infrastructure manager perceive when their markets are mature and whether they can be more competitive and for every infrastructure manager it is vitally important to understand the link between accounting and charging, requiring the adoption of a business logic that secures that cost drivers are well identified and controllable. For the regulator, in turn, the leading principle will be to check that the resulting differentiation of prices is free of any corporate discrimination, namely regarding infrastructure access by public and private companies.

In terms of cost categorization, it is desirable to maintain a clear distinction of infrastructure-related cost categories supported by common definitions, regarding cost items depreciation, upgrading, renewals, maintenance and management/operation. Such a detailed categorization should be combined with the adoption of accounting cost centers





acting as building blocks defined at bottom levels of the physical and organizational infrastructure setting.

This combination of cost categorization and cost accounting represents an essential requirement to understand how much of each cost category may be tied to incremental based charges. This also allows greater flexibility to face more complex approaches to infrastructure cost accounting frameworks that may simultaneously fulfill the management, charging and regulation purposes. In brief, for the SMCP policies to succeed there is the need to have a structured cost accounting scheme which includes capacity costs in terms of life cycle costs of future maintenance, reinvestment and investment activities as well as running costs. This recommendation on cost structure aims to bring more business focus to cost accounting, enabling a better insight on the cost of activities entailed in network provision, covering nodal and linear infrastructure).

In the line of thought of the EU policy (annex 7.4) one of the most important challenges to cost accounting for charging has been the development of proper calculation of the differentiated costs incurred in network provision in support of charging decisions, often interpreted as the SRMC (Short Run Marginal Cost) level. It is then necessary to understand costs incurred in infrastructure managers activity, their nature and corresponding drivers, an area of research clearly associated to two main different approaches, the econometric (top-down costing) and the engineering approach (bottom-up costing). Yet, previous and current research show that it seems to be difficult to define incremental costs in relation to each cost category. It is thus necessary to simplify and homogenize calculation procedures, with incremental cost formulations that may allow a better understanding of cost drivers, encouraging cost efficiency, and improving infrastructure managers's financial performance. Therefore, innovative cost management approaches are required for two major reasons:

- Internally: to cut unnecessary activity costs, improving infrastructure manager cost efficiency through better cost management, reaching market segments of higher value;
- Externally: to identify sound reasons (such as enhanced "economic sustainability", where environment and energy play an important role) for justifying public funding/subsidies for the remainder of costs left uncovered by charges, set in such a way that cost efficiency goals are not counteracted. To accomplish this objective it seems to be indispensable to know how close a service comes to break even, considering the market revenues and the state service contributions on the revenue side;

Given this context under change it has become crucial to link cost accounting to the whole infrastructure management. It is necessary to move from conventional cost accounting



systems to new approaches focused on delivering the sort of detail and in-depth cost knowledge that enables effective benchmarking. This will in turn enable a competitive pressure from which business can benefit. Moreover, adopting ABC costing brings also more accountability and transparency to the discussion of provision of level of service since it enables a more informed discussion on the cost variability as a consequence of changes in level of service.

Improving conventional cost accounting practices, upon better knowledge on usage related costs and their nature, brings to discussion the application of Activity Based Costing (ABC) to the infrastructure managers. ABC represents a cost accounting system based on current costs of activities rather than historic costs, and is therefore advisable in order to reconcile top-down and bottom-up costing approaches. Moreover, ABC may take full advantage of the sophistication effort on bottom-up economic/engineering models, which in all cases are required to feed the ABC cost partition mechanisms.

The application of such cost accounting / allocation concept may help clarifying the somewhat blurred area that lies between shorter term and longer term cost assessment, by allowing an approach to pricing based on forward-looking incremental costs. From a managerial perspective, ABC also provides the ground for Activity-Based Management (ABM). Activity-based management focuses on managing activities to reduce costs and improve customer value and can be divided in (Kaplan and Cooper, 1998):

- Operational ABM, using ABC information to improve efficiency. Those activities which add value to the “IM product” (i.e. slots) can be identified and improved. Activities that do not add value need to be reduced to cut costs without reducing product value;
- Strategic ABM using ABC information to decide which products to develop and which activities to use. In the case of infrastructure managers this means also anticipating market trends, enable planning of new investments and supporting decisions for long term PSO contracts / practices;
- Multi-annual contracts, ensuring that long term deficits are supported by public funding.

Such an approach to cost accounting structuring can contribute to ensure that infrastructure manager expenditures are allocated to marketable services of the infrastructure managers, thus ensuring the cost relatedness of charges. Combined with proper cost allocation partition keys (based on marginal costing approaches to network usage parameters), ABC may deliver a pragmatic approach to justify charges on incremental cost basis. Moreover, it may open for more frequent and effective cost benchmarking, especially regarding allocation of common costs, allowing regular cost cross comparisons



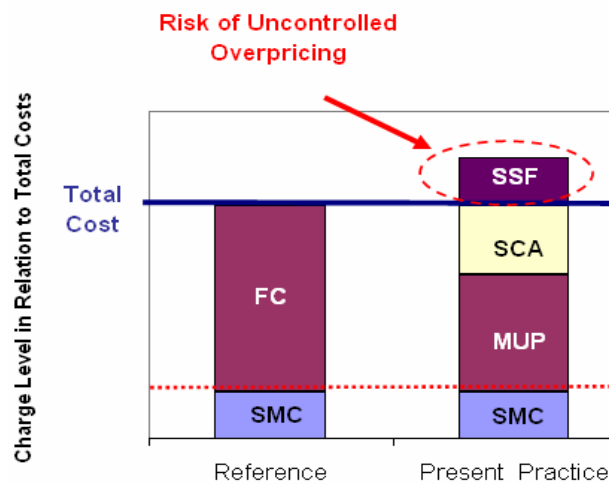
among infrastructure managers, and fulfilling the information requirements for railway regulators to accomplish their mission of surveillance for non-discriminatory

## CHARGING FRAMEWORK

Following the EU policy , already referred, which introduced policy orientations regarding infrastructure pricing, intense discussion and studies have been developed in Europe addressing the application of marginal social cost pricing to transport infrastructure. Notwithstanding the clear subscription the European Commission made of the concept in its transport policy, we have seen through empirical evidence that the application of Short Run Marginal Costs (SRMC) approaches faces obstacles when it comes to practical implementation as it is difficult to establish criteria for marginal cost calculation, regarding how much of each cost category may be deemed variable . The traditional accounting systems, not activity oriented, do not allow a sound assessment of the character of each cost item, neither to have a sufficient decoupling of these. On the other hand, charging according to incremental costs, understood as a proxy to Short Run Marginal Costs (SRMC), implies that the infrastructure manager is unable to raise the necessary funds to develop its activity, requiring state budget contributions to finance network/infrastructure development/improvement along the life cycle of the infrastructure. Moreover, it does not generate a clear link to improved infrastructure manager cost efficiency and cost optimizations strategies. Therefore, it is increasingly important that the charging system adopts a dynamic forward-looking approach to current and future costs, rather than historic costs. Indeed, despite the developments in marginal cost calculations achieved in some research studies, not only incremental costing is often considered to be complex by infrastructure managers but in addition there is a significant dispersion of practices and interpretations of the EC Directives regarding pricing in the different modes. On the other hand, current practices also brings about potential drawbacks, namely risk of uncontrolled overpricing, in particular if an incumbent detains infrastructure facilities also used by competitors, as it is the case with railways. Although it is clear that EU policy recommends that application of cumulative charges cannot exceed total costs, uncontrolled overpricing may in fact arise, ending up distorting overall charging whenever these added charges for special services can represent an obstacle to new entrants: This is especially so in cases where scarcity charges and markups are applied to circumstances where total costs are already covered (e.g. airports). The traditional accounting systems make this situation possible without being perceived by the regulators.



Figure 5 - 1 Charge level in relation to total costs<sup>14</sup> (conceptual)



Consequently, an exclusion of competitors can also take place, even in the case of supposedly fair charging for all infrastructure components, under the following circumstances:

- If the essential facility is not open for use in case of capacity constraints (e.g. the incumbent uses all of the possible slots on this part of the infrastructure and is not willing to share the paths, because of “grandfather rights”);
- In the case of time constraints (e.g. all economic attractive slots within a certain period of time are allocated to restricted parties); and
- Under technical constraints (e.g. the infrastructure can only be used by a certain kind of trains with a certain technical design, without any interoperability to other parts of the network).

<sup>14</sup> The acronyms used in this figure stand for the following meanings: SMC - Social Marginal Costs; FC - Full Cost; MUP - Mark-Ups; SCA - Scarcity Charges; SSF - Special Services Fee.

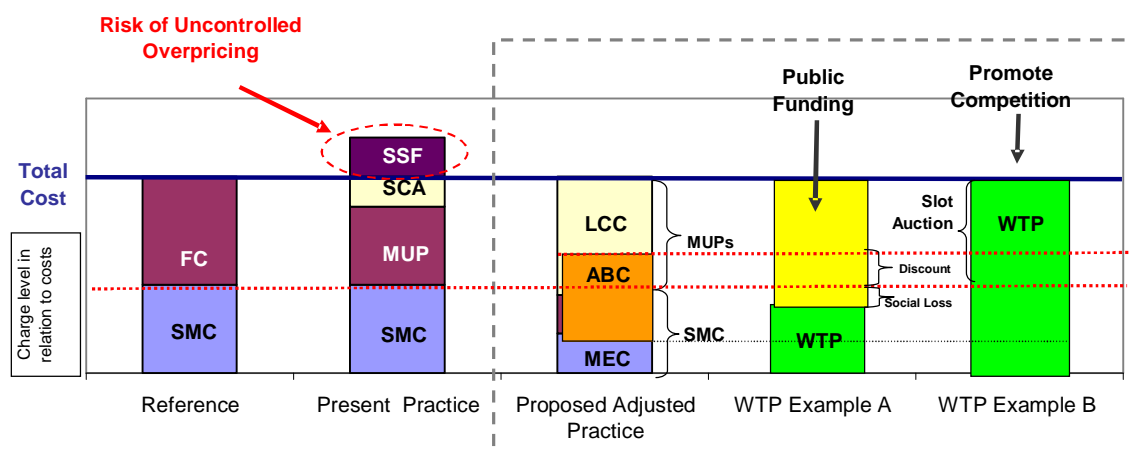


These examples emphasize the need for the regulator to control access not only in terms of primary charges (minimum access package), but also on additional charges, which is only possible if the decoupled costs of the different activities that contribute to the provision of the infrastructure are known and have their cost levels benchmarked for efficiency. This is hardly the case since the most common situation is for the regulators to have a considerable deficit of information.

Another drawback is the fact that the adoption of scarcity charges (SCA) and mark-ups (MUP) share a common association to “Willingness to Pay” (WTP) of infrastructure users (e.g operating companies). Moreover, current charging practices allow adding up WTP related elements to basic SMC (Social Marginal Cost) based charges. This means that WTP will prevail over SMC considerations. So, whenever WTP considerations are brought to charging practices - no matter if through mark-ups or scarcity charges - marginal costs consideration and calculations become useful merely as a general indication for charging. Overall charge in this case is in fact determined by the acceptance by the infrastructure users of a certain market bearable charge, overriding SMC considerations.

This dynamic is illustrated in the next conceptual diagram, depicting the contradictory effects associated to current practices in relation to the cumulative use of different charging elements, which is in fact a practice allowed (or even uncontrolled) given the reduced information provided by the current accounting systems.

Figure 5-2 - Business oriented perspective on infrastructure charges  
(conceptual)



In this context, the adoption of ABC systems in infrastructures may be considered as a pragmatic approach to setup a basis for forward-looking incremental cost based charging system. This proposition keeps the essential spirit behind the existing legal framework supporting EU policy, namely the charging principle being based on incremental costs (EC 2001/14), while it also has the potential to deliver better focus on infrastructure manager business orientation, without compromising fair access conditions.

Infrastructure charging centered on ABC (activity based costing), would comprise the marginal operational costs attributable to infrastructure managers activity level. Therefore, on top of charges based on Marginal External Costs (MEC), added charges should be set also considering marginal operational costs. Such charging approach will depend on the market acceptability, i.e. WTP considerations, defining a minimum setting at an indicative SMC reference level.

This proposition represents an improvement over current charging practices, as it develops around the concept of operational costs optimization complemented by willingness to pay as a driver for the application of mark-ups above SMC level. It also requires addressing the slot charge as a whole, including use of facilities, depending on market conditions.

The approach might be extended to the point of covering for total costs, with longer term related charging remaining within the remits of the LRMC (Long Run Marginal Cost) and LCC (Life cycle cost) concepts. In this circumstance, mark-ups would represent a combination of SRMC/MRMC and LRMC concerns, promoting cost coverage to the cost components, with an impact in the long term sustainability of the infrastructure activity, namely:



- ABC related costs (Short / Medium Run Marginal Costs)
- LCC related costs (Long Run Marginal Costs)

It should be noticed that charging below ABC level and higher than SMC estimated level is still possible depending on infrastructure management decision (e.g. through discounts, at the light of the EU pricing principles). This approach is also compatible with the legal framework to the extent that WTP can be seen as a compounded measure for slot reservation (RES), scarcity (SCA) and mark-ups (MUP), still leaving the chance for the adoption of discounts (DIS) and performance schemes (PER). Regarding the main implementation issues related to regulation, it is important to notice that capturing the market value of the slots offered by the infrastructure manager above the point where charges are at ABC level, requires the adoption of auctioning mechanisms. From the regulatory viewpoint, it can be supported that charges above the total cost would further require setting up slots reservation for new entrants, this way avoiding prevalence of incumbent operators under exceptional market conditions.

Following the approach already adopted for similar circumstances, namely in the road sector, on the side of charging regulation, the “peak” pricing should be capped in relation to “out of peak” by a factor X, that must be defined for each mode, based on specific studies<sup>15</sup> and of course subject to tests and further adjustments. By adopting a price cap principle, the regulator will ensure that there will be an incentive to invest in expansion of capacity, avoiding situations where the infrastructure manager could simply exploit “peak” charges in relation to “off peak” charges under capacity constraints. Therefore, the thresholds that should deserve the attention of the regulator are the “ABC charge” (with evidences required from ABC Information Systems) and “Total Costs” levels. The ability to reach the two main control points represents a significative advantage for the regulator who is often under the risk of being capture due to lack of business knowledge and associated information.

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<sup>15</sup> In the road sector a factor of 2 was settled to cap “peak pricing”. The issue was discussed also with the railways community in the framework of the RAILCALC project (EC) and the factor of 2 was considered as acceptable as departure point.



## 6 CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Synthetic conclusions

The ENACT research develop a substantial amount of new knowledge and insights regarding the use of PPP in transport infrastructure, its advantages as well as its limitations. The research developed a total of six reports which richness of information cannot possibly be reflected in these synthetic conclusions. Our first recommendation is thus for the reader to consult the web page of the project where all information is publicly available. In the following lines we provide a synthesis the main conclusions and practical recommendations resulting from this research project.

The main conclusions of ENACT research are presented along the following main topics.

- Social marginal cost pricing principles: first and second best conditions;
- Social marginal cost pricing and cost recovery;
- Contractual design for a better PPP performance;
- Financial structures and risk evaluation;
- Public accountability

Social marginal cost principles: first and second best conditions

One of the best-known policy prescriptions from economic theory is that, to reach an efficient allocation of resources, prices should be set equal to marginal costs (first best). However this postulate raises some difficulties since cost of transport comprise: cost for the operator or infrastructure manager and external cost incurred to the other members of the society (marginal external cost of congestion, of pollution and of accidents)

To guarantee the SMCP welfare optimisation the validity of first best conditions have to be fulfilled. In fact we have observed, and confirmed the results from previous research, that practical constraints to SMCP implementation (technical, organisational and institutional) lead to second best alternatives, namely:





- ∅ highly differentiated pricing systems in time and space;
- ∅ users perception and transparency and acceptability constraints;
- ∅ imperfect pricing of substitute or complementary goods;
- ∅ existence of transaction costs;
- ∅ public deficit and debt, equity issues (users pay);

Second-best pricing does effectively entail deviations from SMC, regarding:

- ∅ Mark-ups can be added to the marginal costs in order to achieve cost coverage but a good control over costs is required, otherwise overcharging risks can occur;
- ∅ Ramsey pricing a particular form of mark-up which requires that prices are increased and that the increase is inversely proportional to the price elasticity of demand.
- ∅ Multipart Tariffs consist of fixed, block wise variable and variable parts.

#### Social marginal cost pricing and cost recovery

A major problem in the adoption of SMCP within PPPs relates to the cost recovery problem, that is the incompatibility of simultaneously considering the use of SMCP (welfare objective) and the objective (private) of cost recovery. The severity of this situation varies with the scale of operation and the prevalence of first or second best conditions.

- ∅ When transport systems exhibit constant returns to scale and when “first-best” conditions prevail, theory leads us to expect that optimally designed systems will achieve full cost recovery (including capital costs) under SMCP, but ...
- ∅ Under more realistic second-best conditions - where competing modes are priced above or below SMC, where capacity cannot be smoothly adjusted to traffic because of indivisibilities, or where past investment is sub-optimal and cannot readily be optimised - the implications of SMC pricing for cost recovery are not clear

Case studies show that external cost are not included as a variable for cost allocation, except for limited application. The main objective of the implemented pricing schemes among all transport modes is the cost recovery to face the financial constraints. The degree in which the costs are covered by the charge revenues is frequently insufficient. There is a



conflict between the interests of private agents investing in transport infrastructures and the implementation of SMCP that will decrease user charges when infrastructures are improved (lower renewal costs) or extended (less congestion). There is no simple solution ready to be applied in whatever condition, as SMC pricing may in principle give rise to either surplus or deficit in revenues compared to infrastructure costs. There is no guarantee that the SMC pricing will generate sufficient revenues to cover all infrastructure costs, including increasing capacity.

In general there will be a wide gap to be filled with scarce public funds. How far we are from the hypotheses of first best depends upon: how large are the fixed costs to be covered; and the possibility to smoothly adjust capacity because of indivisibilities or sub-optimal past investment.

The limitations observed in previous research and also in ENACT case studies suggest that:

- Ø Second best solutions, taking into account the need of cost recovery, seem to be more appropriate in a context that requires the involvement of private funds;
- Ø There is a need to look at the concepts from a more empirical and pragmatic point of view in order to move beyond SMC pricing;
- Ø There is the need to deal with the social cost components in a transparent and effective way;
- Ø SMC pricing should be used as a basis to devise more suitable pricing principles to attract private investors without disregarding the social component of the transport provision

#### Alternatives for contractual design

During the course of the PPP-contract, some measure of flexibility is required in the level of the SMC price to take account of changing circumstances (e.g. technological developments, efficiency gains, etc.). This issue can be resolved through regular reviews of the price level, and specific procedures to adjust it when needed.

Because of possible returns to scale, SMC pricing may yield insufficient revenues for the private operator to cover all infrastructure costs. With supplemental payments from the government this issue can be remedied.



Incorporating external marginal costs in the price charged by the private operator may produce perverse incentives on the long run:

- Ø Perverse incentives to favour users with high external costs.
- Ø Perverse incentives to keep external costs of congestion, environment and accident high. It is possible however to pass the part of the SMC price that should cover the external marginal costs on to the government. The private operator will then receive only the part to cover marginal cost of infrastructure, and perhaps in addition, supplemental payments by the government to cover a possible shortfall in revenues.
- Ø It will be difficult for a public party to get reliable information on the marginal cost of infrastructure from the private party. When supplemental payments are to be paid to a private operator, it will be difficult to ascertain the correct height for these payments.
- Ø When SMC pricing is implemented as a rigid price regulation, yield management and price discrimination to optimise utilisation of capacity and maximise revenues will not be possible.
- Ø The government's perception of SMC may differ from that of a private party, because of a different sensitivity for and appreciation of risks, which will be reflected in a different valuation. This will mean that the SMC will be different when perceived from the private party than when perceived from the government. Firms will require to charge above SMC and thus obtain above normal profits in order to take the risks involved in innovation. Hence SMC pricing will inhibit firms to innovate.

Decoupling is a possible solution: separating reward for provision and income from charges:

- Ø The application of PPPs in the transport sector will probably not be much affected when SMC pricing or second best alternatives are introduced;
- Ø Separating reward from provision and income from charges will likely be possible in all cases. Usage can normally be registered, hence the government could always pay usage payments as a reward for the provision of services. In some cases (mainly road and rail) it will be possible to pay availability payments (which is preferable to usage payments because of a better allocation of risks and more sophisticated incentive structure).



- Ø Public-Private Partnerships based on performance based payments (usage or availability payments) will also be able to meet the EUROSTAT criteria on recording an investment done by way of a PPP off Government Balance sheet, so it will not count in the computation of the Annual Government Deficit (this is an important consideration for some governments in Europe to engage in PPPs).
- Ø The only circumstances in which direct payment by users (instead of performance based payments by the government) is preferable, is when users are better able than the government to observe performance, and furthermore have alternatives to their disposal. This may be true for especially ports and airports.

The picture that emerges from field observation is that SMCP is highly desired by policy makers while legislation for PPPs is to a large extent lacking in the EU. There might be fiscal incentives for the state (as a budget restraint entity of its own, not as representing society) in the accounting rules for PPPs to prefer PPPs over standard contracting out. The financial structure's impacts on incentives of various actors are emphasized. In short, "good" financial structuring provides efficiency incentives that might be hard to achieve with contracts by "contracting out" but "bad" structuring causes the adverse.

#### Risk evaluation

Risk evaluation is a particularly important issues and it should cover a wide spectrum, from planning and traffic risks to ownership and political accountability. Risks are assessed differently in different cultural and institutional frameworks. But risks that cannot be eliminated should be evaluated. The benchmark model for pricing risk, the Capital Asset Pricing Model (CAPM) is presented in some detail in ENACT (D4) as well as criticized and compared to the alternative Arbitrage Pricing Theory (APT). An application of the CAPM idea to a transport infrastructure project represents one of the main results of the project.

Optimal risk sharing among parties means that the social value of the project is maximised taking into account asymmetric information among parties (moral hazard and adverse selection) and the wish and ability to bear risks. Thus, the main motivations to invest in a PPP transport infrastructure asset can be summarized as follows:

- Ø Attractive risk/return profile compared to property, bonds and equity in the current market;



- Ø Inflation-linked nature of many assets that provide a profile of returns attractive to institutions such as pension funds with long-term liabilities to match;
- Ø Further value-added opportunities by using expert knowledge of project structures to optimise the value of individual PPP projects;
- Ø Further value-added opportunities through portfolio effects (including efficiencies across insurance, PPP management and life-cycle management);
- Ø High recovery value of infrastructure assets after the PPP contract termination;
- Ø PPP investments can tie up substantial capital expenditure and stabilized revenues streams over long concession lives of often 30 years to 35 years.

Case studies provided valuable insight on the issues at stake. Some managed specific conclusions on SMCP and PPP design within their own context, while others more thoroughly detailed possible benefits and disadvantages of different solutions. The financial impact SMCP application on PPP depends on what level of sunk costs are considered in the PPP contract.

There are too many ways of calculating SMCP and this may make it unreliable for private partners and of difficult political understanding and acceptability. SMCP will lead to greater uncertainty and therefore may lead to higher risk premium and/or tension for renegotiation and inevitably increase contractual and transaction costs.

SMCP principles should not be abandoned but performance enhancement mechanisms should be used to ensure agents behave towards efficiency. Finally, a word of advice, SMCP is a policy option not a case by case decision, so it should be seen as a long term perspective.

## **6.2 Pragmatic recommendations**

The ENACT project provides significant new knowledge that may be important to politicians and other decision makers dealing with transport infrastructure. These are:



- PPPs may - with an enhanced contract design - contribute very much to the efficiency of the whole package of building, maintenance and operating of infrastructure projects.
- PPP contracts should be formulated to stimulate risk taking according to ability and willingness to manage risks, taking into account asymmetric information.
- Transferring too much risk to concessioners would lead the charging of too high risk premiums.
- By good contracting the role of banks and financing institutions may enhance the efficiency of PPPs.
- The wish to combine payment to infrastructure providers with Social Marginal Cost Payment (SMCP) from infrastructure users is understandable and desirable, but in general not feasible. Logically, these two purposes do not fit very well. But they may be combined in some ways.
  - If (in the rare case) intake from infrastructure users cover costs and there is no perverse incentives SMCP from users may be applied;
  - If (in the most common case) no cost coverage: The price of public funds is high and no perverse incentives:
  - A combination of SMCP from and an additional subsidy between a lower and a higher border to secure cost coverage and avoid too high payment to the provider: The price of public funds is low and/or danger of perverse incentives;
  - A two part model with SMCP from users to government and performance based payment from government to provider may give good incentives to all actors.

### **6.3 Requirements for SMCP implementation in PPPs**

As argued in especially Chapter 3, PPPs in road, railway, and inland waterway transport can be fully compatible with SMC pricing when they are performance based, rather than based on direct user charges. The same happens with maritime and air transport, although with much lower level of effectiveness. When SMC pricing would be introduced, it would therefore be recommended that current PPP-contracts based on direct user charges are



renegotiated to performance based contracts, and that all new PPPs are performance based.

As demonstrated in the next chapter to undertake performance based PPP arrangements reform of the accountancy system is required in order to create institutional capacity to monitor the infrastructure business and ensure market bias will not occur.

As is clear from the previous chapters and annexes, European policy and legislation with regard to Public-Private Partnerships facilitates contracts with adequate incentives that generate value-for-money. Even though the EUROSTAT-guidelines are sometimes misused by governments to design risk sharing in PPP-contracts for the sole reason of moving them off the public balance sheet, they also make performance based PPPs more attractive for governments (relative to PPPs that are based on charging users directly). The EUROSTAT guidelines make it easier for governments to fit performance based PPPs into their annual budgets while still meeting the Maastricht Convergence Criteria.

Hence there is in principle nothing in European policy and legislation that inhibits performance based PPP-contracts in road, railway and inland waterway transport. However there may be some room for additional measures and initiatives on European Union level, that could assist member states in this respect when SMC pricing would be introduced. When current PPP-contracts based on direct user charges (mostly PPPs for toll roads) would have to be converted to performance based PPPs, a likely consequence will be that government expenditures in some countries in which such PPPs are common (especially Italy, France, Spain, Portugal) will grow, as they now would have to pay performance based payments to private operators. The revenues these governments receive from SMC pricing may not quite be sufficient to offset these extra payments. For these countries special provisions could be made to smoothen the transition, e.g. an exemption on counting these additional expenditures as part of the government deficit, in return for the obligation to use receipts from SMC pricing (nationwide, not only on the particular pieces of infrastructure) to pay for the converted contracts.

For PPPs in ports and airports, it was recommended that the main objectives behind SMC pricing (a level playing within and between modes of transport, and internalisation of external costs) should rather be achieved through a harmonised competition policy and additional regulation. What would be needed to implement this recommendation is a harmonised framework for charging, state aid, and a delineation of port and airport infrastructure (e.g. breakwaters, dredging, buoys, etc. in relation to ports; and e.g. shopping areas, luggage handling facilities, etc. in connection to airports). For airports much of the basic regulation has been put in place. Though the Directive on Airport Charges (2009/12/EC) would have to be adjusted to take better account of the internalisation of external costs, and would have to be applied to all airports. For ports regulation would be



required which moves far beyond initiatives to make port dues and state aid transport (Communication on a European Ports Policy (COM(2007)616). Here new regulation would need to be developed and implemented.

For public transport services it was recommended that SMC-pricing is integrated in the PPP contract, while supplementing revenues with subsidies in case cost recovery is not achieved (and providing additional incentives to take account of possible perverse effects of internalising external costs). European legislation already makes this possible through Public Service Obligations. Hence no legislative action is needed.

For all modes, infrastructures and services, an accounting framework based on a systematic ABC rationale would allow identifying with greater rigor functional costs that enable charging equal or above marginal external costs and below total costs, clarifying the drivers for each cost category and thus bringing more transparency and accountability to the efforts of improved efficiency.

This activity oriented rationale constitutes an approach to pricing based on forward-looking incremental cost supported by current costs rather than historic costs. Hence, ABC principles applied to transport infrastructure business may provide multiple contributions to its development, namely:

- By providing the level of transparency needed for effective regulatory monitoring (REGULATORY Perspective)
- By enhancing cost accounting accuracy and enabling cost management (MANAGEMENT Perspective)
- By providing effective link between cost of activities and charging in order to send sound economic signals to infrastructure (MARKET Perspective)
- By fostering cost efficiency and reliable market reactions for decisions on investment (INVESTMENT perspective)

Last but not least, the current EU policies and associated legal frameworks offer no barriers to the implementation of this proposed practice of bridging cost accounting and charging for transport infrastructure services, leaving the regulator the freedom to decide whether or not competition should be intensified, according to willingness to pay and market maturity (Figure 5-2, example A versus example B) .





## 7 ANNEXES

### 7.1 APPLYING SMC PRICING IN PPPs FOR THE MARITIME SECTOR

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#### 1. Introduction

Economic research into the seaport sector invariably starts from the port as a physical entity. The role of seaports is described primarily in terms of facilitating the loading and unloading of ships, storage, freight handling (including stripping and stuffing of containers, chemical processing, etc.), and transportation to the hinterland. Clearly, then, port activity is a heterogeneous product, involving various actors. Moreover, port activity is increasingly required to fit perfectly into the logistics chains of which seaports are an integral part.

The objective of each actor as an economic entity is clear to see: to maximise one's own profit by taking adequate account of the principal decision parameters, i.e. price, transport performances (in terms of tonnage and distance), and generalised cost. A shipping company, for example, shall aim for markets where price levels are high enough. And in those markets, that company shall try to maximise its transport performance (measured as tonnage multiplied by distance). At the same time, the shipping company shall strive towards the lowest possible generalised cost. A similar business strategy shall be pursued by all other important actors.

This paper investigates whether Short-run Marginal Cost (SMC) pricing is feasible to implement in seaports and with what type of consequences, e.g. concerning cost coverage. Answering these questions requires an analysis of the cost structure of seaports and especially of seaport calls, as well as of how the division of these costs over the different actors runs. As from the moment that this information becomes available, it can be analysed to what extent SMC pricing can be applied in Public-Private Partnerships (PPP) within the seaport sector. Till now, mainly seaport infrastructure is involved, including the seaport entry from the open sea.



The outline of this paper is as follows. First, the structure of current port pricing schemes is analysed. What differentiation currently exists? What differentiation might be required for SMC pricing? What level of differentiation is possible? What type of information is required to define and/or identify optimal charges? Next follows the calculation of the SMC of a port call. For doing that, attention is paid to the question of short-run versus long-run marginal cost, the calculation principles, the construction and the use of a simulation model. In a subsequent section, PPP agreements in a seaport context are dealt with.

## 2. The structure of current port pricing

Pricing by ports and operators within ports is historically determined, is often quite complex and, as such, is sometimes perceived as archaic. Debates on overt or covert subsidies, captive markets and the need to constantly dredge and deepen maritime access routes undoubtedly raise questions concerning potential distortion of competition and/or abuse of monopolistic power.

Is it possible to get some typology concerning port pricing? Therefore we should look at pricing of port calls in Europe, especially the current practices, port pricing principles, developments in level of differentiation, and the information required to calculate optimal charges. The emphasis is on the pricing of the arrival/departure of an extra vessel in the port that can be influenced by the port or public authorities, thus focussing on those costs (and, in theory, the incurred prices) caused by that extra vessel. The extra costs caused by the arrival/departure of goods are not taken into account (e.g. terminal handling costs and the applied pricing strategies of port authorities with respect to granted terminal concessions or lease agreements).

### 2.1 What differentiation currently exists?

The port product may be regarded as a chain of interlinking functions, while the port as a whole is in turn a link in the overall logistic chain (Suykens and Van de Voorde, 1998; Meersman, Van de Voorde and Vanelslander, 2009). One of the tasks of the port management authorities consists in providing port and ship efficiency. Pricing can be a tool to improve this efficiency. Generally, port pricing currently differentiates according to the following main criteria (Adler et al., 2003):

- vessel types and destination;
- location of operations in the port territory;
- total time of service use (processing time); and



- season.

This differentiation does not reflect the actual costs incurred by the port operations and does not recover costs, thus creating severe inefficiencies such as congestion as well significant financial loss.

Traditional port pricing is characterised by (Strandenæs, 2004):

- non-transparency (tonnage charges, cargo charges, specific charges,...);
- favouring regional and coastal shipping;
- favouring exports; and
- differentiated cargo charges.

The main criticism of traditional infrastructure charging and cost-based pricing of port services is that they do not induce ship efficiency.

Within ports, the relative importance of the separate links has clearly changed in the course of time, in part because of efficiency-enhancing technological developments (e.g. rising containerisation rate, larger vessels, speedier handling, etc.). This has had, and indeed still has, consequences for the cost structure; for example, in the extent to which economies of scale and costs have been passed on to the various market parties.

Demand for port calls, port transshipment and supplementary services is derived from demand for the goods involved and is thus a function of economic growth, industrial production and international trade (Meersman, 2009). The prototypical port does not exist. Indeed, no two ports are entirely similar. Ports vary in terms of market players involved (government, port management, shippers, forwarders, agents, shipping companies, trade unions, etc.), each of which has specific objectives. Consequently, the 'port product' is complex and opaque to many. Competition has increased strongly, not just between ports, but also between companies that may or may not be located in the same port (Huybrechts et.al, 2002). Mutual accusations of unfair competition are rife, often resulting in interventions by the regulatory authorities. However, efficient intervention requires insight, particularly into port pricing.

In most European ports, pricing of an additional vessel is based on the sum of several pricing elements, each containing several constituent factors. Some components are shown in Table 1. It is important to point out that discounts (e.g. for frequent users or for passenger ships) and surcharges (e.g. night and weekend shifts) apply on most tariffs. The



prices in Table 2 are apparently optional in some ports. This means the services are provided to the vessel operator but they are not mandatory. Tables 1 and 2 are based on current pricing practice in some European ports and should be seen as a summary of individual case studies.

Relatively little empirical research has been conducted on actual pricing strategies by and within ports. One of the few exceptions is the ATENCO project, the main findings of which were presented in Haralambides et al. (2001). The study certainly indicates that there are substantial differences between the respective funding and pricing practices applied in ports across Europe. This diversity is deeply rooted in different legal and cultural traditions and reflects differences in port management style and the related issues of competencies and degree of autonomy.

A first set of results was obtained on the basis of an analysis of survey questionnaires aimed at gathering information on both present pricing principles and strategies, and the likely impact of introducing new pricing systems. The general conclusion speaks volumes (Haralambides et al., 2001, p. 950): “The case studies of ports practising full cost recovery demonstrates the presence of a wide variety of pricing principles used in practice. The pricing strategies of these ports exhibit substantial managerial discretion that cannot be captured fully by textbook definitions of pricing. A best practice formula for pricing in the real world clearly does not exist, not even in ports pursuing full cost recovery as a primary objective”.

Trying to formulate a conclusion in relation to the practice of pricing is likely to increase the confusion that already exists. Moreover, it is clearly difficult to outline a typology into which all ports will fit. It appears that the ports that ‘preach’ full cost recovery do not pass on historical costs, which may be considered as a form of covert subsidising. Thus, research on port pricing behaviour is by no means methodologically sound.

Table 7-1 - Overview of pricing elements applied in selected European ports<sup>16</sup>

HARBOUR DUES / TONNAGE DUES	• type of vessel;
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<sup>16</sup> Antwerp, Amsterdam, Eemshavn, Ghent, Hamburg, Marseille, Rotterdam, and Wilhelmshaven.



	<ul style="list-style-type: none"> <li>• gross ton<sup>17</sup> (with maxima);</li> <li>• liner or non-liner shipping;</li> <li>• origin and destination of the vessel;</li> <li>• place of berth in port;</li> <li>• vessel entering or leaving the port;</li> <li>• cubic metre indicator;</li> <li>• weight of goods or number of containers loaded/discharged;</li> <li>• valid for a period.</li> </ul>
BERTH DUES / QUAY DUES	<ul style="list-style-type: none"> <li>• type and length of vessel;</li> <li>• type and weight/unit of loaded/discharged goods;</li> <li>• route of the vessel;</li> <li>• berthing time;</li> <li>• gross ton;</li> <li>• use of quay or buoy;</li> <li>• cubic metre indicator;</li> <li>• public or private quay;</li> <li>• valid for a period.</li> </ul>
TOWAGE	<ul style="list-style-type: none"> <li>• location, distance and duration of towage;</li> <li>• length of vessel;</li> <li>• gross ton (with maxima);</li> <li>• type and number of tugs used.</li> </ul>
PILOTAGE	<ul style="list-style-type: none"> <li>• point of arrival of pilot;</li> <li>• draught and length of vessel;</li> <li>• gross ton;</li> <li>• distance of pilotage.</li> </ul>
MOORING AND UNMOORING	<ul style="list-style-type: none"> <li>• length and location of vessel.</li> </ul>
TRAFFIC CONTROL FEES	<ul style="list-style-type: none"> <li>• length of vessel.</li> </ul>
REPORTING OF VESSEL	<ul style="list-style-type: none"> <li>• gross tonnage or deadweight of the vessel;</li> <li>• location of vessel.</li> </ul>
MARITIME POLICE	<ul style="list-style-type: none"> <li>• gross ton.</li> </ul>
PORT / TERMINAL SECURITY	<ul style="list-style-type: none"> <li>• per container or per weight of goods.</li> </ul>
WASTE DISPOSAL DUES	<ul style="list-style-type: none"> <li>• main engine capacity;</li> <li>• cubic metre indicator.</li> </ul>
PASSENGER FEES	<ul style="list-style-type: none"> <li>• number of passengers.</li> </ul>

Source: own composition on the basis of European port information

<sup>17</sup> "Gross ton: quantity without dimension, used as unit of ship's capacity, as shown in the international certificate of measurement issued in the country of registration in accordance with the stipulations of the International Treaty on Ship's measurement, drawn up in London on June 23, 1969.



Table 7-2 - Some optional pricing elements in the ports

LOCKING THROUGH OF VESSELS <sup>18</sup>	<ul style="list-style-type: none"><li>• gross ton. (GT)</li></ul>
CLEANING OF WATER SURFACE	<ul style="list-style-type: none"><li>• length of shift;</li><li>• time of cleaning.</li></ul>
SUPPLYING DRINKING WATER	<ul style="list-style-type: none"><li>• connection charges;</li><li>• water charge.</li></ul>
WHEELMEN SERVICES <sup>19</sup>	<ul style="list-style-type: none"><li>• length of vessel.</li></ul>

Source: own composition on the basis of European port information

## 2.2 What differentiation might be required for marginal cost pricing?

Several pricing variables were included in Tables 1 and 2. The prices can currently be levied by port authorities, regional authorities and/or private companies - sometimes on separate invoices. Some benefit might be gained by bringing all the dues into one price-mechanism (= one formula) when a vessel is entering/leaving a port; not only would this be simpler for users, but it would force port authorities to create a greater transparency and lead to greater comparability with competing ports.

From a theoretical perspective, the pricing principle seems simple enough; all tariffs applied by and within the port should be based on the short-run marginal cost. This principle should be adhered to, even in situations where the authorities have made serious mistakes in their investment policy, or where the port is confronted with sudden and unexpected changes in demand. On the other hand, it is sometimes asserted that “from a theoretical perspective, and assuming that a number of conditions are fulfilled, long-run marginal costs represent the most appropriate basis for efficient pricing” (Haralambides et al., 2001, p. 939). The authors go on to say that “irrespective of the cost basis chosen, the principle that prices should accurately reflect (not to say recover) social opportunity costs is crucial” (Haralambides et al., 2001, p. 939; see also Haralambides and Veenstra, 2003).

Whether one should base the port pricing discussion on short run or long run marginal cost, is still under debate. Up to now at the conceptual level short run marginal cost proponents have the upper hand. The argument in favour of the short-term marginal cost is that the whole point of pricing is to confront the user with the additional costs he/she causes. Only the short-term marginal cost indicates precisely the difference in costs between acceptance and refusal

<sup>18</sup> Rules of priority (at sealocks) for an entering/leaving vessel.

<sup>19</sup> Assistance to captains.



of an additional user (Blauwens et al., 2008, p. 427). However, for sound pragmatic reasons, it may be more desirable to charge the long-term marginal cost.

Strandenæs (2004) explains how pricing can be used to allocate port slots more efficiently. In the current port pricing schemes, differences in waiting times are not always taken into consideration. This means that willingness to pay is not included. Alternative pricing schemes are: congestion pricing, priority pricing and port slot auctions. It should be added that the alternatives mentioned may be able to improve port efficiency if they can increase effective capacity.

### 2.3 What level of differentiation may be made possible by developments?

Existing pricing schemes in ports contain already a high level of differentiation (type of vessel, length of vessel, depth of vessel, gross tonnage, weight of goods,...). The question is whether these pricing schemes, which are based on historical costs and trends, adequately reflect the underlying cost structure of an additional vessel entering a port.

Adler et al. (2003, p. 11-12) indicate some key-barriers to implement efficient cost-based pricing in ports:

- lack of transparency (appearing to be the biggest barrier);
- lack of harmonisation of pricing principles;
- the power of monolithic companies to prevent change;
- ports have little interest in collecting additional data that will be required to accurately charge new tariffs;
- delay data is currently very difficult to compute and scarcity (data) is not considered at all.

Dealing with port pricing, the best approach is to start from the heterogeneous nature of ports, taking into account the different market players, with different - possibly conflicting - interests. Table 3 provides an overview of potential objectives of the various players.

Table 7-3 - Port players and their possible objectives

Port Player	Possible Objectives
Government	Efficient management of assets
Economists	Minimising the welfare losses
Port authorities	Maximising throughput Maximising value added



	Maximising employment
Users	Transparency of charges Prices should reflect the costs of the services
Society	Quality of life

Source: Based on Suykens and Van de Voorde, 1998 and Pettersen-Strandenes and Marlow, 2000

Merely on the basis of the potential conflict situations that may arise from these different objectives, we may conclude that “there is no single solution to the problem which is port pricing” (Pettersen-Strandenes and Marlow, 2000, p. 8).

The various possible objectives of the players already indicates the large number of potential incentives to intervene through ports. Some of the observed effects are:

- market imperfections (e.g. asymmetry information, asymmetry in contestability, scale effects in upstream port oriented industries);
- regional economic considerations;
- national economic efficiency (e.g. reducing oversupply of port facilities);
- environmental issues (e.g. obstruction from environmentalist groups against construction of new terminals).

#### 2.4 Information required to define/identify optimal charges

Port pricing remains a complex matter and it is often argued that port accounting systems provide no foundation for any other pricing method than one based on average costs. However, it can no longer be assumed that, even in the absence of ‘measurable’ marginal costs, approaches based on average costs provide the best approximation to marginal costs.

Port pricing is widely perceived as limited to the dues paid to the port authority or port management for the use of its services. This, however, covers only part of the port picture. Marginal costs encompass a lot more than the costs incurred by the port authority. Moreover, port dues levied by the authority rarely reflect underlying costs, but constitute some arbitrary approximation based on comparison with other ports or on past experience. The fact that they are often not split up according to the services actually used seems to confirm this argument.





An understanding of short term and long term marginal cost components is required. As in other transport modes, one can distinguish between four elements of marginal costs in port operations conceived as a part of the maritime mode: (i) costs for provision of infrastructure, (ii) transport user costs<sup>20</sup>, (iii) costs for supplying port services, and (iv) external costs. In table 4, some examples of relevant costs are included. Whether they are marginal or not when a vessel is entering/leaving will be discussed in the next paragraph.

Although there is not yet a consensus on how to determine an optimal charge for a port call, some general principles can be outlined. In order to define/identify optimal charges, the following steps can be distinguished:

1. which parties are involved in a port call?
2. what are the competences of the parties involved?
3. which part of the logistic chain should be used<sup>21</sup>?
4. taking (1-3) into consideration, which are the relevant costs to be considered?

In other words, it concerns the cost of servicing an additional vessel of a particular type requiring a particular service at a particular time.

The price of a port call should be based on the marginal cost but the discussion remains whether it is better to opt for short term or long term marginal costs for each of the parties and whether to use a-priori or ex-post marginal cost pricing<sup>22</sup>. Another point of discussion is the definition of the marginal unit. Our suggestion is to base the pricing system on one additional vessel calling a port (rather than an extra ton or TEU). This vessel can be described in several ways - gross tonnage, capacity indicator, type of ship, or some combination of these.

Table 7-4 - Some relevant port call costs

Infrastructure costs	Locks, breakwater, navigation lights, buoys, banks, radar system, dredging, ice breaking,
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<sup>20</sup> Users in the transportation sector are individual companies desiring to transport commodities.

<sup>21</sup> In other words: where does the principle of marginal cost pricing start? If this principle starts at the beginning of a river leading to a port, the owner of this river should also be involved. For example with reference to the port of Antwerp, dredging the River Scheldt is a combined responsibility of the Flemish Community and the Dutch government.

<sup>22</sup>For example, in the context of dredging, a-priori marginal cost pricing would cover the situation where dredging is done to allow larger vessels to enter the port (i.e. vessels which could not have been there without the dredging), whereas ex-post marginal cost pricing might suffice if an extra vessel entering a port does not cause extra dredging costs.



	quays,...
Transport user costs	Time costs and reliability costs
Costs for supplying port services	<ul style="list-style-type: none"> <li>• Vessel related costs (tugboat, pilot boat, the vessel transporting commodities): e.g. fuel, stores, lubricants, spare parts, time costs and reliability costs for the shipowner,...</li> <li>• Service related costs: vessel manning costs, shipping agency, ship repair and cleaning, supply of fresh water, supply of energy, supply of mariner's care, waste reception, bunkering, port authority,...</li> </ul>
External costs	<ul style="list-style-type: none"> <li>• Accident costs;</li> <li>• Noise costs;</li> <li>• Air pollution costs;</li> <li>• Congestion costs.</li> </ul>

Source: own composition

As a next step, the following partners involved in a port environment should be distinguished:

- Supervising government(s);
- Port authority;
- Terminal operating companies (handling and storage);
- Other port users (shipping companies, industrial companies, shippers, hinterland transport companies);
- Service providers (pilots, towers, customs brokers, agents, forwarders, ship repairers, stores/lubricants providers, bunkering providers, waste reception providers); and
- The society.

For each of those parties, the relevant marginal costs for a port call will need to be calculated and their ability to charge other parties will need to be determined. A specific question will then be which party(s) will charge (directly or indirectly) the owner of the vessel entering the port, i.e. the vessel generating the marginal costs.

In the next paragraph, the following questions will be investigated for each of the parties:

- what marginal costs do they experience when a vessel is entering/leaving a port?; and
- are those marginal costs relevant for the pricing strategy in the context of a port?



### 3. Calculating the social marginal cost of a port call

First of all the discussion 'short-run versus long-run' will be dealt with. Consequently, in order to determine optimal charges for a port call, it is necessary to decide what part of the logistic chain is deemed to be part of the port call. Having done this, it will be necessary to identify the costs of servicing an additional vessel of a particular type requiring a particular service at a particular time. These will include: infrastructure costs, transport user costs, costs for supplying port services, and external costs.

#### 3.1 Short-run versus long-run?

An important element is to clarify the principle of marginal cost pricing in its application within a port context. The marginal cost rule states that transport should be provided at a price that reflects exactly the marginal cost, i.e. the price should be equal to the cost of the resources absorbed in producing an additional unit of the service. At a price above (below) marginal cost production will be lower (higher) than the optimal level.

Starting from this general principle, the question arises what marginal cost is appropriate to be considered in a port context: short-run, long-run, medium-run, or some combination of the former? According to several authors only a conditional answer can be given to this question<sup>23</sup>.

Short-run marginal cost relates to the use of existing capital goods, while long-run marginal cost not only relates to the use of existing capital goods but also to the expansion of capital goods in order to keep up with output. That means that the long-run marginal cost contains the cost of additional capital goods as well as the cost of transport services to materialize with these capital goods.

In an ideal situation with perfect competition, the price will be equal to the long run marginal cost and the long run average cost. This is illustrated in Figure 1. The short run marginal (SRMC) and average (SRAC) cost curves reflect the cost structure for different scales of production. The long run average cost curve (LRAC) is the envelope of the SRACs. The long run marginal cost curve (LRMC) intersects the SRMC at a production level for which

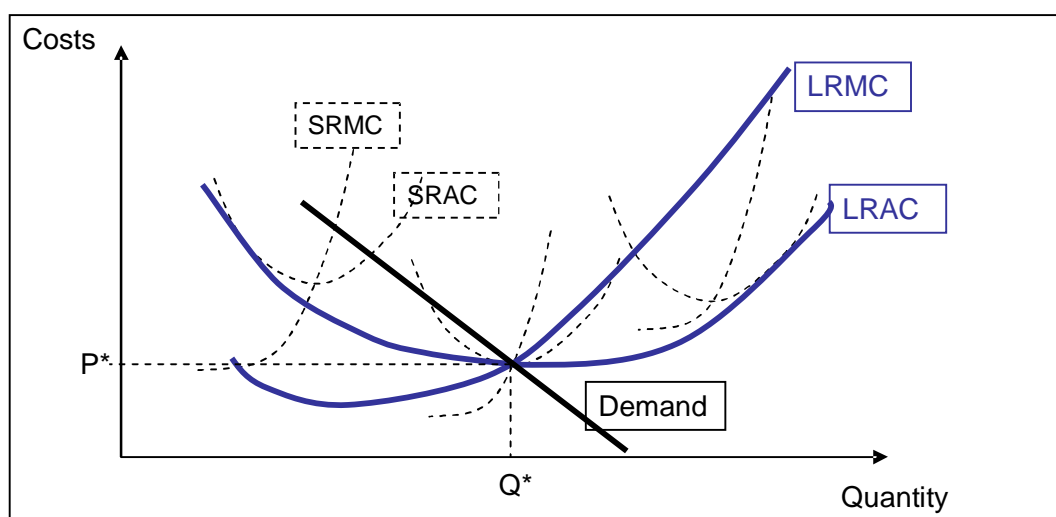
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<sup>23</sup> This paragraph has been based on the port and transport economics literature (e.g. Bennathan and Walters, 1979; Blauwens, De Baere and Van de Voorde, 2008) and on discussions with colleagues. We explicitly would like to thank Prof. G. Blauwens, University of Antwerp, for his comments and suggestions. All eventual, remaining errors are our responsibility.



the  $SRAC=LRAC$ . At production level  $Q^*$  and price  $P^*$  resources are used in the most efficient way and there is also full cost recovery.

Figure 7-1- Short and long run cost functions



Source: own composition

This analysis not only assumes perfect competition, but also a perfect knowledge of the long run demand function and also a fast and almost continuous adjustment of the capacity or the scale of operation. Investments in port infrastructure however are not only expensive, but it also takes time to implement and for the investment projects to materialize. Furthermore, short run demand can differ considerably from the long run demand projections. As a consequence, one can be confronted with situations of under- or overutilization of the existing capacity. As a result, the short-run marginal cost may either be lower or higher than the long-run marginal cost (see Table 5).

Table 7-5 - Relation between short- and long-run marginal cost in a port context

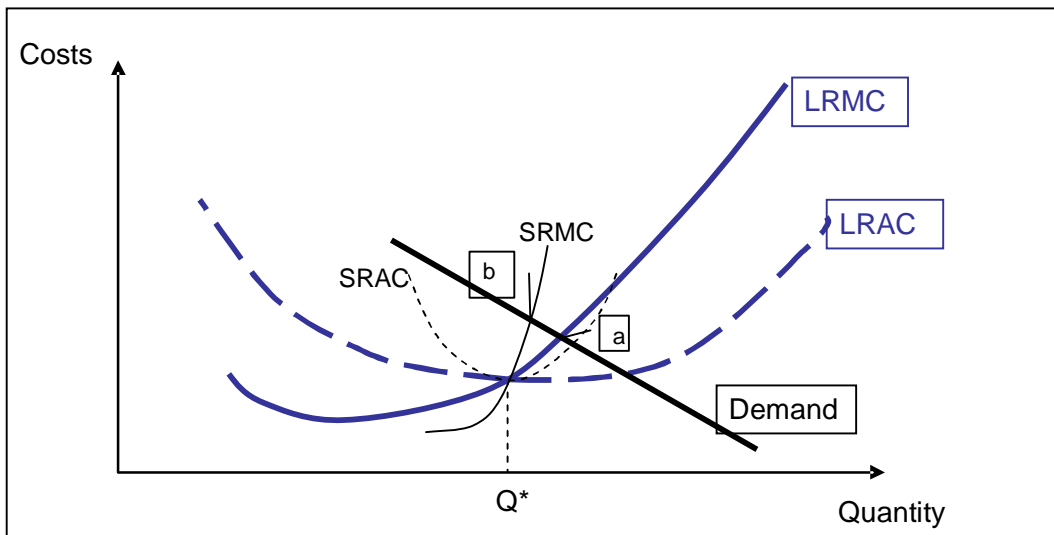
Scenario	Effects on cost	Effect of pricing
High capacity utilization, e.g. demand is higher than forecasted and/or lack of capacity (Figure 2)	The short-run marginal cost will be high (cf. scarcity of port capacity) and above the long-run marginal cost	With a price close to the long-run marginal cost (Figure 2, point a), congestion would occur; with a price based on short-run marginal cost (Figure 2, point b), congestion would be virtually eliminated.  Full cost recovery.
Low capacity utilization	The short-run marginal cost	With a price based on the long-run marginal cost



Scenario	Effects on cost	Effect of pricing
e.g. demand is smaller than expected and/or excess capacity (Figure 3)	is below the long-run marginal cost	(Figure 3, point a), the use of the already underutilized port would be discouraged. With a price based on the short-run marginal cost (Figure 3, point b) there will be a higher capacity utilization.  No full cost recovery.

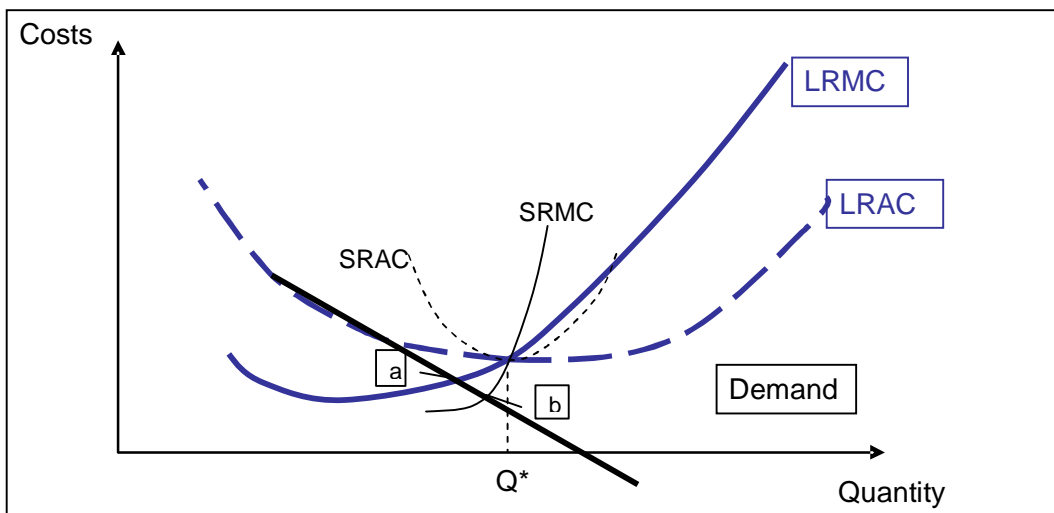
Source: own composition

Figure 7-2 - Demand is higher than expected:  $SRMC > LRMC$



Source: own composition

Figure 7-3 - Demand is smaller than expected:  $SRMC < LRMC$



Source: own composition



Out of this one can conclude that the short-run marginal cost is always the appropriate base for pricing, irrespective of having under- or overcapacity. The aim of pricing is to confront the user with the additional costs that he/she causes. Only the short-run marginal cost indicates precisely the difference in costs between acceptance and refusal of an additional user.

Sometimes it may make sense to charge for the long-run marginal cost. If one equates prices to the short-run marginal cost, we risk to get strong variations over time, with different rates for peak and off-peak periods (e.g. function of tides), different prices in the high and the low season. Moreover, transport prices will also fluctuate over the years. With growing demand, prices will increase, up to the point when an investment is made in new capital goods, after which prices will suddenly decline<sup>24</sup>. Such a strong differentiated and fluctuating tariff, though desirable from the perspective of economic allocation, may meet with resistance for political and/or organizational reasons. It may therefore be deemed necessary to impose prices that remain constant. This price should then be a kind of average of the short-run marginal cost at different moments. This average can be approximated by the long-run marginal cost.

### 3.2 Calculation principles

A seaport, for the purposes of this paper, is defined according to the nature of the vessels entering the port: if sea vessels can reach the ports, they are to be considered as seaports. Four main cargo types using seaports can be distinguished: containers, general cargo, liquid bulk and dry bulk. Also passenger vessels call at seaports. Different commodity types will imply different commodity values and therefore also different levels of marginal costs.

The route of a vessel calling at a seaport can be divided into several stretches. Figure 4 shows a general overview of such seaport setting. A vessel that is on its way to a port can sail on several stretches, depending on the port setting as well as on its own characteristics or on environmental factors: starting with maritime transport at sea, a part of a river or canal can be used, further on also a lock, and finally docks will be reached. Once the ship is berthed, other activities can continue: terminal activities such as unloading/loading,

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<sup>24</sup> A typical characteristic of a port is that port expansion takes a long time (in some cases several years) and in construction and operations there may be large discontinuities. In case of this kind of discontinuous jumps (e.g. the new Deurganck container terminal in the port of Antwerp adds a capacity of 6 million TEU, be it in stages), the long- and short-run marginal costs will coincide for wide ranges of output from the same size of port or terminal. Pricing based on long-run marginal cost can be acceptable for all outputs if one does not operate too small or too large a port or terminal.



storage and unloading/loading of hinterland modes. After this, the goods transformed will be moved to hinterland connections.

Figure 7-4 - Theoretical seaport setting



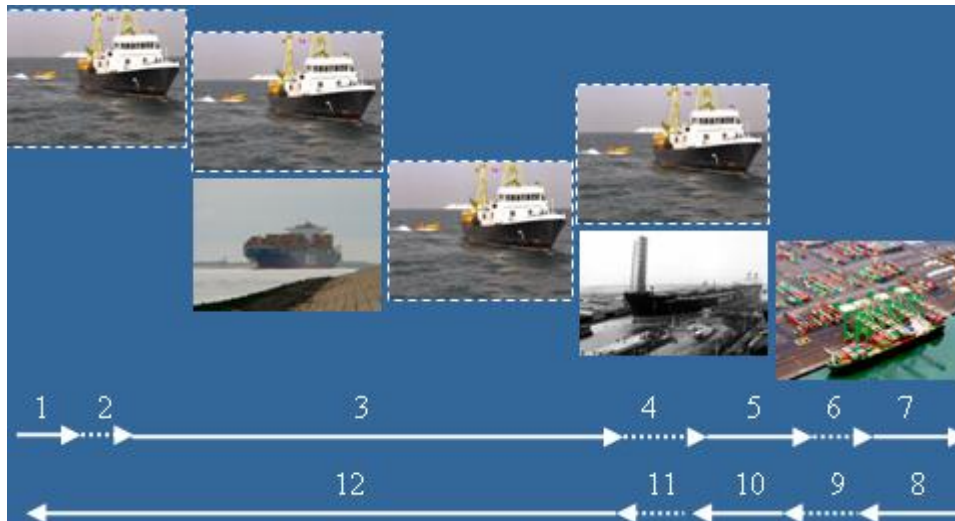
Source: own composition

It is of course also possible to focus on movements in the opposite direction. The seaport setting is a general typology and can be applied to freight vessels and passenger vessels. It is of course not necessary that every link is used in a specific port typology. Not all ports have locks for instance.

The figure below represents the possible stretches graphically, and indicates where waiting may be imposed. Full lines indicate sailing time, dotted lines indicate waiting or idle time.

The length of the various stretches as represented may vary of course according to the port's specific setting. The vessels graphed on the picture indicate pilotage and/or towage, which may be required by law or requested by the vessel itself. A distinction should be made among sea pilotage and towage, river pilotage and towage, canal pilotage and towage, and in-port pilotage and towage. Not every intake of pilots or towage vessels requires the vessel to stop: in some cases, pilots may for instance enter the vessel while the latter is sailing.

Figure 7-5 - Graphical structure of a seaport call



Source: own composition

It should be noted that one or more of these regular stretches may be interrupted by for instance a call at another port located on that stretch, or by for instance a bunkering or repair call. Some ships also call at several terminals at a time. In that case too, the normal times of a single berth call will be exceeded.

This section details what marginal cost elements can be distinguished in such theoretical seaport setting, what port settings can be distinguished in practice, and what vessel types imply substantial differences in marginal costs. Assessing marginal costs this way should ultimately allow determining prices which equal marginal costs, and particularly short-run marginal costs. Considering short-run marginal costs implies that derived effects on for instance shippers (mainly time and reliability effects), long-run capital investments (vessels, deeper maritime entrance, larger locks, more berths, more recent handling cranes) and loss of port's or even shipping companies' customers are not considered, although the methodology allows to include them in a next phase.

Four main components of marginal costs can be distinguished:

- Infrastructure costs, related to e.g. wear and tear of the locks.
- Transport user costs, related to e.g. the operations of vessel calling.
- Supplier/operating costs, related to e.g. the operations of the locks.
- External costs, related to e.g. accidents or pollution.





This categorisation is founded on the results of the UNITE-project (Bickel, a.o., 2000, p. 7), which was also stated to be a suitable composition in earlier studies (Talley, 1994, pp. 67 - 70; European Commission, 1998, p. 10).

We observe that sometimes, port administration is considered as a separate dimension of supplier/operating costs. In the meantime, it is reasonable to omit commercial port costs in the marginal context. There is no clear link between commercial costs and an extra ship entering a port. A small port, aiming at a larger market share, may use extensive marketing and promotional tools, causing an inverse relationship with existing traffic. It may also be possible that a large port uses its widespread fame as a commercial tool, so that an extensive marketing campaign is not necessary. Also, a port may use pricing incentives as an indirect promotional aid. All these factors cause the relation between commercial costs and number of vessels calling to be unpredictable. As staffing is usually fixed, or at least not directly related to the number of vessels entering a port, port administration staff costs do not have to be considered to be a marginal cost element either. A supplementary service cost item is constituted by port authority offices, where a similar argument is valid: there is no periodic replacement. The absence of a direct link of replacement with number of ship calls explains the omission of this cost element in our calculations.

An important supplementary service both to vessel and goods, especially as intermediation between shipowner and transport user is concerned, is shipping agency. As the agent is only to be paid when the deal is made and so the ship is certain to sail, his commission is to be considered as a purely marginal cost. Peston and Rees (1971, p.12) stress the importance of this cost item. However, as it is mainly a derived activity, which should not necessarily take place in the port of call, especially with new developments such as internet and e-business, it is not dealt with in this paper.

A further supplementary service specific to the vessel is ship repair and cleaning. This entails hull blast, cleaning and repair, steel replacement, and dry-docking in general. Again, workers' wages could be retained as marginal costs (Stopford, 2009). However, as these are activities not strictly necessary for a ship call, they are not included in the marginal cost calculations made in this paper.



Finally, other supplementary services to vessels are energy supply, fresh water provision, medical care, waste reception and bunkering. Energy supply is rare, since most vessels have their own generators on board in case they need energy. Fresh water for use on board is either supplied through fixed waterpoints, located at regular distances on the quay, or brought with waterboats. Mariner's care is supplied in a specially equipped office which is manned at any time. This means that energy, water and care supply do not cause any marginal staff costs, except for the case of water provision with water boats, where workers are eventually to be hired for that specific purpose and vessel. As this involves a supplementary service however, it is not considered in this paper. Waste reception is performed for each ship individually on explicit demand. In that case, a container is put, where all waste can be collected. This way, waste reception has marginal staff costs, as containers have to be transported to each ship. Moreover, a ship is not obliged to use waste reception facilities. If a certain port is the last port in a number of calls at European ports, the probability that waste will be kept till that port is low. Bunkering finally is also to be performed on a ship-to-ship basis. Bunkering is done by boat by private companies, which means that extra crews need to be available for servicing an extra ship, which implies marginal costs.

Marginal superstructure costs for water, energy and mariner's care supply are zero. Waste reception just like bunkering is performed for each ship individually, but vessels are part of a fixed fleet owned by several private companies. Marginal superstructure costs for bunkering and waste reception do not exist therefore.

Anchorage is an activity for which many ports charge, but which does not cause any direct (marginal) cost. Therefore, it is not considered as a marginal cost element in the analysis of this paper.

Accidents deserve special attention in the further analysis of this paper. Need for marginal cost calculation in this area is expressed by Tervonen a.o. (2001, p. 42): "The aim of accounting for marginal accident costs of transport is to pass the external social costs of accident risks caused by additional movement on to the users of the network as such. Risk costs must be determined for all categories of transport activity and for different transport environments ex ante, along with the resulting realisation of ex post real economic costs.

The limiting factor of costing is the primitive level of understanding and lack of applications in risk-related marginal cost assessment."

A distinction is made for direct accident costs between material damage and human damage. This is also the categorisation used by Tervonen a.o. (2001, p. 43): "Accident costs



fall into two categories: 1) purely financial, medical, repair and production loss costs, and 2) the non-material costs of injuries and suffering. These cost items should be analysed together with risk factors for defining probable costs of the actualisation of risks”.

Material damage has to do with the vessel (extra replacement) as well as with loading/unloading or storage (extra repair of superstructure) operations. Material damage comprises damage to proper capital goods (for vessel operators and superstructure owners) as to capital goods of third persons (especially for vessels). Furthermore, damage to transported goods is part of material damage costs.

For human damage, the same distinction is made: accidents can happen on board of the vessel as well as on the landside. With human damage, both damage to proper workers as to passengers is considered. Dutch Port Council has dedicated a special report to port accidents (Nationale Havenraad, 2001). They also distinguish between shipboard risks (from unlashing / lashing or from removing / installing conventional twistlocks) and quay-side risks (from removing / installing semi-automatic twistlocks). Experience from Tervonen (2001, p. 8) learns that “accidents with fatality or injury are rare in commercial services”. For completeness though, we retain the maritime part in the marginal cost categorisation.

In each case, the increased probability of an accident by an extra vessel calling has to be calculated. This way, marginal accident costs caused by an extra vessel can be quantified.

Framework specifications about marginal supplier/operating costs are largely present in literature. In most cases though, a specific point of view is taken (shipowner, cargo handler,...), and stress is put on income and expenses instead of revenues and costs. Costs need not be monetary expenses, while revenues need not strengthen the company’s cash position. Most references take the shipowner as a central player. In some of these cases (e.g. Stopford, 1997, pp. 154 - 171; Wijnolst and Wergeland, 1997, pp. 204 - 226), the maritime part as well as the port part are considered. Other references (e.g. Heggie, 1974, p. 3; Peston and Rees, 1971, p. 12) specifically concentrate on port expenses from the point of view of the shipowner. Talley (1994, p. 67 - 70) is even further decomposing each port expense item. In this paper, the stress is clearly on costs, and in particular all costs caused by a marginal vessel call.



The different stretches composing a port call are now assessed in further detail (the numbers refer to figure 5).

- (1) For the at-sea stretch, there are no marginal infrastructure costs. Ice breaking is checked for the Port of Helsinki. In a normal winter, ice breaking is usually to be performed once in the morning, and once in the late afternoon, before the last group of vessels is leaving. It is clearly stated that ice breaking is ship-independent. Even in case no ship would be expected to call at the port, ice breaking is performed on a regular time basis. This is necessary among others to allow rescue operations to take place. So the marginal cost of ice breaking is zero. When a strong winter occurs, ice breaking has to be performed on a more frequent basis, in some cases even nearly for every ship or for every group of vessels (vessels are sometimes grouped in convoys then). But this situation is a strong exception, so we consider marginal ice breaking costs not to exist.

Transport user costs have a marginal component which mainly consists of vessel operating costs. The latter costs are composed of the elements from table 5.

Table 7-6 - Marginal vessel operating cost elements

Marginal cost elements	Function of
Crew	flag, vessel type and size, time,...
Fuel	vessel type and size, distance, speed, cargo load...
Stores	Vessel type and size, time,...
Lubricants	Vessel type and size, distance, speed,...
Spare parts	Vessel size and type, distance, speed,...
Oil	Vessel size and type, distance, speed,...

Source: own composition

Pilotage and towage may be required, depending on environmental as well as ship characteristics. For pilotage and towage, in general, there is only need of supplementary tugboats and pilot boats in case capacity is exceeded. Most pilotage and towage companies have a fixed fleet. They theoretically never go beyond this fleet by hiring material. The same reasoning goes for pilotage and towage staff. This way, the extra ship calling does not cause any supplementary capital costs for towing nor pilotage. The only marginal cost items on the supplier/operator side are therefore related to fuel use, oil consumption and spare parts requirements. Meanwhile, tugboats are also used as rescue and fire-fighting boats.



They are used as buoy-layers too. The latter functions therefore have no marginal component.

Accidents are an important external element at sea. Their marginal cost level is a function of flag, total traffic, traffic conditions, etc. Air pollution and water pollution are other external elements, which are dependent on vessel size and type as well as speed, ... Eventually, also pilotage may be needed and therefore have a marginal component. Noise effects are negligible in this section.

- (2) At the point where ships have to wait to enter the river or canal, the only infrastructure element which could imply marginal costs are buoys, which are especially necessary to trace out the channel at sea. However, they are replaced on a regular basis. Neither their number nor the regularity of replacement is influenced by the number of vessels. Regularity solely depends on time: about every 18 months, a buoy has to be replaced, since by that time, natural overgrowth makes buoys less visible, so that maritime safety is negatively influenced and replacement is needed.

Transport user costs at the buoy waiting point are the same as those described in Table 6, be it that there is no fuel consumption, no oil consumption, and no need for spare parts. They are therefore called 'limited' vessel operating costs.

As to the supplier/operator costs, towage is not needed for the waiting process, and pilots usually only come on board when the ship is taking off for the canal entry.

Accidents in this zone are extremely limited in number and impact, just like noise pollution. Air and water pollution are possible, although less likely than at full sea, as control at this point is usually much more tight.

- (3) In the zone from buoy to lock, no infrastructure elements have marginal components in a ship call. Breakwater expenses are considered to be independent of port usage (common costs, cfr. Heggie, 1974, p. 14). The same holds for navigation lights, which is confirmed by the European Commission (1998, p. 10). For buoys in the buoy-to-lock zone, the reasoning for the maritime entrance waiting point is valid here too. For maritime entrance banks, replacement does not seem to depend on the number of vessels passing by. Much more important is the natural streaming of the water: certain points of the bank need to be



regularly fortified. This way, Flemish Department of Environment and Infrastructure states that marginal bank costs should not be considered.<sup>25</sup>

The radar system in the buoy-to-lock zone is a unique investment, the capital cost of which is not influenced by an extra ship entering or leaving the port. Radar towers are often built alongside maritime entrance rivers. Data are processed at a central tower. From there, control is assured through several screens operated by a fixed staff. In case a dangerous situation tends to occur, direct contact can be made with the ship(-s) involved. This process implies that nowhere marginal costs are in place.

Concerning infrastructure maintenance, just like bank erosion, dredging is a cost item which is only linked with time and streaming of the river, and not with the number of vessels calling at the port. Short-run marginal costs of dredging are zero.

Vessel operating costs, as transport user costs, do have a marginal component. The full set of vessel operating costs, similar to that of Table 6, applies.

Pilotage and towage are often required here, so that there too the marginal elements discussed in the supplier/operator part of the at-sea section apply.

On the side of external costs, air pollution applies. Its cost can be assessed in a way similar to that of the at-sea section. Noise effects are negligible again. Accidents have an extremely limited chance of occurring, as pilotage and towage are provided and in many cases made compulsory. Water pollution is minimal too, as port state control is in place.

- (4) In the locking zone, from an infrastructure point of view, it should be noted that lock replacement is not dependent on the mere time factor, but is determined by the number of moves lockdoors have to make. This way, marginal lock costs are not directly caused by an extra ship but by a group of vessels. Locks have a fixed capacity, which is not always fully used. As a solution, we can take the average occupancy rate for our calculations. By spreading the marginal lock replacement cost over this average number of vessels per move, we have a method which allows to state that lock replacement has a marginal cost per vessel. Spreading over vessels in the lock can be done on an equal basis, ignoring for pragmatical reasons the fact that different types (length) of ship may be present.

It is furthermore correct to state for locks that maintenance, just like replacement, is a function of the number of moves (groups of vessels), and so depends on the call of individual vessels. Marginal lock maintenance costs should again be spread over the vessels in the lock at one move, in order to obtain marginal costs for a vessel.

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<sup>25</sup> Confirmation of this statement is found on the web site of the Scheldt Information Centre (2006).



Among the transport user costs, limited vessel operating costs like in section (2) of the port call apply.

On the supplier/operator side, in locks, usually, the river or canal pilot leaves the vessel at the moment that the vessel moors into the lock, whereas the port pilot, if required, boards the vessel at the moment that the vessel starts heading towards the berth. Therefore, no pilot costs are involved in the stretch where the vessel is waiting in the lock.

On the external side, noise, air and water pollution are extremely limited, as engines are usually switched off while in lock. Accidents in or around locks, due to the special guidance measures, are normally restricted to the absolute minimum.

- (5) In relation to infrastructure in the lock-to-berth zone, Heggie (1974, p. 13) states that quay maintenance is independent of the number of vessels calling at the port, and this way doesn't have a marginal cost component. Wear and tear is not determined by the number of vessels passing by, but rather by weather conditions and type of building material.<sup>26</sup>

Among the transport user costs, the vessel operating costs should be considered. They are similar to those of Table 6, with the difference that in this section diesel oil is used instead of heavy fuel, as the former is less polluting.

Supplier/operator costs are mainly composed of pilotage and towage costs, at levels comparable to those in preceding maritime entrance sections.

External costs mainly show up in air pollution, be it that the latter is usually smaller than at sea, as different fuel is used. Water pollution is rather exceptional due to port state control. Noise effects are negligible again. Accidents are not at all frequent too, as pilotage and towage are present.

- (6) For the at-berth section, it was stated in (5) that quay wear and tear is not determined by actual use, but rather by 'external' conditions. Therefore, it should not be included as a marginal cost element in the setting of this paper.

Transport user costs are the limited vessel operating costs which also applied to (4) in the lock zone. There are no marginal supplier/operator costs involved, as ships in this stretch are just waiting to be operated. For the same reason, accidents as well as noise, air and water pollution are all absent.

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<sup>26</sup> This is confirmed by the White Paper of the European Commission (1998, p. 10), where maintenance of this type is considered to be a fixed cost.



- (7) The observations made in (6) with respect to quay wear and tear and transport user costs also apply to stretch (7).

Manning of the cargo handling superstructures (cranes, straddle carriers,...) are considered to be of marginal nature too: if handling material is not operating, employees need not be paid. By extension, this is also true for port workers doing hands work. It is also valid for passenger handling, where employees have to guide and welcome travellers. Handling is closely linked to storage. Storage personnel's wages are of the same marginal nature as the previous manning costs.

Handling operations causing marginal wage costs are the transfer from vessel to yard and the transfer between yard and terminal gate in the case of commodities. In the case of passengers, this is usually one move. Lashing / unlashings, hatch moving and weighing are additional operations which cause marginal staff costs. Container storage is mainly composed of stacking containers or stocking commodities. Cargo planning is considered to be done on an administrative level, with employees not assigned to a specific ship but doing a job for several vessels. Therefore, the latter's cost is not marginal (Ocean Shipping Consultants, 2001).

Handling costs are heavily dependent on the type of goods transported. Therefore, a distinction between different commodity types (and corresponding ship types) will have to be made. Handling superstructure mainly is of capital nature. First of all, cargo and passenger handling facilities (e.g. cranes and straddle carriers) are to be in place. Since this type of capital is usually not to be replaced after a certain number of moves, it does not have a marginal cost component. Just like for ship fleet, we assume that a fixed amount of capital equipment is disposed of, and that no use is made of external material. If extra handling material would be used, beyond the fixed fleet available, and corresponding operators, beyond the fixed number of people employed, would have to be temporarily hired, extra capital hiring costs would constitute extra marginal costs.

It should be remarked that sometimes terminal productivity is enhanced on explicit demand of the shipowner. Higher productivity means more moves per hour and per crane, mostly through extra resources. These surely have a marginal cost, and therefore, the simulation will have to sort out situations with 'normal' superstructure and staffing levels from situations with increased productivity requests.

Next to handling, also storage has to be provided. For storage areas and warehouses, even less than for handling superstructure, use-dependent replacement is required.

Warehouse energy and surveillance are to be considered as fixed costs, independent of the volume of commodities stored. Surveillance is assured anyway. Energy costs are highest for getting base temperatures in warehouses. The marginal energy use for supplementary





volumes which have to be cooled can be neglected. This means that marginal operating costs for warehouses are non-existing.

Accidents at the berth or on the storage area are more frequent than in the maritime entrance or on the lock to berth area, but in most cases cargo loss and especially human damage is much more important than material damage to the container or to handling material. In case an accident happens, marginal costs are of course involved. Noise and air pollution are present in this stage too, but are mainly caused by handling superstructure instead of the vessel, as the latter normally has its regular engines switched off.

- (8) This stretch is the prolongation of stretch (7), be it with a perspective on returning to full sea. Marginal costs therefore correspond to those of stretch (7).
- (9) Stretch (9), which is the zone of time where the vessel waits before leaving the berth and eventually also the port, equals stretch (6).
- (10) Stretch (10), and therefore also the composition of its marginal costs, is similar to stretch (5), in the sense that the vessel is now moving from the berth towards the lock.
- (11) This stretch is the equivalent of stretch (4), where the vessel is going through the lock process.
- (12) This final part of the port call corresponds to stretch (3) and finally ends into reaching the full sea, where the vessel starts heading for its next port of call.

It is important to observe that stretches in one direction can incorporate time use which may differ a lot from time consumption in the opposite direction. Neither should time use at one particular call equal time use at another call for the same stretch, even if the same vessel is involved: different 'environmental' circumstances may apply.

The occurrence of the previous stretches, each of them having corresponding marginal costs, determines the port lay-out. Port lay-out is one of the characteristics which allows distinguishing among port types. Other main distinguishing characteristics, which are drawn from Vanellander (2005) are mentioned in Table 7.

Table 7-7 - Seaports' main distinguishing factors

Factor	Possible states
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Activity scope	Complete - limited
Lay-out	Tidal - non-tidal; basins - no basins
Location	Coastal - river; large - small population hinterland
Organization	Land lord - limited operating - operating
Security	High - moderate - low
Traffic	High - moderate - small; mixed - containers only - bulk only

Source: own composition

Most combinations of variables' values are possible, although some combinations have a more frequent occurrence than others.

But not only a different port setting makes up for different marginal costs. Also the type of vessel is important. A first characteristic to distinguish among vessel types is the type of cargo transported. In the beginning of this section, a distinction was made between containers, general cargo, dry bulk, liquid bulk and passengers. For each of these vessel types, a further distinction is possible according to the size of the vessel. As an illustration, table below distinguishes among the most frequent container vessel sizes in general.

Table 7-8 - Most frequent container vessel sizes

Container vessel category	Average TEU capacity	Typical length (ft)	Typical draught (ft)
1st generation	1,700 TEU	450-630	7
2nd generation	2,305 TEU	700	17
3rd generation (Panamax)	3,220 TEU	860-950	38
4th generation (Post-panamax)	4,828 TEU	900-1,000	42



5th generation (Post-panamax-plus, jumbo, ultra-large container vessels, mega-containerships)	7,598 TEU	1,100	46
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Source: own composition

A specific application of marginal cost calculation could be the consequences of congestion (if existing). It speaks for itself that congestion will have a detrimental impact on the generalised cost and on the overall transport or throughput performance. After all, to a shipping company, congestion implies time loss and thus a higher generalised cost.

However, congestion is also problematic for the other port actors. Vessels whose arrival at berth is delayed through congestion may be difficult to fit into the loading and unloading schedule of the terminal operator. This will have implications for capacity management and result in higher costs. The same holds for other actors, including in the fields of storage and hinterland transportation. Moreover, a knock-on effect may be felt elsewhere in the maritime transport chain: delays can have an impact on operations in other ports of call.

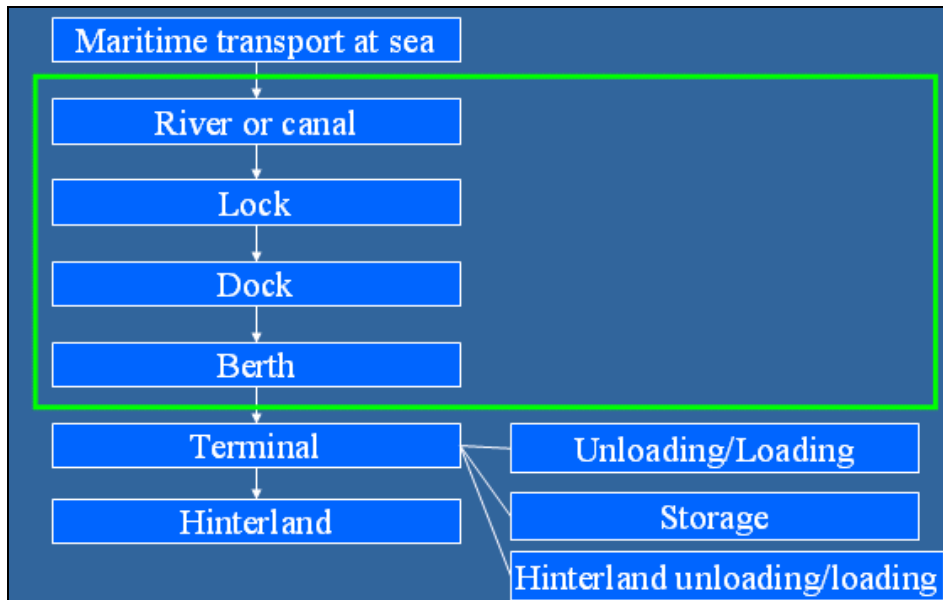
Therefore, it is important that we should acquire adequate insight into how port congestion arises, the associated costs, and how it can be avoided or eliminated most effectively.

### 3.3 Constructing a simulation model

The aim of building and using a simulation tool is to calculate the marginal cost of a port call. The emphasis is on the arrival/departure of an extra vessel in the port. To be able to construct a simulation tool, it is first of all necessary to define which parts and which activities of the total logistics chain are considered. This has been done in paragraph 3.2. ('calculation principles').

Within the simulation tool, the calculations are based on the inner box of Figure 6: river or canal, lock, dock and berth. We do not include maritime transport at sea, terminal activities and hinterland movements. The loading/unloading activities of the vessel are only considered in relation to the crew members and not in relation to terminal workers. The starting point can be defined as the first contact point of the vessel with the port, in case a vessel is arriving. The ending point can be defined as the last point of contact of the vessel with the port, in case a vessel is leaving. Confining to this part implies that noise costs, which are only caused by terminal superstructure, are not treated in the calculations.

Figure 7-6 - The seaport simulation framework (based on Figure 4)

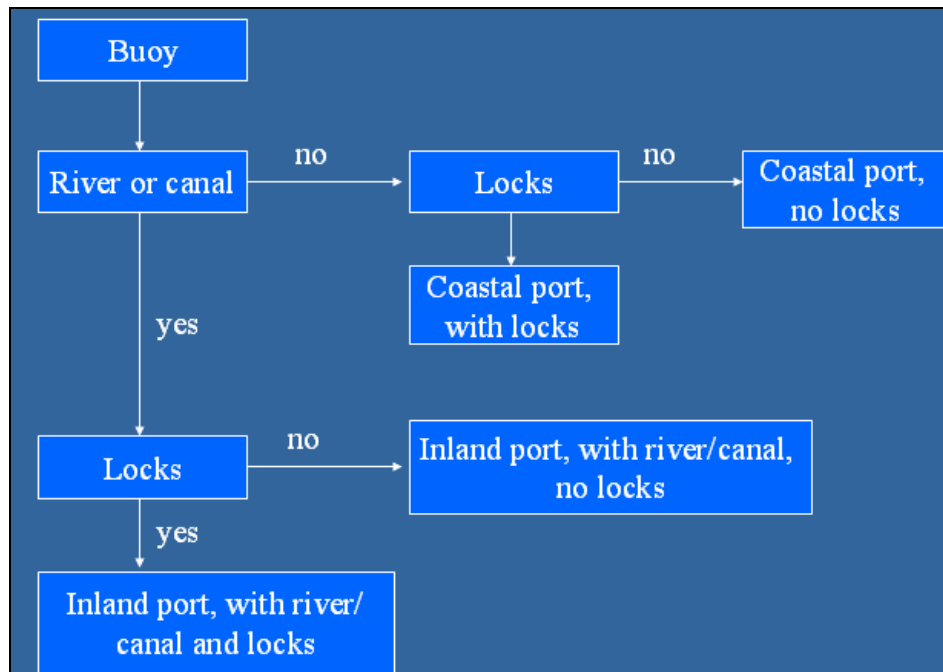


Source: own composition

The simulation tool is not specific for one port, but should be applicable to several ports. The main objective is therefore also defined as: “to assess marginal costs for different port and vessel types, according to a well-defined typology”. For several ship typologies and several port typologies, marginal costs can be calculated. The construction of the simulation tool is based on an engineering approach and has been constructed in MS-OFFICE Excel.

In figure below, the decision process for the simulation tool is shown, containing possibilities when calling at a port. The maritime entrance buoy will be considered as the first point of contact with the port authorities.

Figure 7-7 - The decision process for the simulation tool



Source: own composition

Marginal costs are defined as those extra costs when a vessel is calling at a port or leaving a port. However, due to unavailability of some data, those marginal costs are sometimes approximated by average costs.

The four main marginal cost elements defined in section 3.2 (infrastructure, transport user, supplier/operator and external) are considered for a vessel on a specific link. The research is based on short-run marginal costs.

An example of SMC pricing in PPP is the use of locks in seaports. For example, the port of Antwerp is an inland tidal port using locks. Both banks of the Scheldt are used, with a phased development on the Left Bank. In order to have a second maritime entry on the left bank, the creation of a new lock is under consideration. Within the framework of this paper it could be argued to investigate a PPP formula for this lock in combination with the principle of SMC pricing.

In Meersman et al. (2006) a marginal infrastructure cost for the use of a lock has been estimated to be € 707 per sea-going vessel. Table 9 gives an overview of the CAPEX of a



new lock (€ 580,000,000, prices of 2007) and the OPEX per year (€ 10,900,000, prices of 2007). Considering a horizon of 50 years, this leads to total expenses of € 1,125,000,000 (prices of 2007).

In a next step, we should determine the number of vessels using this lock. Starting from the observation of about 17,000 sea-vessels arriving in the port of Antwerp (Antwerp Port Authority, 2009), a number of scenarios can be calculated based on the share of vessels using the new lock (in Table 9: 100%, 75%, 50% and 25%). On the basis of the different assumptions, revenues based on SMC can be calculated (per year and for a period of 50 years). This leads to revenues ranging between € 600,950,000 and € 150,237,500. In some cases only 13% of the total expenses are covered.

Table 7-9 - Example of SMC pricing in PPP: the case of a new lock in the port of Antwerp (values in euro, prices of 2007)

Expenses:				
Capex:	580,000,000			
Opex per year:	10,900,000			
Number of years:	50			
Total Opex:	545,000,000			
Total expenses:	1,125,000,000			
Number of maritime vessels in Antwerp per year:				
	17,000			
Revenues:				
Marginal infrastructure cost per vessel:	707			
Share of vessels using the new lock (%):	100	75	50	25
Number of vessels using the new lock per year:	17,000	12,750	8,500	4,250
Infrastructure cost per year when using the new lock:	12,019,000	9,014,250	6,009,500	3,004,750
Number of years:	50	50	50	50
Total revenues:	600,950,000	450,712,500	300,475,000	150,237,500
Revenues - expenses:	-524,050,000	-674,287,500	-824,525,000	-974,762,500
Revenues / expenses:	0.53	0.40	0.27	0.13



Source: own composition based on Gauderis et al. (2008)

Previous results are also in line with the findings in table 5. Low capacity utilization does not lead to full cost recovery, whereas high capacity utilization could lead to full cost recovery (in this case higher than expected).

Two remarks could be formulated on the basis of previous calculations:

- Locks in the port of Antwerp are also used by inland waterways, whereas the calculation of the marginal infrastructure cost in Meersman et al. (2006) only considers maritime vessels.
- The marginal infrastructure cost of € 707 has been calculated on the basis of information of OPEX in the year 2006.

Therefore, two alternatives have been calculated in tables 10 and 11: doubling the marginal infrastructure cost and halving the marginal infrastructure cost. Even in the case of doubling the marginal infrastructure cost, only in the exceptional case of a share of 100% of the vessels using the new lock, the total expenses are covered.

It is shown in Meersman et al. (2006) that marginal infrastructure costs are only a small fraction of overall marginal costs, and fully depend on lock use: if no locks are used, no marginal infrastructure cost occurs.

Table 7-10 - Example of SMC pricing in PPP: the case of a new lock in the port of Antwerp (values in euro, prices of 2007) - doubling the marginal infrastructure cost

Expenses:	
Capex:	580,000,000
Opex per year:	10,900,000
Number of years:	50
Total Opex:	545,000,000
Total expenses:	1,125,000,000
Number of maritime vessels in Antwerp per year:	17,000
Revenues:	
Marginal infrastructure cost per vessel:	1,414



Share of vessels using the new lock (%):	100	75	50	25
Number of vessels using the new lock per year:	17,000	12,750	8,500	4,250
Infrastructure cost per year when using the new lock:	24,038,000	18,028,500	12,019,000	6,009,500
Number of years:	50	50	50	50
Total revenues:	1,201,900,000	901,425,000	600,950,000	300,475,000
Revenues - expenses:	76,900,000	-223,575,000	-524,050,000	-824,525,000
Revenues / expenses:	1.07	0.80	0.53	0.27

Source: own composition based on Gauderis et al. (2008)

Table 7-11 - Example of SMC pricing in PPP: the case of a new lock in the port of Antwerp (values in euro, prices of 2007) - halving the marginal infrastructure cost

Expenses:				
Capex:	580,000,000			
Opex per year:	10,900,000			
Number of years:	50			
Total Opex:	545,000,000			
Total expenses:	1,125,000,000			
Number of maritime vessels in Antwerp per year:				
	17,000			
Revenues:				
Marginal infrastructure cost per vessel:	353.5			
Share of vessels using the new lock (%):	100	75	50	25
Number of vessels using the new lock per year:	17,000	12,750	8,500	4,250
Infrastructure cost per year when using the new lock:	6,009,500	4,507,125	3,004,750	1,502,375
Number of years:	50	50	50	50
Total revenues:	300,475,000	225,356,250	150,237,500	75,118,750
Revenues - expenses:	-824,525,000	-899,643,750	-974,762,500	-1,049,881,250
Revenues / expenses:	0.27	0.20	0.13	0.07

Source: own composition based on Gauderis et al. (2008)





#### 4. PPP agreements as sources of alternative financing

##### 4.1 The setting

Investments in maritime entrance and port infrastructure involve very large amounts. That makes it difficult for a government to apply the traditional 'pay as you go' methods, among others since the available amounts per fiscal year are limited. Moreover, postponing projects and waiting till the necessary means are available leads to congestion and waiting times for potential users, as indicated in previous sections. The linked loss of competitive power in turn leads to potential welfare loss (Capka, 2006).

The traditional financing of port infrastructure works has reached its limits, especially because of limited financial means. To cover up for the lack of financing, more and more alternative financing methods are sought for. Globally, three typologies can be distinguished: ways of alternative financing that by the investing government is purely considered to be a financial operation; a non-financial PPP, and privatising infrastructure elements.

The Canadian Council for Public-Private Partnerships defines PPP agreements as follows: "A cooperative venture between the public and private sectors, built on the expertise of each partner, that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards" (CCCP, 2001).

The public and the private sector can co-operate on two areas, that can run over into each other. First of all, co-operation is possible in the financial domain, whereby the private partner<sup>27</sup> provides the total or part of the financing for constructing and maintaining the infrastructure. On the other hand, the private partner can cater for operating the infrastructure, without being responsible for financing that infrastructure. The underlying motive for co-operation between the public and the private sector is the fact that both sectors have unique features that can mean a surplus value for the project. But it goes without saying that, from a government point of view, the biggest motive for a PPP agreement lies in budgetary shortages, the old age of existing infrastructure, and the growing demand for public services. Bringing in a private partner moreover nearly always boils down to being able to finish a piece of infrastructure quicker, running that

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<sup>27</sup> In this text, we use the word 'partner' in single, knowing that in practice, several partners can be involved.



infrastructure in a better way, and/or taking advantage of the new, available innovative techniques.

A successful PPP for a government means a lowering of financing costs and building new knowledge. Via a PPP agreement, the government aims at a bigger cost efficiency in buying and building infrastructure, not so much at owning and managing the assets directly. The private company, for that co-operation, receives a reward, and eventually generates also employment when able to build or manage the infrastructure project.

A PPP agreement so is about dividing the financial means, the risks and the returns between the private and the public sector. Each party is to bring in means, like financial means, expertise and fixed assets (e.g. land and material). Governments for instance can make available land for a certain infrastructure project, while the private sector brings in financial means. Via co-operation, the government also intends to lower own risks that are inherently linked to building new infrastructure.<sup>28</sup> The higher the perceived risk that is being transferred to the private partner, the higher the required risk premium will be that the private partner will expect from the government. That same government can provide the private partner with future income in different ways: via the permit to levy a toll, via a shadow toll, or via a remuneration of availability.

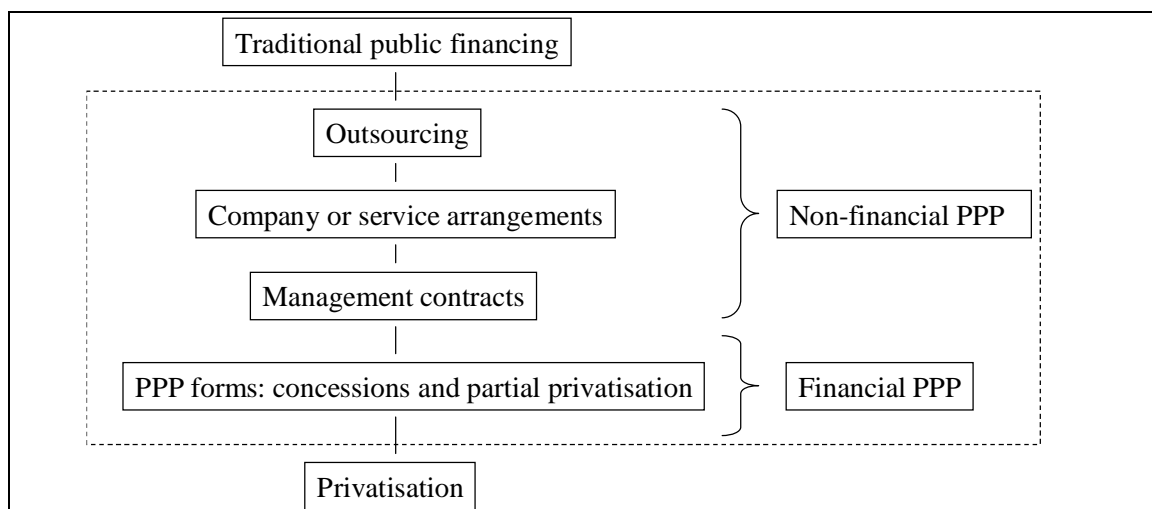
#### 4.2 Different types of PPP agreements

Different types of PPP structures exist, in function of the responsibility that the private partner bears. Options are carrying the financial risk, building, designing, managing or owning the infrastructure. Figure 8 gives an overview of the different options.

Figure 7-8 - Types of infrastructure agreements

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<sup>28</sup> The risks that public and private parties may face, consist of general risks (especially political and market risks) and project-specific risks (in particular the financial risk, the construction risk and the operational risk).



Source: based on Guasch, 2004

Under non-financial public-private co-operation, all forms of co-operation between both parties are comprised where the private partner provides no financial support to the public sector for building the infrastructure. The contribution of the private partner to the materialisation of the infrastructure can happen in different ways, among others via outsourcing, company and service arrangements and management contracts. This PPP form therefore provides no solution when the government is in search of alternative financing. (Worldbank, 2009)

With a financial PPP or Private Finance Initiative (PFI), the public sector takes the capital, that is necessary for buying or building the infrastructure from the private sector. Within PFI, one distinguishes among two important groups: the concession and the partial privatisation. The most complete PFI form, where the private sector takes over all tasks from the government, is the Design-Build-Finance-Operate-structure (DBFO). This structure encompasses all steps that are necessary to make the infrastructure project happen: designing, building, financing and managing. An alternative to this is the DBFMO (Design-Build-Finance-Maintain-Operate) structure. The private partner, next to designing, building, financing and exploiting the infrastructure, is also in charge of maintaining it. Over the years, many alternatives to this structure have been developed.<sup>29</sup>

Finally, there still is privatisation, where the full responsibility for a certain infrastructure project is transferred to the private sector. Privatisation is also known as Build-Own-Operate (BOO). The private partner has no obligation to transfer the infrastructure to the

<sup>29</sup> The most well-known forms are Buy-Build-Operate (BBO), Build-Own-Operate-Transfer (BOOT), Build-Transfer-Operate (BTO), Build-Operate-Renewal (BOR), Wrap around Addition, Lease-Purchase and Sale-Lease Back, Temporary Privatisation.



government, and the government has no obligation to re-buy that same infrastructure later on.

#### 4.3 PPP in port infrastructure

In transportation in total, in the period 1990-2007, PPPs emerged in 81 countries, totalling 1,097 projects<sup>30</sup>. The region with the largest share of transport PPP agreements is Latin America / Caribbean. Europe does not seem to have many PPP agreements in transport. The most frequent type of PPP agreements are concessions, also in Europe. Management and lease contracts are least used. The annual number of projects and their investment value does not seem to have changed much over the period. For seaports in particular, this would have been about 325 projects, having a project value of 41 bn USD. (Worldbank, 2009)

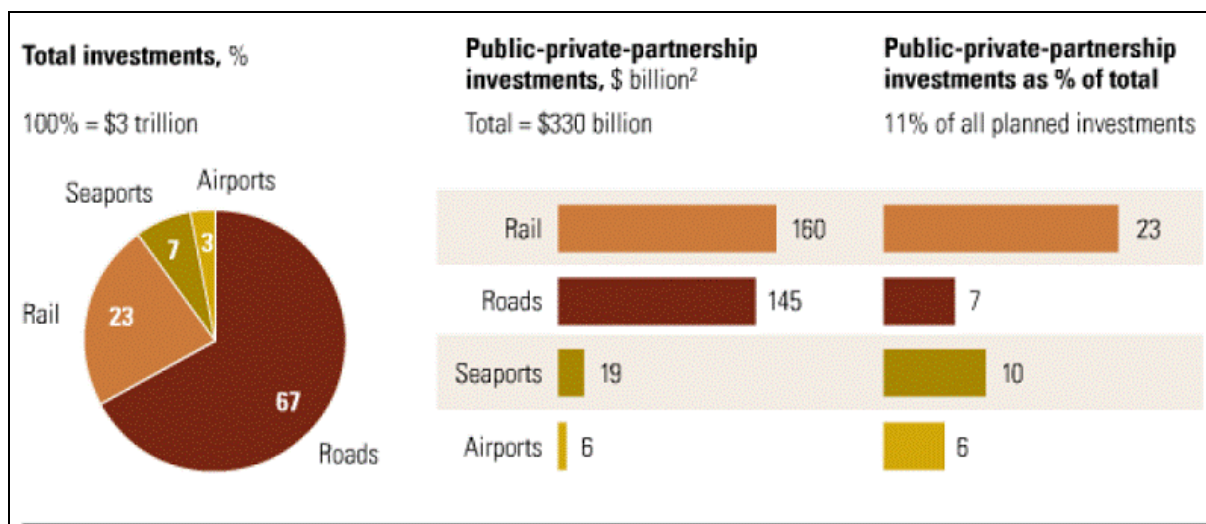
For the period 2005-2010, it is expected that about 10% of all PPP agreements in transportation will be in the seaport sector, involving private investments of about 19 bn USD, as shown in Figure 9.31 The share of seaports in PPP investments is therefore higher than its share in overall investments, which is 7%. In transportation, rail represents the highest value of private investment volumes through PPPs, although in a number of projects, rail has about the same share as seaports. (Cheatham and Oblin, 2007)

Figure 7-9 - The PPP pipeline

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<sup>30</sup> These figures involve projects that we registered by the Worldbank.

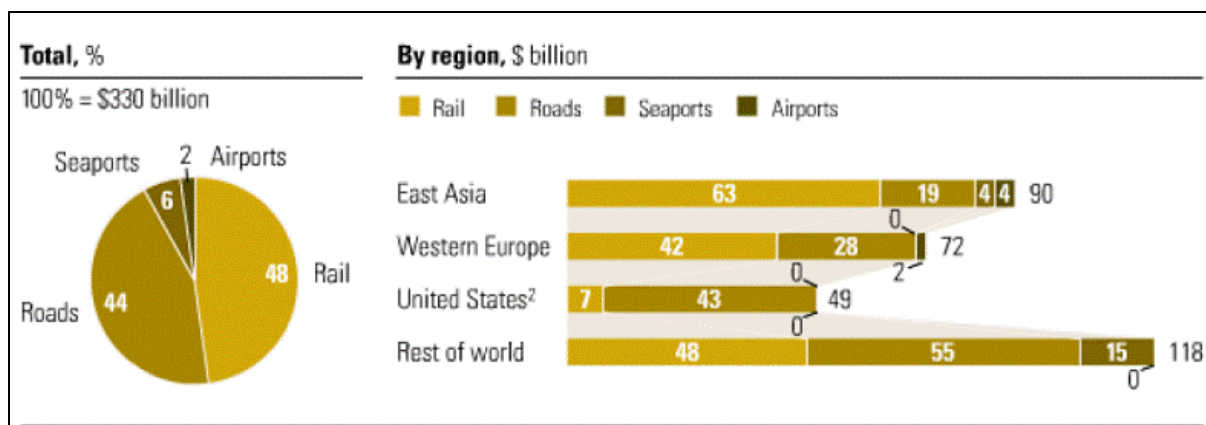
<sup>31</sup> Global total extrapolated from country data weighted by GDP. Countries included are Australia, Brazil, China, France, Germany, India, Italy, Japan, Portugal, Russia, South-Korea, Thailand, United Kingdom and United States. The breakdown by mode is not available for Australia and Portugal.



Source: Cheatham and Oblin (2007)

Geographically, it seems that Western Europe and the United States will have no PPPs in seaports over the period 2005-2010, as shown in figure 10. In East-Asia, seaports represent 4% in all transport PPP agreements, so that the rest of the world makes up for about 15% in all such agreements. (Cheatham and Oblin, 2007).

Figure 7-10 - The regional PPP landscape



Source: Cheatham and Oblin (2007)

Where PPPs are applied in ports, they can take different forms. Land-lord seaport authority bodies belong to the type of port where the seaport authority least intervenes in operations. In these seaports, possession, occupation and use of property is transferred by the seaport authority institution to a potential user, in exchange for a payment or a rent. This arrangement usually takes the form of a lease, which can adopt three varieties: a land lease, a lease to operate, and a lease for building. (Asian Development Bank, 2000, p. 20)



- A land lease grants the concessionary the right to possess, use and operate a (mostly) 'naked' port area on payment of a 'fixed' concession duty (called a 'canon' by Trujillo and Nombela (1999, p. 26)). Examples of land leases are found for example in Antwerp, Singapore, Busan (among others at its Gamman terminal), Rotterdam, Los Angeles, Hamburg, Long Beach, Klang and New York (at Port Newark / Elizabeth Marine Terminal).
- In case of a lease to operate and manage, a management agreement transfers management and operation of a seaport site, its equipment and administration to a management company, against parting with a share of cargo handling charges. This construction was set up in Kingston (Jamaica), where the Kingston Container Terminal is owned by the Port Authority, but managed by APM Terminals.
- A lease to build makes the lessee financially responsible for all infra- and superstructure improvements and constructions, transferring these to the lessor (port authority) upon termination of the lease contract, but allowing the lessee to earn a toll on facilities constructed. The port of Hong Kong for instance applies the lease-to-build contract type among others at the Kwai Chung Terminal. Also at Busan, a lease-to-build contract is used for the development of the New Port Project. At Kaohsiung, part of container terminal n°5 was leased out through BOT (Build-Operate-Transfer). The Yantian International Container Terminal development at Shenzhen is equally performed under such BOT regime. In New York, the Global Marine Terminal was privately developed, and the South Brooklyn Terminal is to be developed under the 'lease to build' system.

Several types of conditions can be imposed on the lessee signing the lease contract. In Kochin for instance, DPA International in 2004 won a contract for building and operating the International Container Transshipment Terminal (ICTT), upon condition that at least 400,000 TEU be handled within 10 years after obtaining the ICTT lease contract at another container terminal in the port operated by DPA International; furthermore, operations should be fully shifted to the ICTT terminal within two years after starting construction there; the contract runs for 30 years (Manoj, 2004). Characteristics typically defined in concession contracts and limiting the lessee's degrees of freedom are length, ownership division, labour requirements, operational practices, pricing boundaries, investment requirements, financial performance indicators, liability and risk division, and arbitration terms (Estache et al., 2001, p. 3; World Bank, 2001c, p. 20-24; Crook, 2002, p.15 and Juhel, 2001, p. 166).

More port administration involvement than in land-lord seaport types is found in limited-operating seaport authority bodies, in which the seaport authority institution provides equipment for operations. Cass (1999, p. 35) sees these as a variant of the land-lord type,



where besides the seaport area also operational equipment is leased. Nevertheless, a contracting operator in a limited-operating seaport executes operations in his own name and commercial risk (like in a land-lord seaport), but under regulatory control and on account of the port authority (Trujillo and Nombela, 1999, p. 29-31). Such an operator can be granted a permit to operate a public utility, a permit to operate a private utility, or a joint venture contract. (Asian Development Bank, 2000, p. 20)

- A permit to operate a public utility allows the container-handling company to operate a public facility on account of the port authority. The incentive for investing is low though in case of permits to use public utilities, since this contract is merely about private or common utilities or specific services, not about site occupation, which is the case in the land-lord system. A permit to operate a public utility is in place for instance in Brest, where the Chambre de Commerce et d'Industrie granted a permit to three operators.
- A permit to operate a private utility has the operator build superstructure of his own, but still has him operate it on account of the administration. A permit to operate a private utility exists for instance in Caen, where Combustibles de Normandie operates a terminal under such regime.
- A joint-venture contract is often applied in case the operator has insufficient resources to equip the terminal himself. A joint-venture contract is applied for example in Qingdao, for creating the new Qingdao Qianwan Container Port Cy Ltd.

Under a comprehensive (or service, or operating) type of port authority, the seaport authority institution also takes care of operations, although contracts with companies are still possible, as is frequently the case for stevedoring activities. One example of a comprehensive (or service, or operating) type of port authority is Dubai where the Port Authority is assuming all functions from infrastructure provision to (un-)loading.

It should be noted that different organizational arrangements are applied to several terminals in the same port, even at the same time and to the same contractor. Dubai Ports Authority for instance won an operations contract for the existing Rajiv Gandhi Container Terminal in Kochi under a lease-to-operate concession (Manoj, 2004), and at the same time, it acquired a BOT contract in 2004 for the International Container Transshipment Terminal in the same port (The Hindu Online, 2004).

#### 4.4 The problem: SMC does not lead to cost recovery



Overall, it seems that project numbers and investment volumes in seaport PPP agreements are going down. Europe and North America even feature no such agreements at all<sup>32</sup>. How can this observation be linked to the observations made in earlier sections?

From section 2, it can be learned that overall, SMC does not lead to recovery of fixed costs: only LMC would do so, because only in the long-run perspective, investments are included in the calculations. However, LMC has the disadvantage that in the short run, which in a port context can still be fairly long, it either leads to overcapacity or a shortage of such capacity. The reason is that under a certain seaport investment, in a situation of demand which is lower than expected, overcapacity will occur, which shows that the price asked was too high. When demand is higher than expected, a capacity shortage will occur, showing that the price asked was too low.

The fact that in ports, apart from the terminals, fixed cost investments are very substantial, and there is practically no way to allocate marginal effects per vessel, implies that values recovered from SMC in pricing in ports are extremely low. In no way can this be an attractive investment for private partners, who are constantly looking for profit and a sufficient return on investment.

This is slightly different in other modes of transport, where the marginal effect on investments, in particular infrastructure, is more easy to observe. In road and rail transport, wear and tear of infrastructure is quantifiable, and well-developed cost figures exist, based on widely spread and long lasting cost records. It is less the case in barge and air transport, and extremely so in the port sector.

It can be expected that for terminals, the situation is similar, as far as the infrastructure part is concerned. Matters are different for terminal operations, where a clear allocation of costs per vessel is possible, so that there is a higher tendency to apply marginal cost pricing. A factor which further compels to do so, is the strong competition within the terminal business, and the market power exerted by the shipping lines as customers.

As fixed investment volumes per project are only expected to further rise, if only for the side effects to be mitigated (environmental, social,...), it can be expected that the attractiveness of such port-related projects will not increase, on the contrary.

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<sup>32</sup> According to the projects recorded by the Worldbank.





## 5. Conclusions

From a theoretical perspective, SMC pricing is shown to be a well working principle, on condition that as many as possible of the activities have clearly attributable marginal effects. LMC pricing in general is said to be optimal for the average investment. However, in a port sector, with infrastructure investments that last for a very, very long number of years, applying LMC pricing would lead to either under- or overcapacity, which is not optimal from a welfare-economic point of view.

For stimulating private involvement in the port sector however, through PPP for instance, SMC would not be very helpful, since typically, only a very minor part of the investment would be paid for by the actual user. In no way can this be considered a profitable and attractive investment, especially when the non-terminal elements are considered.

This is also observable in the actual PPP agreements that were made in a port context: According to Worldbank data, Europe and North America feature none, and in the parts of the world where they are applied, the numbers of projects are low, and mainly focus on terminal investments.

When looking at the prices that are actually applied in the port sector, these seem to be far below the tariffs that should be asked when SMC would be applied. Even stronger, the rules and criteria applied when pricing vary very strongly between ports. No port resembles another: not in the actual unit tariffs, and not in the categories and criteria applied. So there is a strong point for introducing marginal cost pricing.

How this could be done in a port context, was partly analyzed in this contribution, in a theoretical way for the entire port call stretch, and with actual calculated values for the use of locks when calling at a port. But for attracting PPP agreements, apparently, SMC would not help much.



## **7.2 Does the political and economic context influence the success of a transport project ? An analysis of transport public-private partnerships**

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### 1. INTRODUCTION

National governments around the world differ substantially in their social and economic structures and in particular in their infrastructure endowments. State governments are characterized by diverse administrative cultures and capabilities and distinct legal and planning traditions. For instance, institutional diversity in the transport sector is considerable, with countries adopting different approaches with respect to user charges and ownership structures, and thereby implementing various approaches to infrastructure investment strategy and financing. Despite these differences, a framework for what are now referred to as PPPs (Private Public Partnerships) has emerged to provide transport services through partnerships between three main actors: public sector, private sector and multilateral lenders. The main potential benefit of the PPP approach in transport is its flexibility in adapting the structure of incentives and risk-sharing to the features of the project and to the economic and institutional environment. But because of this flexibility, it is perhaps unwise to seek a unique model of PPP that can be replicated across transport sectors and across countries. The choice context is indeed a multi-objective decision, and in practice, the three actors have to achieve a judgment about the trade-offs between the various, sometimes conflicting, objectives.

The literature devotes special attention to the difficulties in PPP agreements between the public and private sector (Laffont, 2000; Laffont and Martimort, 2002; Grout, 1997; Hart, 2003). Private banks are seen as the party that always wins (Estache, 2004) even if a project fails, or if the government and the private company have to renegotiate the PPP. Within this framework, multilateral lenders such as the European Union and the World Bank have openly supported public projects involving PPP agreements between private investors



and governments, especially from developing countries (Independent Evaluation Group World Bank, 2007). A number of papers analyse the behaviour of the private investor, in particular by focusing on the maximization of private benefit under incentives schemes (Laffont, 2000; Laffont and Martimort, 2002; Laffont and Tirole, 1993; Martimort and Pouyet, 2006).

When examining PPP agreements, several authors observe the necessity for a shift in the public sector role: that is, from being merely a provider to increasingly becoming a regulator (Independent Evaluation Group World Bank, 2007). This implies the need for a legislative and administrative framework in order to facilitate PPP investments (Medda and Carbonaro, 2007). Although many countries use PPP arrangements, we observe different ways of adopting this approach due to different cultural influences and traditions in planning and management of public works, deficiencies in legal and institutional structures, and different degrees of political awareness and acceptance of the PPP concept. Hammami et al, (2006) highlight the potential significance of a country's past experience in PPPs in attracting further PPP projects to that country. However, we observe that there is as yet no empirical evidence showing how this experience may (or may not) affect later PPP outcomes. Also, the connection between a country's level of corruption has not been studied in the light of its influence in the success of a transport PPP project. Several studies have been made about corruption and its influence on economic growth (Leff, 1964; Huntington, 1968; Gould and Amaro-Reyes, 1983; United Nations, 1989; Klitgaard, 1991; Schleifer and Vishny, 1993; and Mauro, 1995), but none has been conducted using a stringent microeconomic methodology.

The objective of the present paper is to examine how the three actors, public sector, private sector and multilateral lenders, each contributes to the success of PPPs in transport investments, by considering different political and socio-economic contexts. We will also focus our analysis on the effect of a country's level of corruption and democratic accountability in the success of a PPP project.

The paper is organized as follows: Section 2 presents our hypotheses with their theoretical backgrounds. In Section 3 we describe the dataset used to test the hypotheses previously described, outline the dependent and independent variables employed in our analysis, and explain the modelling procedure. Section 4 describes and analyzes our results on the variables that may affect a PPP outcome and thus concludes the paper.



## 2. HYPOTHESES FORMULATION

In order to address the impact of the three actors on the success of PPPs, in this section we discuss the hypotheses that represent the backbone of our analysis. Although there are many elements which influence the success of PPP agreements, we consider in this analysis three main building blocks: country experience, investors and multilateral lenders.

The first block represents the country's past experience in transport PPP projects as well as its macroeconomic performance when the project started and the way a country is perceived in terms of corruption and democratic accountability. This block will be the foundation for the success of the project and will (or will not) reinforce the subsequent blocks. We assume that a country with "bad" past experience in PPP projects and/or deficient macroeconomic performance will not attract as many private investors for its PPP projects, as would another country with better experience. The second block is the link between the private investors involved and the PPP project. The private investor might have several characteristics, and in this paper we focus on the number of private investors forming the consortium in charge of the PPP project. The final block represents the multilateral lenders supporting the PPP project. Although some of the literature discusses their role as agents of policy change and focuses on how they might add a degree of external coercive pressure to the PPP project's national government (Henisz et al, 2005), we concentrate on their presence as a means of success for the PPP project.

### 2.1 Country experience

#### 2.1.1 Country's past experience with transport PPPs

Past experience in running infrastructure projects related to transport projects may be a good forecaster of future PPP outcomes related to transport. It reflects not only the government's reputation in its capacity to honour agreements with the private sector, but also the capability of the private sector to accomplish projects with the private sector. This experience has proven to be a critical predictor of successful future PPP arrangements (Hammami et al, 2006). Positive outcomes and thus country experiences on previous transport PPPs are associated with positive outcomes of future PPPs in that country.

Hypothesis 1a: Good country experience on previous transport PPP projects is positively associated with the outcome of the next PPP in that country.



Past experience sometimes also implies the existence of unsuccessful PPP projects. This experience, although “bad”, might enhance the future chances for successful PPP projects due to lessons learned from a negative experience. However, we assume here that having unsuccessful PPP projects means having a black spot on a country’s record of PPP projects, and can therefore potentially discourage future private investments, attract fewer investors, and may also signal to the government or the public sector that they are not coping successfully with PPP projects.

Hypothesis 1b: Bad country experience on previous transport PPP projects is negatively associated with the outcome of the next PPP in that country.

### 2.1.2 Country’s macroeconomic performance

The stability of a country, based on its macroeconomic conditions, is important in order to attract private and foreign investors (especially in emerging markets, as shown in Dailami and Klein, 1998), and has also proved to be important in limiting the number of PPPs in a country (Hammami et al, 2006). We will analyze its effects on the positive outcome of a PPP. Poor macroeconomic conditions may hinder the success of a PPP project, whereas a good macroeconomic performance may foster better outcomes.

Hypothesis 1c: Satisfactory country macroeconomic conditions are positively related with the chances of successful PPP projects in that country.

### 2.1.3 Country’s corruption index

Most of the economic literature agrees that corruption would tend to lower economic growth (Gould and Amaro-Reyes, 1983; United Nations, 1989; Klitgaard, 1991; Schleifer and Vishny, 1993; and Mauro, 1995).<sup>33</sup> As pointed out by Mauro (1995), corruption may reduce economic growth as it lowers the incentive for entrepreneurs to invest. Corruption can also distort the composition of government expenditure, shifting the expenditure of public resources from socially desirable projects to projects where it is easier to extract large bribes. When a country is perceived as corrupt, there might be fewer private investors willing to support projects in that particular country, constraining the set of potential investors (and thus restraining the “optimal” investor for the project). There is also a higher probability that the chosen provider may not be the most capable, but rather the one with the best bribe, thus limiting the likelihood for a successful outcome.

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<sup>33</sup> Some authors have pointed out that some level of corruption is desirable (Leff, 1964; Huntington, 1968).



Hypothesis 1d: The more a country is perceived as corrupted, the less likely it is that the PPP has a positive outcome.

In order to test if the perception of corruption may be more relevant in some regions rather than in others, the interaction between them will also be analyzed.

Hypothesis 1e: The effect of the perception of corruption on the success of a PPP varies within projects in different regions.

#### 2.1.4 Country's democratic accountability index

When a developing country is perceived as having low democratic accountability (DA), it means that that country's government is less responsive to its people. For instance, an autarchy would be perceived as having the lowest DA, whereas an alternating democracy<sup>34</sup> would be perceived with the highest. Although it might be the case that a lower number of investors would like to invest in a country with a low DA, once a willing private investor is selected for a PPP project, government support (with all its authority) will follow, and so it is less likely that this PPP will fail. Conversely, a PPP agreement in a country with a high DA will have government support, but it might be subjected to a shift in support due to change unforeseen by means of a democratic vote.

Hypothesis 1f: The more a country is perceived as having low democratic accountability, the more it is likely that the PPP has a positive outcome.

The influence of the perception of DA may differ among the different types of projects. Projects such as airports, seaports and railroads are more capital-intensive than toll roads, thus they have a higher level of risk. Governments with lower DA will have more authority to assist these types of projects if needed, whereas governments with higher DA will generally not be able to do it.

Hypothesis 1g: The effect of the perception of democratic accountability varies within different types of projects, thus affecting the final outcome of a PPP project.

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<sup>34</sup> By alternative democracy we refer to a country's democracy, where besides having fair and free elections to the executive and legislative powers, and an active presence of more than one political party, there is a viable opposition and the executive power has not served more than two successive terms. In other words, it is a democracy where the same party or coalition has not been continuously in power.



### 2.1.5 Country's region

Countries belonging to certain regions usually share cultural, socioeconomic and political characteristics. They might have a similar rule of law, or they might react the same way to certain situations or problems. There are also regions with more experience in PPP projects than others, as shown in Sirtaine et al, (2005): Latin America and the Caribbean region have received 50 percent (US\$345 billion) of worldwide private capital flows to the infrastructure sectors during the 1990s. The implication here is that the region where which the project is located can possibly affect the success of a PPP transport project.

Hypothesis 1h: The region where the project is located affects the outcome of a PPP project.

Different types of projects may have diverse results among the regions, as proven by Sirtaine et al (2005), who evaluated the profitability of infrastructure concessions in Latin America and found differences among sectors. The experience that a region has in toll roads versus seaports can be dissimilar, and the ways the different societies might welcome certain projects can vary. The interaction between types of projects and interaction among the regions will be analyzed.

Hypothesis 1i: The region where the project is located, and the type of project affect the outcome of a PPP project.

## 2.2 Investors

### 2.2.1 Number of private investors

As the number of private investors increases, it may be harder for them to agree and to work efficiently; therefore, a negative outcome for the PPP project may become increasingly likely with more than one private investor.

Hypothesis 2a: If there is more than one private investor on a PPP project, it is more likely that the PPP has a negative outcome.

However, the ways the number of investors affect countries with different incomes can differ. In countries with low- and lower middle-incomes, more than one private investor in a PPP project could indicate that the consortium has broader expertise and proficiency in PPP projects; they will share part of the costs and risks; and more parties will be watchful



of their own (and their partners') investments. These characteristics may prove to be more relevant in countries with low- and lower middle-incomes, since the country itself might not have the expertise on infrastructure investments. A positive outcome for the PPP project may therefore be more likely with more than one private investor in low- and lower middle-income countries.

Hypothesis 2b: If there is more than one private investor on a PPP project, it is more likely that the PPP has a positive outcome in a low- or lower middle-income country.

### 2.2.2 Private percentage of the project contract or company owned by private investors

Ownership is a major factor in the PPP literature, as discussed by Bennet and Iossa (2006) and Valila (2005), because ownership will provide certain incentives to the private sector in charge of the PPP project. In every PPP project a project company is in charge of its development, or a project contract stipulates the rights and duties of the private parties. A project company may be owned by a percentage of the private investors.<sup>35</sup> Whenever private investors own a larger share of the project company, they should have a greater incentive to become involved and closely follow the results of the project. Thus when they own a greater share, it is expected that a better outcome can be achieved by the PPP project.

Hypothesis 2c: Positive PPP outcomes are more likely to occur when the private percentage ownership of the project company (or the project contract) is higher.

## 2.3 Multilateral lenders

### 2.3.1 Role of multilateral lenders

Multilateral lenders or lending agencies (the World Bank, European Investment Bank and Asian Development Bank, among others) are sometimes involved in PPP projects by executing their role as the giver of loans. As proven by Butkiewicz and Yanikkaya (2005), lending by these agencies stimulates growth in the recipient countries in some cases. To be sponsored by these multilateral lenders, government and private investors in a PPP project

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<sup>35</sup> The private investor's ownership may be a percentage of the project contract or project company but this does not necessarily indicate the ownership of the project's assets.





must fulfil several conditions, such as the timing of recouping the investment, interest rates and regulation regime. Many lenders monitor the PPP process from its inception, through the selection of the private investor, and to its final development and completion. If a PPP project is sponsored by a multilateral lender, it will be invigilated, thus the PPP's failure should be increasingly unlikely.

Hypothesis 3: Existence of multilateral lenders in a PPP project will enhance the positive outcome of that PPP.

In the next section we will describe the dataset used to test the six hypotheses described, and we will explain the modelling procedure and the dependent and independent variables employed in our analysis.

### 3. METHODS

#### 3.1 Data description

To test the previous hypotheses, a database with 856 transport PPP projects was used. The database is part of the Private Participation in Infrastructure Projects Database, which has projects from four sectors: energy, telecommunications, transport, and water. The original database is a joint product between the World Bank and the Public-Private Infrastructure Advisory Facility (PPIAF).<sup>36</sup> In order to be included in the database, the project must involve the ownership or operation of physical assets required to provide the infrastructure services, and must have a private investor who bears a share of the project's operational risk. Only 856 projects related with the transport sector are analyzed in this paper. Transport sector projects are divided into four subsectors: toll roads (47%), seaports (29%), airports (13%), and railroads (11%).

The database<sup>37</sup> provides information for transport projects that have reached their financial closure<sup>38</sup> between 1984 and 2005. Figure 1 illustrates that almost one-third of the projects reported reached their financial closure between 1996 and 1998. The increase in the number of projects reflected in 1990 is due mainly to the toll roads subsector, whereas the increase until 1998, and the decline since 1999, is reflected in all subsectors.

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<sup>36</sup> The database can be downloaded at <http://ppi.worldbank.org/>

<sup>37</sup> Data regarding macroeconomic information for the countries included in the database was collected from the World Economic Outlook of the International Monetary Fund (<http://www.imf.org/external/pubs/ft/weo/2006/02/data/index.aspx>) Data regarding the corruption and democratic accountability index are from PSR Group database.

<sup>38</sup> Financial closure, as defined by the Private Participation in Infrastructure Database, occurs when there is a legally binding commitment of private investors to mobilize funding or provide services.



The database only includes projects awarded in low- and middle- income countries as classified by the World Bank (2005). The transport database covers data from 72 countries, classified in six regions: East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, South Asia, and Sub-Saharan Africa. Almost half of the projects (44%) are from Latin America and the Caribbean, and dispersed mostly among Brazil, Mexico, Argentina, and Chile. The projects from East Asia and the Pacific are highly concentrated in China, while the projects from South Asia are concentrated in India.

### 3.2 Modelling procedure

Our dependent variable (Success) is a binary variable, taking the value zero, if the project's status was either cancelled or distressed, and one, if the project's status was under construction, operational or concluded. In order to estimate the regressions, we use a generalized linear model in the form of a logit model (Greene, 2003)

$$\Pr(Y = 1 | x) = \frac{e^{x'b}}{1 + e^{x'b}}$$

(3.1)

where  $Y$  is the dependent variable,  $x$  is the vector of independent variables, and  $\bullet$  is the vector of parameters.

### 3.3 Dependent variable

Each project of the database may be in one of the following five states: i) under construction (projects for which assets are being built); ii) operational (projects that have begun providing services to the public); iii) concluded (projects for which the contract period has expired and the project was neither renewed nor extended by either the government or the operator); iv) cancelled (projects from which the private sector has exited before the end stipulated in the contract); and v) distressed (projects where the government or the operator has either requested contract termination or are in international arbitration).



The status of the project was grouped into a dichotomous measure, entitled Success, equal to one if the project's status was under construction, operational or concluded. In our sample of 856 projects, 804 were in this status (94%). If the project's status was either cancelled or distressed, the dependent variable was set equal to zero. Table 1 illustrates the total status of the projects in the database and their relation to the dependent variable.

### 3.4 Explanatory variables

Past experience with PPPs. Two variables measuring the past experience of a country in transport PPPs were created, entitled Yes PPP Experience and No PPP Experience, respectively. For a PPP, Yes PPP Experience counts the number of successful<sup>39</sup> transport PPP projects done in the country of the PPP at the moment of the PPP's financial closure; whereas No PPP Experience counts the number of unsuccessful<sup>40</sup> transport PPP projects done in the country of the PPP at the time of the PPP's financial closure. Both variables are set to zero for countries with no prior experience in transport PPPs. PPP projects undertaken in the same country do not necessarily have the same values in Yes PPP Experience or No PPP Experience, since it depends on the year that each country has its financial closure.

Variables that characterize a PPP. A variable representing the total investment (investment in facilities and in government assets) for each project was included (Total Investment). Its values are in 2005 constant US million dollars. It is expected that a project needing more investment will have greater difficulty achieving a positive outcome. Another variable (Percentage Private) was set to show the percentage of the project company or project contract owned by private investors. The database projects may belong to one of the following transport sectors: toll roads, seaports, airports, and railroads. One dummy variable was created in order to report the type of sector in which the project belonged: Toll Roads became 1 if the project was a toll road project, 0 otherwise.

Number of investors. The variable (Investors) was built in order to capture the effect of the number of private investors in a PPP project. Table 2 illustrates the frequency of the consortiums comprised of more than one private investor across the different regions. In

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<sup>39</sup> Successful is understood as a project whose status was under construction, operational or concluded.

<sup>40</sup> Unsuccessful is understood as a project whose status was cancelled or distressed.



general, 41% of the total of PPP projects of the database involves more than one private investor, but these consortiums are primarily in Latin America and the Caribbean (61%).

Multilateral lenders. The variable Number of Agencies was constructed to reflect the number of multilateral lenders in certain projects. As shown in Table 3, a multilateral lender supported only 12% of the projects in the database, and 57% of these are projects realized in Latin America and the Caribbean.

Country's corruption index: A 6-point scale variable Corruption was included for each country for the project's year of financial closure. The value 6 was given to the most corrupted country as perceived during that year. The types of corruption that the variable takes into account are actual or potential corruption (excessive patronage, nepotism, job reservations, loose ties between politics and business, etc).

Country's Democratic Accountability: A 6-point scale variable Democratic Accountability was included for each country for the project's year of financial closure. The higher number of points is assigned if a country is closer to an alternating democracy governance, while the lowest score is assigned to an autarchy.

Country's Region: Three dummy variables were created to classify the region in which the project was executed. Africa becomes 1 if the project is in the Sub-Sahara Africa region or in the Middle East and North Africa region, 0 otherwise. Asia becomes 1 if the project is in the South Asia region or in the East Asia and Pacific region, 0 otherwise. Latin America becomes 1 if the project is in the Latin America and the Caribbean region, 0 otherwise. Projects executed in the Europe and Central Asia region were taken as the base case and represented when the three dummy variables became 0.

Country's Income: One dummy variable was created to classify whether by the project's financial closure the country of the project was a low- or lower middle-income country or an upper middle-income country. Low and Lower Middle Income variable became 1 if the country of the project was a low- or lower middle-income country, 0 otherwise.



Other explanatory variables. A dummy variable to include GDP growth was added (GDP growth). If, during the year of financial closure GDP growth of the project's country is negative, then the value of this dummy is zero. If GDP growth is between 0% and less than 3%, it takes the value one; if it is between 3% and less than 6%, it takes the value two; and it takes the value three if GDP growth is more than or equal to 6%. Another variable was included to measure the country's development: the current account balance as the percentage of GDP for each project on its year of financial closure (Account). Finally, in order to capture exogenous macroeconomic trends that might be affecting the results, the variable Trend was created, starting at 0 in year 1984, and adding one for each year until 2005.

#### 4. RESULTS AND DISCUSSION

Four models were estimated as shown in Table 4. Model 1 was our first approach in modelling the hypotheses, where we focused on the effect of the variables representing countries' past experience with PPPs (Hypotheses 1a and 1b), macroeconomic performance (Hypothesis 1c), corruption (Hypothesis 1d), democratic accountability (Hypothesis 1f), number of investors (Hypothesis 2a), and multilateral lenders (Hypothesis 3). As not all the variables were statistically significant at a 95% of confidence, Model 2 was estimated in order to fulfil this requirement. In Model 3 we wanted to upgrade the estimation by including the dummy variables representing the different regions of the world where projects are located (Hypothesis 1h), and the interactions between the former variables used and the regions (Hypothesis 1e), types of projects (Hypotheses 1g and 1i), and the income level of the country (Hypothesis 2b). Model 4 resumes all of the hypotheses and shows those that proved to be statistically significant.

We find strong support for almost all of our hypotheses. In all specifications the variable representing the total investment (in facilities and government assets) proves to be significant. We find statistically-robust support for a negative association between the total investment and the success of a PPP project. This seems likely, as a higher total investment means a riskier project, which in turn makes it increasingly difficult to achieve a successful outcome.

Consistent with Hypothesis 1a, we observe a positive association between a country's past experience with transport PPP projects and the success of later PPPs. All the models show that the parameter for the variable Yes PPP Experience is statistically significant and positive. This reflects the significance that past experience in transport PPP projects plays



in the success of future transport PPP projects. Past experience is not only a learning process, but also highlights a government's reputation in honouring this type of agreement. In a similar way, Hypothesis 1b is strongly supported by the models, denoting a distinction between good and bad experience (successful and unsuccessful projects), and sanctioning failed past experience in transport PPP projects.

As expected, we also find a positive association between a country's macroeconomic performance, reflected in the variables Account and GDP Growth, and the positive outcome of a PPP project (Hypothesis 1c). Both models acknowledge the importance of the variable Account. On the other hand, Models 1 and 3 indicate a positive influence of the variable GDP growth in the success of a PPP, but they also show a low significance. The variable account only proved to be significant in Model 3. The macroeconomic conditions on the models suggest the relevance of these indicators in predicting the outcome of a PPP project. While good macroeconomic conditions may enhance the positive outcome of a PPP project, poor macroeconomic conditions may inhibit it.

In the case of the variable related with corruption, there is a negative association between countries perceived as more corrupted and successful PPP projects (Hypothesis 1d). This highlights the difficulties that PPP projects may face in more corrupted countries, where fewer investors are willing to supply a PPP project, thus constraining the optimal outcome of a PPP. Also, even if there are private investors willing to participate in the PPP project, it may be that the selected private partner will be the one with the best bribe or better political relationships, rather than the most capable one. The influence of corruption appears more prevalent in a project's success if it is executed in Latin America and the Caribbean and Africa (Hypothesis 1e). These regions seem to be more sensitive to the perception of corruption, although the average of the country's perception of corruption in Latin America is not the highest. This situation might reflect a market threat in countries perceived as corrupted in Latin America and the Caribbean.

Regarding Hypothesis 1f, both models show a strong positive relationship between developing countries perceived with low democratic accountability and PPP outcomes. Considering the countries in our dataset, this relationship highlights that a country with a low democratic accountability score, perhaps an autarchy government, may potentially have more authority to support the PPP project than a more democratic government. These types of infrastructure projects (highways, ports, airports, etc.), which require large sunk investments and a very long recouping period, are often perceived as an improvement by



people living in developing countries; and their failure is related with a government's failure. Therefore, in order to fulfil the requirements of the projects, governments with lower democratic accountability seem more prone to successful PPPs. However, the perception of democratic accountability seems to be more relevant in all transport projects except toll roads, which is in line with the previous justification about the necessity for large capital investments in these types of transport investments.

In order to use the dummy variables for regions (Hypothesis 1h), all the projects in Europe (and Central Asia) were regarded as the benchmark. As shown in Model 4, Asian (South Asia or East Asia and the Pacific), African (and Middle Eastern) and European countries bear the same risk in terms of transport PPP success. Conversely, Latin American (and Caribbean) countries show a lower risk of failure. This could be due to the longer PPP experience that most Latin American countries in the database have compared with other countries in other regions. Although projects from European countries have been more successful (in percentage) than Latin America's, they are fewer in number and thus their PPP experience is lower.

Turning to the hypotheses regarding investors (Hypotheses 2a and 2b), we find enough evidence to support Hypothesis 2a. Variable Investors proved to be significant to assert the importance of the number of investors in a transport PPP project. As the number of investors increases, the chance of a successful PPP decreases. Larger numbers of private investors that form big conglomerates may have increased difficulty in communication and a higher chance of dispute among them. On the other hand, countries with low- or lower middle-income appear to offset this result as the parameter representing this interaction appears to be positive and significant (Hypothesis 2b). These countries usually have lower expertise in large infrastructure projects (and less in PPP projects), so greater investor expertise might prove to be more relevant than a communication problem. A project in a riskier country represented by a low income status could, moreover, compel private investors to remain alert and involved in this particular investment.

Hypotheses 2c and 3 are not statistically validated by the models presented in Table 4. The variable representing the existence of multilateral lenders proves to be statistically insignificant, but its positive sign confirmed at least that the suppositions described previously were in the right direction. To understand these results, a correlation analysis was made and no indication of a correlation arose between these variables and the other ones modelled. Previous results (Galilea and Medda, 2007) have shown that before



introducing such variables as corruption, democratic accountability and regions, these two variables were statistically significant, but their importance lessened and thus lowered their significance. As shown in Table 3, only 12% of the database projects had at least one multilateral lender, so we will continue to analyze their importance as more projects (with more information) become available.

In relation to the models, only Models 1 and 2 focus on the variables describing project and country, whereas Models 3 and 4 use the information provided by the first two models and add the interaction between variables and the region constants. As the log likelihood increases, this information proves to be relevant for the estimation. The best model is Model 4, since it includes more information about the variables and the interactions between them; it is statistically superior than Model 3 (all its parameters are significantly different than zero); and, because a loglikelihood-ratio test does not reject the null hypothesis that both models are equivalent, for parsimony, Model 4 is better.

## 5. CONCLUSIONS

PPP projects have gained relevance as a way to finance transport infrastructure and services. PPPs have been supported by governments, sponsored by the private sector, and have also been favoured by multilateral agencies. Although there are numerous successful PPP projects, notwithstanding, there have also been a large number of “divorces” (Estache, 2004). In this paper we have presented empirical evidence on the role that country experience in PPPs, private investors, and multilateral lenders may play in the positive outcome of a PPP in transport.

A country’s past experience in PPP agreements in transport is important, not only in attracting new investment projects, but also in instilling greater confidence in the success of present projects. This also means that countries with poor past experience, or no past at all, will find it more problematical to complete successful PPP projects. However, if multilateral lenders want to promote PPP investments, they should support projects in countries with limited or no experience and help them set up a regulatory and/or legislative framework for PPP projects.

It is not surprising that GDP growth and the current account balance as a percentage of the GDP may impact on the success of a PPP project. Unfortunately, countries that require successful PPPs often have very low (or even negative) GDP growth and a negative account





balance. As Hammami et al, (2006) also highlights, development agencies should assist these countries to pull them out of the underdevelopment trap.

The perception of a country's level of corruption and democratic accountability appears to be relevant in the final outcome of a PPP project. Countries with governments perceived as corrupted will hardly find international investors (often those with the most experience in this type of project) or even capable ones willing to construct and/or supply the project. Moreover, usually the company selected could be the one with the higher bribe and/or with the best political connection, rather than the most capable one. On the other hand, projects developed in countries with governments perceived as having low democratic accountability can achieve better performance than projects in countries perceived as having higher democratic accountability. In this case it seems that autarchies may have a better capacity to assist PPP projects, if needed, than in the case of alternating democracies.

The importance of the region where the project is located has proven to be relevant, making Latin American projects more attractive for success, and thus for future investors. Although European and African projects in the developing world do not have a poor record in terms of their success, they do have less experience in PPP agreements in transport, and this situation could be damaging their score (in relation to Latin American projects). Development agencies should focus on these regions, not only to allow them to grow in terms of experience, but also to help them define a regulatory framework for PPP projects.

A critical point in our research is certainly the definition used for the success of a PPP, since we consider a variable linked with economic performance, rather than use a variable related to the status of a project. Our further research will be directed towards obtaining more precise investment information in order to broaden our results. We will compare the results with a similar analysis of transport PPP projects in the developed world, since certain conclusions, such as the effect of corruption, may be different in this scenario.

Also, it would be interesting to study the success of PPPs focusing within one transport subsector in order to add more specific characteristics and some efficiency indicators into the analysis.

## FIGURES AND TABLES

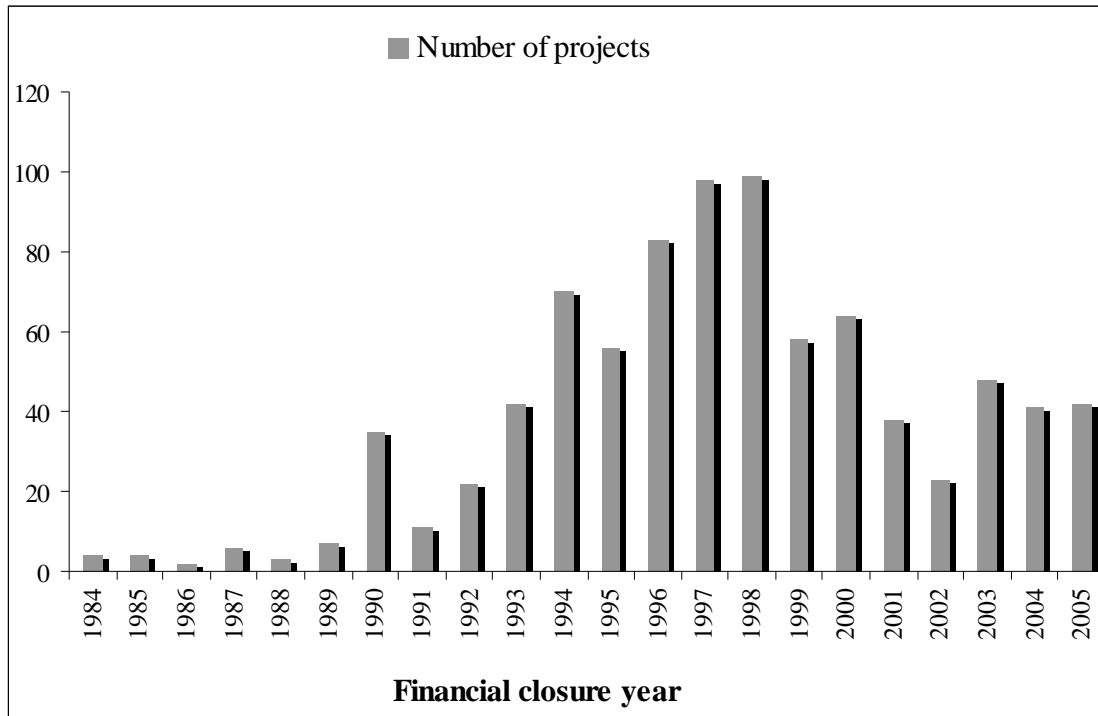


Figure 7-11 - Number of transport projects by year

Source: Private Participation in Infrastructure Projects Database, World Bank



Table 7-12 -: Status of the projects in the database

Project status	Dependent variable		Total
	0	1	
Operational	-	694	694
Construction	-	67	67
Cancelled	46	-	46
Concluded	-	43	43
Distressed	6	-	6
<b>Total</b>	<b>52</b>	<b>804</b>	<b>856</b>

Source: Private Participation in Infrastructure Projects Database, World Bank

Table 7-13 -: Incidence of multiple private investors across regions

Region	Number of private investors		Total
	One	Two or more	
Latin America and the Caribbean	152	215	367
East Asia and the Pacific	220	51	271
South Asia	53	25	78
Sub-Saharan Africa	36	28	64
Europe and Central Asia	28	27	55
Middle East and North Africa	15	6	21
<b>Total</b>	<b>504</b>	<b>352</b>	<b>856</b>

Source: Private Participation in Infrastructure Projects Database, World Bank

Table 7-14 -: Incidence of multilateral support across the regions

Region	Multilateral support		Total
	No	Yes	
Latin America and the Caribbean	309	58	367
East Asia and the Pacific	255	16	271
South Asia	74	4	78
Sub-Saharan Africa	52	12	64
Europe and Central Asia	44	11	55
Middle East and North Africa	20	1	21
<b>Total</b>	<b>754</b>	<b>102</b>	<b>856</b>

Source: Private Participation in Infrastructure Projects Database, World Bank



Table 7-15 -:: Models predicting PPP success

Variables	Model 1	Model 2	Model 3	Model 4
(Intercept)	4.21 (2.56)*	5.97 (4.27)**	3.72 (2.07)*	3.37 (3.14)**
Africa			1.38 (0.57)	
Asia			0.032 (0.02)	
Latin America			7.34 (2.44)*	6.53 (2.31)*
Latin America & Toll Roads			-2.20 (-1.44)	-2.60 (-2.24)*
Africa & Toll Roads			1.38 (0.57)	
Asia & Toll Roads			-1.19 (-0.74)	
Total Investment	-0.00065 (-2.02)*	-0.00055 (-1.73)*	-0.00041 (-1.06)	-0.00070 (-2.02)*
Number of Agencies	0.44 (1.32)			
Investors	-0.37 (-2.18)*	-0.33 (2.01)*	-0.34 (-1.79)*	-0.39 (-2.11)*
Investors & Low and Lower Middle Income Countries			0.38 (1.18)	0.64 (2.07)*
Percentage Private	0.012 (1.24)			
Yes PPP Experience	0.14 (4.89)**	0.15 (5.10)**	0.15 (4.57)**	0.15 (4.79)**
No PPP Experience	-2.10 (-5.48)**	-2.16 (-5.68)**	-2.53 (-5.33)**	-2.30 (-5.53)
Account	0.11 (2.17)*	0.094 (1.84)*	0.090 (0.17)	
GDP Growth	0.35 (1.57)			
Trend	0.17 (2.19)*	0.15 (2.07)*	0.69 (2.65)**	0.18 (2.33)*
Corruption	-0.50 (-1.65)*	-0.48 (-1.60)*		
Corruption & Latin			-2.05	-1.99



America			(-2.40)*	(-2.44)*
			1.38	-0.58
Corruption & Africa			(0.57)	(-3.03)**
			0.52	
Corruption & Asia			(0.75)	
Democratic	-0.62	-0.61	-0.56	
Accountability	(-2.21)*	(-2.33)*	(-1.36)	
Democratic Acc. & not Toll Roads			-0.34	-0.50
			(-1.05)	(-2.29)
Number observations	621	621	620	620
Log Likelihood	-83.61	-86.42	-72.18	-74.99

Note: t statistics in parenthesis, \* significant at 5 percent, \*\*significant at 1 percent

The authors used program R for computing models 1 and 2 and Biogeme (Bierlaire, 2003) for computing models 3 and 4.



### **7.3 Toward the Betterment of Risk Allocation: Investigating Risk Perceptions of Australian Stakeholder Groups to Public-Private-Partnership Tollroad Projects**

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#### 1. Background

Public-Private-Partnership (PPP) tollroads are growing in popularity throughout the world. This is a response to the need to invest in road infrastructure as well as the constraints on public budgets that are increasingly focussing on sectors such as education, law and welfare where the private market is more ambivalent about its potential role. Roads in contrast have clear market returns and have attracted growing interest from the private sector at a time when governments are stretched in their ability and willingness to raise public debt.

Hence PPPs have been broadly adopted by governments as a financial means to procure, including but not limited to, infrastructure-based road services. A specific rationale of such a procurement policy is that greater value for money (vfm) in the public interest can be obtained through transferring risk to the party that is least risk averse (Partnership Victoria, 2000; HM Treasury, 2006; WWG, 2006) and that is best positioned to manage it (cf., NSW Treasury, 2005).

Numerous studies (cf., Ball et al., 2003; Grimsey and Lewis, 2005; Corner, 2006) have asserted that risk sharing is the *raison d' être* for vfm and risk transfer from the public sector to the private sector is prominent in PPPs (Li et al., 2005a). On the other hand, the common concern shared amongst market players is that the ethos of optimal risk allocation that risk should be assigned to the party that is best able to manage it, has not been adhered to (see for example two studies that surveyed participants of PPPs: NAO, 2001; Grimsey and Lewis, 2005).



Road infrastructure is one of the most active markets of PPPs in Australia (cf., Ernst and Young, 2007), possibly because of its high levels of capital consumption and its relatively low political sensitivity<sup>41</sup>. The tollroads in Sydney and Melbourne are shown in Figures 1 and 2. Private capital is primarily explored as a funding mechanism to solve a transport network problem, be it putting in a missing link or upgrading a vital arterial route. PPP road concessions resemble the nature of a sale-and-lease-back finance lease whereby a government sells to a private consortium<sup>42</sup> a *usus fructus*, i.e. the right to generate income from ownership (Buitelaar et al., 2007), normally for a price named “upfront payment”, to finance, construct and operate an infrastructure asset and profit from the sale of ancillary services generated from that asset. The private operator is given the power to charge users directly<sup>43</sup>, but (generally) has no financial recourse to government. In this light, tollroads are unique in the way that financial risk is transferred to the private sector with the cost of risk transfer borne by road users, and in the way in which government separates the financier and provider roles from its roles as the central planner and regulator.

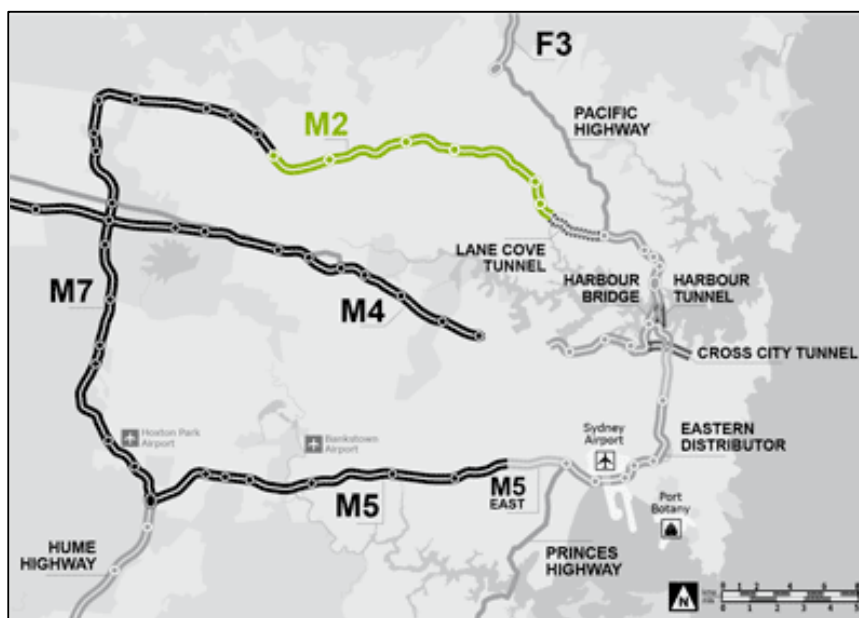


Figure 7-12 - Tollroads in Sydney

The PPP concession bundles the finance, creation, operation and maintenance of the asset into one single package. The bundling concept incentivises the private entity to apply

<sup>41</sup> Roads are subject to political visibility at a much lesser degree compared to other modes of transport such as rail, bus and ferry where there is a strong presence of labour unions, and other public services like schools, public health services and prisons where service deliveries are mainly subsidised by taxpayers. This conception may have contributed to the mismanagement of public perception in various tollroad projects.

<sup>42</sup> The consortium is generally organised in the form of a separate legal entity called the Special Purpose Vehicle (SPV) to operate each stand-alone project (Kozarovski, 2006).

<sup>43</sup> With the exception of shadow tollroads in the UK regarding which the Highways Agency pays the private operator(s) a fee based on the vehicle kilometres driven on these private roads (NAO, 1998).



innovation in the financing package and in design and construction, thus facilitating cost savings over the asset's whole-of-life operation and maintenance. The concession period ranges from 30 to 99 years in order to enable the private concessionaire to recoup the cost of capital and earn a required rate of return (Chung, 2008). In theory, these transport concessions should shield government from traffic risk, financial risk, and operation and maintenance risk, hence better financial vfm.



Figure 7-13: Tollroads in Melbourne

The extant literature suggests that the public sector and the private sector do not share a monolithic set of interests (Meyer and Miller, 2001), objectives (Li et al., 2005a), and expectations (Demirag and Khadaroo, 2008), with the implication being that different parties have different perceptions of risk and their capabilities of risk management differ.

These (mis)perceptions can strongly influence the manner in which partners take on risks and price these risks (Ball et al., 2003; Blanc-Strange, 2007). A number of empirical studies confirmed that perceptions held by different partners about risks, about the motives and behaviours of their opposing partners create significant complication in the negotiations of





risk allocation which would undermine the success of PPP projects (Arndt, 2000; Asenova and Beck, 2003; Li et al., 2005b, Weihe, 2008). These observations raise an interesting question about the eventuality of equitable risk sharing between public and private sector partners. Despite the criticisms of the inequitable risk sharing outcomes (cf., NSWAGO, 1994; NSWAGO, 1997; NSWAGO, 2000; Shaoul et al., 2006; Pollock et al., 2007), PPPs are here to stay. Not only do they provide an additional source of funding, but they also extend efficiency gains from market competition to infrastructure-based public service deliveries. Therefore, if risks and expectations are managed properly with a true risk-sharing partnership spirit, the betterment of risk allocation is likely to eventuate.

Two as yet unanswered questions within the literature are: i) in PPP tollroad contracts, what are the risk attributes that concern the public sector the most and, the private sector the most? and, ii) to what extent is the outcome of risk allocation between the public and private sectors influenced by risk perceptions of different stakeholder groups? The findings herein are the outcomes of a series of unstructured in-depth interviews with stakeholders in Australia who have been either directly or indirectly engaging in PPP road projects. In this chapter, the two research questions are explored in five sections. The next section discusses the extent to which value for money can be materialised through risk sharing in PPPs by examining the empirical findings in the extant literature. Section three explains the research methodology. Section four investigates the two sectors' capability of risk management and the role risk perceptions plays in allocating risks as perceived by the stakeholders being interviewed. Section five concludes with the findings and sets the scene for future inquiry.

## 2. Value for Money through Risk Transfer: An Empirical View

Discourses on achievement of vfm through risk transfer in PPPs are largely unsettled. Many empirical investigations in Australia and the UK show that vfm gains from risk transfer are concentrated in the following dimensions: cost savings to the public sector agency (Hall, 1998; NAO, 1999; AALSE, 2000; Ball et al., 2003; Pollitt, 2005; Allen Consulting, 2007), project on-time delivery (Lay and Daley, 2002; MacDonald, 2002; NAO, 2003; Fitzgerald, 2004), and bringing forward planned capital expenditure, thus enabling the community to have access to the facility sooner (Malone, 2005; Allen Consulting, 2007).

It is arguable that savings arising from transferring the risk of optimism bias, i.e. cost and time-overruns (Flyvbjerg, 2005) are unique to PPPs, as a fixed price construction contract yields the same benefit. The novelty of PPPs is premised on the surrender of the rights to



control the asset to the private sector partner and the bundling of whole-of-life cycle costs. They create incentives for the private partner to use innovative financial packages and to undertake high quality investments at the design and construction stages in order to lower operation and maintenance cost (Li et al., 2005a).

Innovations in design and technology promoted by ownership were cited in Fitzgerald (2004) who examined a number of PPP projects in the state of Victoria, Australia. These innovations, together with the whole-of-life approach to maintenance, have translated into significant vfm. A similar conclusion was reached by Blanc-Brude et al. (2006). In testing 304 PPP roads in Europe, they argued that ownership provided a spur to better risk management and hence greater cost efficiency and productivity.

However, questions rose regarding the likelihood of vfm after governments have been charged excessive premiums. Critics disputed that the market discipline depicts a propensity that the cost of finance is in part influenced by how risks are negotiated and allocated between the public and private sectors; and that any unallocated risks will be effectively priced. It is therefore expected that the private sector would profit from the risks offloaded by the public sector through risk premiums (Blanc-Brude and Strange, 2007), and these premiums represent the excessive profit margin added by the private sector to cover unfamiliar risks. For instance, the Highways Agency who let the first tranche of shadow tollroads in the UK was charged with an excessive premium for the new financial risk created under the predicted traffic volume (NAO, 1998). As noted previously, PPP projects tend to shield governments from the risk of optimism bias, yet it is ambiguous that the risk transfer has yielded any vfm. Blanc-Brude et al. (2006) reported that, based on a large sample of PPP road projects in Europe procured between 1990 and 2005, although PPP roads were generally delivered on time and under budget, they were on average 24 per cent more expensive than traditionally procured roads, suggesting that the public sector was paying expensive premiums to transfer out the risk of optimism bias.

An inherent risk of PPPs lies in their risk allocation process. Risk allocations are the outcome of negotiations between direct participants - the private proponent and the public sector agency, where the latter also negotiates on behalf of the end users (Li et al., 2005a). It has long been recognised that end users have a significant stake in any PPP projects, therefore both government agencies and private consortia need to understand the desire of this major stakeholder group and determine what level of service, at what cost, is more desirable (Arndt, 2000, p.39). But concerns arise in regards to governance risk and



risk of failing to assume social responsibility and to be accountable for the welfare of end users by government (cf. Demirag and Khadaroo, 2008). Hodge (2004) argued that the real risk issues within PPPs are governance risks which are hard to quantify. Based on empirical observations of risks associated with the Melbourne Citylink (MCL), he contested that while commercial risks that had been transferred to the private sector were well managed, the governance risks were poorly handled by the government. The lack of transparency on the MCL's concept and clarity about the financial arrangements, together with insufficient consideration for the public interest, led to the downfall of a Good Governance Charter platform. The MCL case explicates that the government's confusion of its commercial and governance roles could potentially expose taxpayers to commercial and political tradeoffs. Moreover, governments often found themselves underestimating the risks of failing to assume social responsibility and taking into account the matter of public interest. Johnston and Gudergan (2007) investigated the public resentment over the Cross City Tunnel in Sydney (CCT), a tunnel that went into receivership a year after its opening because motorists refused to use the highly-priced facility. The incident demonstrates that while the government has successfully transferred out the financial risk, it failed to recognise that it was unable, in reality, to transfer the social responsibility and public accountability.

This failure further led to a breakdown in the social contract within the PPP relationship compromising the long-term contractual sustainability between the two sectors.

In summary, the mixed evidence in the literature has implicated that the extent to which risk transfers in PPPs deliver vfm remains a subject of discursive debate. Ostensibly, the concern goes beyond the allocation of commercial risk and project risk to the terrain of governance, public interest and social responsibility. It is important, therefore, that the successful allocation of risks is based on the knowledge of not only technical rationality (e.g., travel demand and cost of borrowing), but also public expectations and acceptance that underlines the public perception of private participation in public infrastructure.

### 3. Research Methodology

Unstructured in-depth interviews were adopted as a means of investigation for this study. The aim is to qualitatively examine risk perceptions of different stakeholder groups to PPP tollroads. The acquired knowledge will then be used to establish the links between perceptions of risk and the required attributes and their concomitant levels - these are summarised in the risk attribute matrix in the Appendix. We favour the unstructured in-depth interview approach because of its powers to achieve honest and robust responses



(Whitehead, 2002) and to ensure realism in the collection of an overall impression of stakeholders' perspectives. The unstructured approach encourages participants to openly express their viewpoints based on their experience in dealing, negotiating and auditing PPP tollroad projects.

To enable a balanced view, an almost equal number of interviewees were selected from the public and the private sectors who have been in/directly engaging in the decision-making of PPP tollroads. The remaining interviewees held current and past senior positions in State Auditor-General Offices in Australia. The majority of the participants with a public sector background, but who had recently retired from the public service, were quite comfortable in expressing their own opinions. Participants from the private sector are free from political influence, hence they were also fairly relaxed in discussing their views. All interviews lasted between 60 to 100 minutes, and were tape-recorded (with permission) to ensure accuracy and to facilitate analysis.

A few studies in the field of perceptions of PPPs employed a similar research methodology but none makes inferences about the extent to which that actual risk allocation is a subject of these perceptions. Nevertheless, these studies provide a useful benchmark for the current investigation. It is to the pointers established by these studies that we now turn.

At the aggregate level, governments' perceptions that vfm can be realised by bundling life-cycle responsibilities into one package, by exploring private sector's efficiency in design and management, and by transferring out risks have fast tracked the expansion of PPPs in Australia (Malone, 2005). There are doubts about whether the vfm concept is compatible with hard-to-quantify public values (Demirag and Khadaroo, 2008) due to the inherent contradiction between achieving financial vfm and safeguarding traditional values of public administration in terms of equality, transparency, democratic accountability and governance by rule (Weihe, 2008).

At the microscope level, the high risk nature of PPPs constitutes a barrier to entry for market participants (Ezulike et al., 1997). For those who are able to afford competing in this highly risky business, risk assessments were chiefly based on past experience and intuition with little attention given to political and reputational risks (Asenova and Beck, 2003; Johnston and Gudergan, 2007).



Arndt's (2000) study is the first to investigate risk allocation in Australian PPPs through in-depth interviews. The richness in the outcomes of his study merits some discussion in detail. First, the ways by which parties perceived risk varied depending on the aims and drivers of those parties, and their ability to control those risks (p.43). Second, the manner and form of the risk allocation for a PPP project were the key drivers of the financial and contractual structure of the project (p.58). Third, the level of risk aversion responded weakly to the firm's accumulated experience in PPPs but responded strongly and negatively to the intensity of market competition (p.310, p.325). Fourth, competitive pressure was the driving force for the evolution of the PPP market, with the danger that governments would use this market force to transfer to the private sector risks that are beyond their capacity to manage (p.325). Fifth, different types of stakeholders, i.e., debt providers, equity investors and contractors, held markedly different views regarding the importance of various factors in influencing the final risk allocation for a project, and regarding the most misunderstood risk category (p.310). Remarkably, the evidence failed to support the proposition that a party's ability to bear risks is a significant influence on its approach to the risk allocation negotiations (p.325). Rather, the approach was dominated by parties' loss aversion in which potential gains were not valued as highly as fears of potential losses (p.326). If this misperception about risks persists, risk premiums would not be reduced as much as they could be, and it would be difficult for governments to push for symmetrical risk allocation.

Follow these pointers, in each interview, we tackled the research questions in four dimensions that are primarily based on participants' perceptions of: a) benefits and gains arising from PPP tollroads; b) the public/private sector's capacity to manage risks; c) considerations that drive each party entering into a PPP tollway contract, and the extent to which these considerations influence their approach to negotiating risk allocation; and d) the process in which levels of tolls are determined. The present study contributes to the literature in the following ways. It is the first interview study, to our knowledge, that investigates the risk perceptions of PPP stakeholders with a focus on tollroads. Although there exist other studies investigating risk perceptions, this is the first one that delves into the subject that the influence of risk perceptions held by different stakeholder groups may have on final risk allocation.

#### 4. Risk Allocation and management

All participants were candid about their views on risk allocation as well as the respective capability of risk management of their own party and of the opposing party. All





Ø Unclear objectives	Ø Network risk	Ø Traffic risk
Ø Political/Reputational risks	Ø force majeure	Ø Financial risk
Ø Sovereign risk	Ø Media risk	Ø Risks associated with ownership
	Ø Public misperception	

Figure 7-14 - Base Line of Principles on Risk Allocation

#### 4.1 Traffic risk

This is the risk that traffic volume is lower than forecast, which results in total revenue derived from the project over the concession term varying from initial expectations. PPPs in the road sector work well in certain road contexts. These are typically urban or inter-urban roads with high volumes of traffic where operations are economically sustainable. All participants agreed that traffic risk is the greatest risk in tollroads and is the risk that governments want to divest the most.

When traffic risk is retained by the public sector, governments may be forced to top up revenue shortfalls. This can translate into unlimited financial risk as in the case of the Sydney Harbour Tunnel (SHT). From its opening to traffic in 1992, the SHT has cost the New South Wales (NSW) government over A\$235 million dollars due to declining traffic volume (NSWAGO, 2007; 2008). Even in cases where traffic risk has been transferred to the private sector, it is inevitable that government will bear some of the adverse consequences. Sydney's M2 and Melbourne's Citylink are examples for illustration. The concessionaires are contracted to pay land rent to the public authority. But rents are payable in concession notes and their redemption can only be triggered when actual toll receipts are sufficient to meet the hurdle rate of return on private equity (Chung, 2008).

Furthermore, recent tollroad concessions, e.g., the Eastern Distributor (ED), the Cross City Tunnel (CCT), the Lane Cove Tunnel (LCT) in Sydney, and the Melbourne Eastlink (MEL), provide provisions for governments to share upside gains on the condition that actual traffic volume is greater than the pre-specified threshold (Chung, 2008). No evidence proves that these upside gains have materialised.

Participants from the private sector believed that private tollroad companies have superior traffic modelling techniques because they have better access to information and expertise. They considered that private firms are better able to manage traffic risk and did not regard



transferring this risk by government as an excessive risk transfer. They admitted that traffic risk is a great concern during the ramp up period. A critical domain is finding the starting point where traffic starts to grow rapidly. They were confident that the growing pattern would eventuate after users realise the benefits of travel time savings and the comfort of driving on a high quality and less congested facility. This turned out to be the main appeal to commercial vehicles, as manifested in the heavy truck use of the MCL-the first private tollway in Victoria (Lay and Daley, 2002).

However, in the opinion of participants from the public sector, the private sector generally takes a less cautious approach in estimating traffic volumes during ramp-up. Recent cases (the CCT, the LCT and the MEL) confirmed that private firms have performed poorly in predicting the periods of time it takes for traffic to get over the ramp-up hurdle. There are three possible explanations of these erroneous forecasts.

First, there are a wide range of parameters feeding into the traffic model. These include demand elasticity of tolls, expected population and economic growth in the corridor, changes in trip patterns, strength of ongoing growth and the average length of trips. These estimates are generally provided in the project's Environmental Impact Statement (EIS) prepared by governments. The private participants complained that these estimates are often not robust enough, causing errors in their traffic forecast, whereas the public participants were discontented with the private sector's unwillingness to invest sufficient effort to understand the demographic composition of the affected corridor (see examples of the CCT and the LCT in the next section).

Second, a problematic domain lies with the prediction of short trips. This may be due to the fact that users perceive that gains in travel time savings for short trips are insufficient to justify the toll cost. Unpredictable short trips were the main reason attributable to the overestimation of traffic on Sydney's M7, where the forecast during the ramp up period was seen as over optimistic in terms of the number of vehicles, even though actual long trips have been better than forecast.

Third, many respondents asserted that increasing market competition has been the main contribution to over-optimistic traffic forecasts. This opinion is supported by a number of episodes documented in the literature. Fierce competition and market scepticism in regards to the commercial viability of a project pressured the private bidder to inflate





traffic numbers in order to win the lucrative contract, as in the case of the Eastern Harbour Crossing in Hong Kong (Tiong, 1995), the Sydney CCT (NSWAGO, 2006) and the MEL (VAGO, 2005). Further, the volume of predicted traffic has a decisive effect on the project's ability to raise finance, since project financiers are interested in the project's cash flows (Akbiyikli et al., 2006). This might have motivated project companies to produce optimistic forecasts in order to enhance the investment's attractiveness to financiers and equity investors.

To reduce traffic risk, the risk-averse private proponents will seek protection, not in a direct financial component, but in terms of the scope of the project, and in terms of the way it integrates with other parts of the network. They will seek to maximise the flow of traffic onto the tollroad by arguing for road closures or against the reopening of closed roads as occurred in the case of the CCT. This has given rise to a host of network issues.

#### 4.2 Network risk

Network risk arises when the contracted services or method of delivery of those services are linked to, rely on, or are otherwise affected by certain infrastructure and other services or methods of delivering the contracted services. Road projects are particularly concerned with the access to the existing road network and the feasibility of connecting to future infrastructure (Arndt, 1998).

Network issues affect the profitability of a private tollroad as well as traffic management for the entire transport network. Beesley and Hensher (1990) noted almost two decades ago that for private provision in roads to be socially sustainable, they need to be part of the broader planning process that considers the whole of the transport network. Arndt (2000) commented, a decade later, that network risk was the most contentious issue to resolve.

He articulated that the private sector recognised the government had to retain the right to operate and manage the transport network at the same time that the private sector had to have enough certainty to justify the traffic predictions and the project's financing on a non-recourse basis (p.198).

At present, network risk remains the issue that has the most divergent views; albeit all participants felt that a tollroad, by definition, especially in the urban environment, is



beholden to the network around it which the private operator does not control. The dilemma lies with the conflicting objectives of network risk management.

From the private sector's perspective, network risk management should provide assurance for the tollroad's profitability, and it is best handled by government for the following reasons: only government has the power to acquire land compulsorily, to enact policies to eliminate competing routes and to facilitate access to the tollway. From the government's perspective, who is concerned with the connectivity of the transport network, the mobility of the community being affected, and congestion problems at network bottlenecks, any tollway ought to be a vital part of urban planning.

Private operators will seek to minimise the options for competing free routes in order to increase the prospects of patronage. Public policies on traffic demand management, often as the result of the private operator's persuasive effort, are typically implemented to mitigate network risk. For example, private operators of urban tunnels would negotiate with government to impose road changes in order to enable the private tunnel to capture surface traffic. It is arguable whether these actions will deliver greater value for money to the whole community; indeed some of them are more likely to create an adverse effect. Road changes to surface roads above the LCT in Sydney generated a positive social impact. Lane Cove Road is the major arterial route connecting North West Sydney to the centre of Sydney and there is a high proportion of the working population living in North West Sydney which relies on public transport. Funnelling private cars into the tunnel offers significant time savings (up to 20 minutes) to users of high occupancy vehicles like public buses. On the other hand, changes made to surface roads above the CCT connecting from the eastern suburbs to the central business district created political backlash. Given that the use of public transport by eastern suburb residents is relatively low, there were serious doubts about the value for money brought about by expanding bus lanes and channelling private cars into the tunnel. It represents a demographic attribute that was not accounted for in the traffic modelling.

From the central planner's perspective, the public sector regrets that private operators only care about the profitability of their road, without giving sufficient considerations to network integration. The problem of disintegration in Sydney is the fragmented network caused by different private ownerships of interconnecting tollways. This condition has created serious bottleneck issues around joint points that have seen the operators of the M2 and M7 in the north west denying responsibility for the problem. These issues would



have remained had Transurban, who is also the main owner of the M7, not purchased the M2.

Although PPP tollroads are only pieces of a jigsaw in an integrated road network, private ownership restricts government's ability to improve network efficiency. Two examples in Victoria are in line with what Froud (2003) named as an inherent risk of PPPs: that these complex contractual arrangements deprive partners of some degree of flexibility. One example is the redevelopment of the Dockland areas. The redevelopment by the Victorian government triggered A\$37 million Material Adverse Effect (MAE) claims built-in to the Melbourne Citylink concession because there are roads running through Docklands that compete with the private road (Hodge and Bowman, 2004; Brown, 2005). Another case is the moribund regional freight network that was privatised by the Kennett government in the 1990s. The private ownership became an obstacle for the current Labor government preventing it from developing transport links, which was only resolved through the state's buy-back of the privately owned network.

Clearly, divergences in objectives are a barricade to a mutually desirable network risk solution. The willingness of government and private operators to work collaboratively in reconciling these differences is the only way to mitigate this risk. Although the power of network planning rests with government, there is a substantial amount of contribution that the private operator can make toward upgrading the network to make it more conducive to the profitability of the tollroad. Empirically, such willingness seems to bear fruit. The A\$150 million upgrade to the arterial feeding into Sydney's M7 initiated by the RTA was made up of financial contributions from the private consortium and the Australian Federal Government. The upgrade not only has had the effect of improving patronage for the M7, but also benefits the local community. The philosophy of Transurban, an active PPP proponent, is to work with government to improve the road network for the benefit of both. It is currently investing a billion dollar upgrade on the West Gate Freeway that feeds into the MCL. The upgrade will relieve traffic congestion and reduce pollution as well as having the effect of improving traffic flows to the private road.

#### 4.3 Financial risk

Financial risk refers to the variability in returns that an asset is expected to earn. It is typically affected by market confidence, public perceptions, consumer attributes, environmental threats and perceptions of misconduct (Asenova and Beck, 2003). The allure of PPPs has been captured by the discipline of project finance in that PPPs force a project



to service any financial debt from the revenue streams derived from the project itself without recourse to public funding (cf., Debande, 2002; Li et al., 2005b).

One apparent benefit of transferring financial risk to the private sector is that risks are subject to the ruthless scrutiny of commercial practice and extensive due diligence related to the quantification and allocation of risks that private sector risk-takers carry out on projects (Corner, 2006). Having private finance at risk will harness the private sector's risk management skills. Because finance cost is the most expensive item, the private consortia are motivated to find better ways to drive cost down. The decision rule to enter into a concession depends on whether the project yields a positive risk-adjusted net present value. This condition is contingent on the degree to which commercial risks can be mitigated contractually upfront. The private sector has access to a wider range of financial products in the international market. These resources have facilitated the formulation of the best financial packages with the benefit that the capital market has on offer various sophisticated financial instruments such as infrastructure bonds, stapled securities, fixed-rate loans, mezzanine loans, hedging, and insurance to cope with financial risk. Many respondents believed that the way the project finance is packaged is where the real competitive advantage should be.

As cited before in Arndt (2000, p.58), the manner and form of the risk allocation for a PPP project are the key drivers of the financial and contractual structure of the project. A rule of thumb is that private equity normally bears the risks that cannot be, or are too costly to be mitigated because equity has greater risk tolerance as it shares the project's upside gains - a benefit that is not open to debt financiers. The logic entails that lenders are more conservative and thus require a much narrower band for risk errors, particularly so in new roads. This requirement inevitably drives up the cost of finance, and hence equity is preferred. Asenova and Beck (2003) noted that finance companies preferred that risks that were difficult to mitigate, but remained with the consortia, to be supported by equity rather than debt. The public sector also prefers a proponent with a strong balance sheet who is able to lower the cost of capital as well as sustain the investment in the long haul. But the private sector is wary of government's approach to evaluate private proposals in which focuses are only attended to capital costs, without giving adequate consideration to life cycle cost savings. Such an approach pressures the private sector not to price the risk premium into project cost<sup>44</sup>, and may threaten the project's long-term financial viability.

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<sup>44</sup> One participant revealed to us that in a country which by far is the most active in PPPs, the treasury will impose a typical 40% mark-up on whatever cost is budgeted by the public agency of roads. This add-on reserve imposes



Despite the recent financial turmoils with the CCT and the LCT in Sydney (cf. Chung 2008), market participants remain sanguine about the future of PPP tollroads. They are all cognisant of the fact that motorists value the comfort of driving in private cars, and hence the demand for tollways is likely to remain strong. Further, tollroad investment has strong appeal to superannuation fund managers because it offers investment opportunities that have a similar term to maturity (Malone, 2005). With the concept of user-pays starting to gain greater acceptance, if risk allocation is managed equitably, there will be a growing market for PPP tollways.

#### 4.4 Risks associated with ownership

Underpinning the idea of private ownership is that the greater the autonomy and flexibility in investment decisions, the higher the productivity efficiency. It is expected that ownership right would motivate a private firm to employ cost efficient means that are beyond what is possible under traditional procurement methods, in order to maximise commercial returns. This expectation corresponds to incomplete contracting, which suggests that the assignment of ownership rights of the relation-specific asset (an asset that has no alternative use except for those specified in the contract) would alleviate underinvestment problems (Williamson, 1979; Hensher and Stanley 2009). The main risks associated with ownership are design and construction risks (D&C), and operation and maintenance risks (O&M).

##### 4.4.1 Design and construction risks

These are the risks that design, construction or commissioning of the facility are carried out in a way that results in adverse on cost and/or service delivery; examples are time and cost overruns; in particular, design risk represents the inability of either party to fully understand design concepts, specifications may be expensive to change after construction is complete and the project is not delivered on time. Since most PPPs pass these risks along with ownership to the private sector, these risks are mainly the responsibilities of the private consortium.

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extra cost on risk premium, the inclusion of which will no doubt make the project proposal appear "too expensive".



Ball et al. (2003) has established that decision makers' perceived risk transfer was dominated by the design quality and construction cost risks. In like manner, Shen et al. (2006) has verified that compared with traditional procurement, PPPs have done better in mitigating D&C risks because they encourage a long-term view of the D&C with the focus on minimising life cycle cost. But the transfer of D&C risks per se does not deliver value for money. First, the cost of assuming optimism bias is priced into the private firm's financial model and will be recouped from user tolls. Second, it does not need a PPP to transfer construction risk as a fixed-price contract can yield the same benefit. The hard value for money is associated with efficiency gains from the private sector's expertise, who possesses 'learning efficiency' from actively engaging in the construction of urban motorways. Such superior efficiency is manifested in a number of PPP roads (e.g., Sydney M7 and MEL) that exhibit notable innovative D&C techniques.

Innovation in design has become a commercially as well as socially sustainable factor in MCL. At the time the MCL concept was formulated, two short tunnels were proposed, but they soon became a serious concern to the government and the local community (Lay and Daley, 2002). Transurban proposed a design concept that involved a longer tunnel in place of the short eastbound tunnel in order to minimise the impact on the local environment. Although the new concept created greater uncertainty in terms of traffic revenue, it indicated Transurban's awareness of the broader community, which has earned it significant community respect and support.

Transferring the D&C risks offers government certainty in project's timely commission. Commercially-driven private firms have more flexibility in implementing the means to derive a desired outcome. A private sector participant informed us that his firm awarded the constructor a A\$50 million bonus for finishing the project eight months ahead of schedule<sup>45</sup>. In contrast, governments do not have sufficient incentives to drive outcomes forward and are often mandated to follow rigid process-adherence procedures which may have created unnecessary delay<sup>46</sup>.

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<sup>45</sup> This is not to say that there exists any prohibition limiting governments from making such payments to encourage early completion. A participant informed us that, at the time when the Australian Federal Government was the owner of the Sydney airport, the government paid a bonus of a similar nature for the early completion of the second runway at the airport.

<sup>46</sup> In cases that governments tried to constrain the design, a trivial variation from the specified blueprint would be considered as non-delivery. There were cases ended up with hundreds of trivial complaints which resulted in lengthy negotiation and delay in delivery notwithstanding these variations had no real effect on the ability of the facility to function. Even worse, some of the specified design was based on old technology, going down that direction will in fact mar the facility's performance efficiency.



#### 4.4.2 Operation and Maintenance risks

These are risks during the operational phase which may affect the profitability of the operator, such as changes in technologies, variations in input costs or components for maintaining and repairing the facility (Shen et al., 2006). In tollroads, they further include the ability to penalise non-paying motorists, and risks associated with meeting safety and environmental standards (Arndt, 1998). Poor handling of the O&M risks by the private operator will also adversely impact on the residual value of the project - a risk to government who will inherit many of these facilities at the concession's conclusion.

One of the notable benefits brought about by PPPs is the tolling technology. The electronic free flow tolling used in the MCL was the first in Australia. Since there was no real field experience at that time, reference to the impact on consumer take up and use was not possible. This constituted a significant risk to the private operator. But MCL has proven that the market accepts cashless tollways because any increase in toll charges is outweighed by savings in travel time<sup>47</sup>. The revenue risk of a fully electronically tolled way will be amplified in the absence of a disciplined enforcement system because it is difficult to stop a motorist driving on an electronically tolled road who has not made payment arrangements with the operator. The enforcement system relies on government's policing and legislative powers to ensure that non-payment will be financially sanctioned.

Ideally, the bundling concept will maximise efficiency in the O&M phase to give the best whole of life outcome. Combining the designer, the builder and the operator into one entity incentivises the designer to deliver a concept that is suitable to build, and the builder to construct a facility that is suitable to operate and maintain in a manner that is cost effective. All these ideas of bundling responsibilities and ownership seem to fit well in the theory of incomplete contracting (Hensher and Stanley 2009). Empirically though, incomplete contracting theory fails the PPP roads for two most noted reasons: a) many private consortia do not intend to hold on to the asset for long; and b) during the operational phase, the private operator will do the minimum to save operating costs. An example is the operation of ventilation stacks in tunnels. They are being run only to the extent that is barely sufficient to pass the key performance indicators linked to environmental standards.

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<sup>47</sup> Unpublished research by Hensher and Rose has shown that making tollroads cashless, in situations where the tollroad previously had some cash payment booths, actually reduced revenue in the short run. This is due to the reluctance of specific segments such as the elderly and infrequent travellers, to obtain and use an electronic tag facility with direct debit or other credit card payment mechanisms. This constraint will disappear in the long run.



#### 4.5 force majeure

Force majeure recognises the need to provide contracting parties protections for highly unanticipated events that will impair the project's functionality and profitability. It refers to the risk that events may occur which will have a catastrophic effect on either party's ability to perform its obligations under the contract, and includes events of natural calamities such as an earthquake, and an uninsurable event like war, that are beyond the control of either party (Arndt, 1998; Shen et al., 2006). Of these uncontrollable events, insurable risks are generally borne by the private sector, those that are uninsurable or too expensive to insure should be shared between the two parties.

Uninsurable force majeure events are covered under the MAE clause (Arndt, 2000). The MAE approach seeks to define certain risk events which will be borne by government, or shared, and defines a mechanism of redress for the aggrieved party if one of those events crystallises. Mechanisms may include reference to an agreed financial model in order to determine objectively any effects on the project. Alternatively, analysis may be limited to an independent, open book audit of the project (Arndt, 2000, p.280).

On occasions, the private proponents threatened to use MAE clauses to demand financial compensation when governments redeveloped the transport network which may impair the profitability of the private road (e.g., the Sydney M2 and MCL). The private sector is also inclined to a tariff increase and an extension of the concession as a redress (Arndt, 2000, p.304). In our study, the private participants indicated that they regarded the category of force majeure as too restrictive. After extensive lobbying, the Victorian government has considered broadening the events to include utility services interruption during the operational phase, floods, ionising radiation, and contamination by radioactivity. The private sector also preferred a more transparent approach to renegotiate with government if a MAE risk eventuates.

#### 4.6 Sovereign risk

Sovereign risk is the uncertainty in legislation and government policy that may adversely affect the project's profitability and the possibility of a new government abandoning or changing PPP schemes. It is particularly relevant to PPPs because they are characterised by a long duration of contractual obligations.





Sovereign risk management is primarily the responsibility of governments. It is important that governments maintain a stable, coherent and transparent political structure to encourage private participation. In this regard, Norton de Matos wrote:

Private development of infrastructure projects can only happen against a background of political stability, coherent and consistent industrial, investment and economic policies, clear and transparent legislation allowing for the involvement of the private sector in specific areas of the economy, and available of foreign exchange for the repayment of offshore debt, if applicable, and the repatriation of profits (1996, p.11; cited in Arndt, 2000, p.30).

In the Australian PPP market, the private sector has been supportive of research that would facilitate the development of a consistent and coherent policy framework to risk allocation (Arndt, 2000, p.281), indicating the importance of a stable political structure to the market. Private proponents are frustrated with policy fragmentation among government agencies with respect to PPPs and toll pricing, which often result in lengthy and costly negotiation to close the deal. Typically, the average participation cost of these mega projects ranges from A\$10 to A\$20 million; thus the private sector has a strong desire to have open dialogue with governments and to push for a single, simplified procurement approach.

The UK is seen to have a more consistent PPP policy structure, as all the PPPs are coordinated by a centralised unit - the HM Treasury. This structure has enabled the standardisation of documentation and a single framework for bidders to operate in, with obvious efficiencies in the tendering process - much shorter bidding periods and reduced tendering costs.

In private participants' view, the Australian market involves different approaches to the procurement of infrastructure by different government entities, with no single model or policy framework in place. The situation is even more problematic in New South Wales. There exist inconsistencies in PPP policy at different levels of government. In the early days, Treasury's role in PPPs was limited to offering advice to the government and taking part in the Budget Committee of Cabinet. Early deals were mostly closed by public agencies without consultation with the Treasury. Project reviews by the government and



the office of State Auditor-General are undertaken on an irregular basis. In addition there remains an absence of guidelines and budget appropriations for ex post evaluation on PPPs in order to provide taxpayers and investors with information regarding the rises and falls of these projects. Victoria on the other hand has a better-defined regulatory framework called Partnerships Victoria to countenance PPPs, which assures international investors with a degree of confidence.

Statutory differences also frustrate governments. Most PPP projects were entered into between the private sector and state governments, but the power to determine or influence certain key variables, like the tax rate and exchange rate, is outside state governments' judiciary. The uncertainty in regards to how the federal government would decide on the tax deductibility of the SHT priced the NSW government a \$A24 million bill (NSWAGO, 2003, p.209).

Nonetheless, international investors have confidence with the Australian market because Australia is a stable democratic country with state governments seen as gradually evolving and improving in their dealings with the private sector for a better partnership. There leaves significant scope for a uniform, national approach to PPPs in Australia. The Infrastructure Australia Act 2008 enacted by the Commonwealth Government is a response to the call that a sustainable PPP environment needs the support of a coherent and consistent political structure. The Act signals a strong commitment by the federal government to a greater and wider private provision of public infrastructure. It is hopeful that under the leadership of the Infrastructure Australia, there will be a more coordinated approach to PPPs across various levels of government.

#### 4.7 Risk of unclear project objectives

It is easy to lose sight of the tradeoffs between invited private innovative ideas and clearly defined project objectives. Literature praises PPPs for the better-defined and controlled services through tight contracts (Hodge and Greve, 2007). On the other hand, unclear and poorly-defined objectives will expose government to a series of new risks including weakening bargaining power and adverse equity impact. The standard public procurement process requires project objectives to be laid out in an EIS which must be publicly exhibited in order to obtain community approval (Chung, 2008). Therefore, where the EIS sits in the process is important as to who assumes the related risks.



Offering an uncertain project to market tendering opens unlimited scope for negotiation. The ED in Sydney was initially put to the market with a set of vague objectives. The tender document only mentioned that the government wanted a road built and invited the private sector to scope out the design, the levels of toll charge, the overall cost, and financial arrangements. After selecting the 'best' proposal, the government then undertook the environmental assessment on the best project. But the government soon found itself in confrontation with the community's rejection. Since the government had chosen the preferred proponent in the absence of community consultation, this left the government in a very difficult position to renegotiate. Effectively the government took the risk on the EIS not being acceptable by the community, and then had to negotiate with only one proponent on changes requested by the community. The ED took many years of intense negotiation to reach the final close. During the long period of time, project scope had changed considerably, and all the intellectual property belonged to the tenderer. The situation hamstrung the government's ability to reopen the tender to the market. In the end, an extra A\$140 million worth of construction work was added to the original proposal and the private ownership was extended from 38 to 48 years to cover the increased cost.

The CCT in inner Sydney is a classic example of a poorly defined project. It originally started as a road project but soon became an urban design solution to improve the surrounding neighbourhood. The initial idea was to remove traffic out of the centre of Sydney. A short tunnel would have been sufficient, and would have cost a lot less, but it would not have provided the advantage on improving the design of the major surface street involved. The then Lord Mayor of Sydney had a grand vision for the city precinct in which William Street, Oxford Street, Broadway and Taylor Square would become key boulevards after the major upgrade. When the Roads and Traffic Authority of NSW (RTA) approved the EIS for a short tunnel design, the then Mayor, who had become the NSW Planning Minister, lobbied the government to actually have it widened. The government subsequently accepted a non-compliant private proposal that would satisfy the broader, more ambitious vision of urban redevelopment. As a consequence, a modified EIS had to be prepared. The private proponent foresaw that the new design would increase the project cost to government and at the same time expose the government to extra funding risks. Unless the new proposal could demonstrate sufficient traffic volume to cover these new risks, it would be unlikely that the government would accept its proposal. Subsequently, the consortium produced a highly unrealistic traffic forecast which enabled it to obtain the approval (JSCCT, 2006a).



Under the new project, all pedestrian pavements were widened, road lanes were reduced and bus priority measures were put in place. This converted the tollroad project into an urban design solution with motorists in effect subsidising the costs of the urban improvement. More than half of the benefits from the tunnel were designated to accrue to non-motorists. This resulted in a serious inequity because motorists were being charged a fee to cover the cost of the tunnel and to provide a subsidy towards the cost of urban redevelopment.

The CCT has generated significant debate about whether tollroads are equitable investments. Should they be paid for by taxpayers who may never need to use the facility, or financed out of a user charge? If they are financed out of user charge, it is debatable whether motorists are being charged an equitable toll that is commensurate with the benefit they derive from the facility. Although the CCT project was deemed successful in terms of transferring out financial risk, and having a longer-term potential in improving urban amenity, it failed on the grounds that government was unable to deliver value for money in the public interest<sup>48</sup>.

Tollways have discernable impacts on land use decisions. Over time, urban planning has broadened the scope of tollways beyond a simple transport task. During this transformation, private provision is being captured by urban planners rather traffic

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<sup>48</sup> Two State Government inquiry reports concluded that (JSCCT, 2006a; 2006b): 1) there was an insufficient evaluation of the public interest before the decision was taken to open the project to the private sector; the current public interest evaluation contained in the Working With Government Guidelines was not clear; 2) while the project may have resulted in no net cost to government, it has resulted in significant cost to the community, through higher than anticipated tolls and added inconvenience for the users of local roads in the area between the East and West tunnel portals, leading to considerable frustration and anger and potentially leading to a political cost to government; 3) a separate, more detailed, policy on privately financed projects should be developed solely for government agencies; the policy should provide clear and unequivocal processes and procedures to be followed by agencies entering into privately financed projects, and provide avenues for escalation of issues where these may require variation from the standard processes and procedures; 4) there was concern that the secondary objective of 'minimisation of the financial cost to government', which the Committee inquiring into the project understood to effectively mean 'no cost to government', was the overriding concern at the time of the preparation and assessment of the supplementary EIS; 5) subsequent alterations to tolls, traffic levels and traffic management measures were made both during and following the supplementary environmental assessment process; these changes appear to have occurred without the depth of analysis or assessment that was undertaken for the initial EIS; 6) not enough attention was given to strategic planning at an early stage of the project, despite agencies that gave evidence to the Inquiry indicating that they followed Government policy in the consideration, planning and assessment of the CCT project; 7) a clear message from the CCT experience was that the community living in the area affected by the surface road changes associated with the tunnel felt that they had been ignored, misinformed, and treated with indifference or even contempt; 8) the apparent degree of animosity between community groups with opposing views on the status of Bourke Street was regrettable, and may have severely impacted on the success of consultation; 9) notwithstanding the high toll levels and traffic congestion on surface streets, the CCT is an impressive feat of engineering excellence that will be considered an essential part of Sydney's road infrastructure for decades to come.



engineers, worsening the 'fuzziness' of project objectives. The dilemma has been how to use private capital effectively to fulfil the objectives of an integrated transport network plan. Careful considerations need to be given to a number of parameters: is the tollway going to be part of urban planning or traffic demand management; and how to make risk sharing equitable so to enable private capital service the underlying objectives in the public interest. If the objective is urban planning to encourage usage, a toll should be set at a sufficiently low level to induce usage. This may require subsidies from government to entice the participation of return-driven private investors. If the objective is to manage traffic demand, the contract should specify the outcome parameters and permit the proponent the freedom to set tolling levels that satisfy these targets. Being in charge of daily operations, the operator has superior knowledge in terms of varying the levels of toll to manage traffic flows. The High Occupancy Toll (HOT) lanes in Virginia for example, gives the private operator the flexibility to set the tolls based on the level of service it is required to maintain. Tolls would go up in periods of high congestion to ensure that the HOT lanes continue to flow as required. The power to vary tolls has facilitated the delivery of required targets by the private operator.

Clearly, there is a need for better communication with the private proponent as well as the community being affected in articulating project objectives and the way these objectives are tied to the broader transport vision and other economic and social benefits. Governments, as well as the private sector, should employ the EIS mechanism to bridge communications with the public. Positive evidence shows that the fulfilment of promised objectives by government has created welcome impact on the public acceptance of government policy (Whitehead, 2002). We argue that this concept should also extend to public infrastructure projects.

#### 4.8 Political and reputational risks

These are social-dimension risks. It has been widely recognised that PPPs are not just about infrastructure, they are essentially about long-term service provision (Forward, 2006). Political risk relates to questions about the continuing commitment of key political parties to the project, and is closely associated with reputational risk (Asenova and Beck, 2003). These risks are common to virtually all PPPs in every area.

Road infrastructure is distinctive in the sense that users are indeed paying the cost of finance. Metaphorically, PPP tollroads are described in Hodge and Greve (2007) as private credit cards through which government purchases the infrastructure with future road users'



money rather than its own resources. Realistically, private provision does not reduce government's liability for providing road space. However, in this regard there is an observably insufficient exercise of public accountability by government. The public sector is often seen as indifferent to the financial eventualities because inadequate care has been invested on the ex ante financial analysis, either by the Treasury or by the responsible public agencies, to understand the private tender, the capability of the private proponent to undertake the project, and to test these implications.

In the road sector, economic instruments such as road pricing and government subsidies as well as engineering instruments related to transport network integration are used to mitigate political risk, but they are usually attached to reputational risk. Road pricing has long been a politically sensitive subject (cf. Verhoef et al., 1997; Viegas, 2001, Jou et al., in press). This is the main reason many governments are generally inexorable regarding the limits it imposes on how high a toll a private operator is permitted to charge. To make the tollway economically sound with a minimum level of toll, private operators are compensated with degrees of freedom in negotiating the scope of the project, i.e., where the road starts and ends, toll escalation and the length of the concession. Some jurisdictions like Victoria in Australia, give the private sector the opportunity to bid for the risk allocation as well. Essentially these changes, especially when the scope is extended, will create wider and longer lasting impacts for a greater community. If not managed transparently, the reputation of government is at risk.

We noted before, tollroads are part of the transport network, and governments inevitably have to improve the roads flowing in and out of the tollway by way of providing scope for alteration or additional lanes. Such decisions are often understood as generating windfall gains to the operator at public cost. The initial design of the M5 motorway in the South West of Sydney scoped for a number of ramps connecting the motorway with existing free roads. To prevent traffic by-passing the toll plaza, and to improve traffic flow to the privately tolled section, the Roads and Traffic Authority agreed to defer the construction of these ramps until the tollroad is paid for (NSWAGO, 1994, p.370). Soon after, when the M5 was struggling financially, the government accepted the private proponent's proposal to allow the current operator to construct and operate a toll-free extension that would have the effect of delivering increased traffic to its tollway (NSWAGO, 1994, p.374). Subsequently, with little financial assistance from the private proponent,<sup>49</sup> the government

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<sup>49</sup> The total cost of stage 2 was A\$65 million (1993 price) of which A\$15 million was funded by Interlink (the private operator of M5). In the opinion of the state audit office, through its A\$50 million low interest loan, the RTA



extended both ends of the M5 eastward and westward respectively. The two free extensions attract a considerable amount of users onto the tollway and produce a significant windfall to the private proponent,<sup>50</sup> but disadvantageous costs to users and government. Later the Labor Government introduced the “cashback” scheme for privately registered vehicles to reimburse users travelling on the M4 and M5, spreading out the financial burden to the state’s taxpayers.

Another similar case is the A\$151 million upgrade of a public road - the Tullamarine-Calder intersection in Melbourne, which includes a new ramp that separates traffic travelling towards the city, and which has generated a minimum A\$11 million profit windfall to the private operator. Although the Victorian government is entitled to an equal share of the windfall gain (which makes the total estimated minimum gain of A\$22M, see Transurban, 2005; VAGO, 2007, p.46), this event shows that government can exercise its power as a central planner to shift the revenue risk to motorists.

In addition to network alteration, government can decide where to situate the toll gates. For example, the M4 motorway in Sydney fills the gaps between two existing freeways (NSWAGO, 1994, p.353). During the negotiation, the private proponent persuaded the government to move the toll gate eastward in order to maximise the M4’s financial viability (NSWAGO, 1994, p.358). The placement of the toll plaza captures people travelling between Sydney and Parramatta such that at least 40 percent of motorists who have no need to use the western section of the facility have to pay for the cost of servicing and repaying the capital of constructing the entire M4 (NSWAGO, 1994, p.358-359). The relocation of the toll plaza has produced a substantial increase in the value of the private equity (NSWAGO, 1994, p.363).

Reputational risk arises when adverse public perception is formed. The worst scenario is when governments are seen to be offloading public accountability. With private ownership, governments brush off the need to make the business economically sustainable, because financial risk has been transferred to the private operator. Surrendering the “control”<sup>51</sup> of toll adjustments to private ownership allows governments to distance themselves from

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funded the majority (77 percent) of the construction cost and bore the credit risk of repayment (NSWAGO, 1994, p.379).

<sup>50</sup> It is estimated that the stage 2 work of replacing the missing link between the Moorebank and Prestons would generate an additional 3,000 vehicles per day at a day toll of A\$2.00 indexed for 10 years (NSWAGO, 1994, p.406).

<sup>51</sup> Inverted commas are used to hint that private operators do not have full control over the toll escalation. Toll adjustments of all Australian PPP tollroads are subject to the state government’s consent.



congestion problems (Hensher and Chung, 2010). Participants who act in the role of public sector performance evaluators are wary of governments' narrow view about PPPs. Governments often do not know how to measure these risks, and do not realise optimal risk sharing requires that these risks to be retained in hand and internalised within the public sector. Public procurers only see the economic and engineering aspects of these projects, whilst neglecting the social dimension embedded in the essential public services these projects are designated to provide. The government's ignorance of public values has significantly undermined its reputation within the community.

#### 4.9 Media risk

PPPs create contractual liabilities and obligations among the contracting parties to deliver public services in order to meet the expectations of multiple stakeholders including the public (Demirag and Khadaroo, 2008). Public perception is a malleable object, and the media, which is regarded as the representative of many key stakeholders in a democracy, serves as an effective channel through which public perception is shaped. The impact of media coverage can be instant and can extend beyond immediate users. Second to the State Parliament, the media is also a highly influential vehicle through which criticism raised in the Auditor-General's report is heard and attended to by politicians and bureaucrats. Especially in the PPP domain, media's interest in the findings of performance audit reports exerts significant pressure on the bureaucracy.

A well-maintained relationship with the media is equally important to the private as well as the public sector, as it serves as a medium of community expectations and public perception management. The experience of the CCT entails that media risk is a sensitive and difficult issue to manage. One participant highlighted that the NSW government's poor management with the media directly contributed to the CCT issue. In his verbatim, "[the CCT issue] went from post opening wrinkles to a migraine to a catastrophe in the space of a short period of time".

Slowly, the PPP parties are devoting more efforts to managing the powerful media. A proactive approach of keeping the media informed fast tracked the completion of the LCT. A dedicated media relation unit inside the public agency helped to maintain an open dialogue with the public about the progress of the Brisbane North-South Bypass Tunnel. Transurban devotes substantial human resources to communicate project benefits to the media, who in return conveys these benefits to the public. All participants wished that





these efforts will gain media's support and hence translating into positive public perceptions of the PPP scheme.

#### 4.10 Risk of public misperception

Public perception can be conducive or detrimental to the proposed PPP road. Unfortunately it generally escapes forecasters' attention. The CCT lesson, for example, shows for the first time that traffic modellers need to take into account the community's perceived resentment about a facility. It is important to realise that how a project is managed in the public realm is an important driver of resentment or support. Adverse public perception is manifested in the lack of public support resulting in delays in project approval and contract variations. The most debatable issue is who should be responsible for the risk of adverse public perception (cf., Li et al., 2005a).

To investigate this risk, differences between public perception towards road pricing and towards private ownership of tollroads need to be carefully distinguished. There have been studies investigating users' attitude towards road pricing (Odeck and Bräthen, 2002; Whitehead 2002). These studies report that road pricing can be made more publicly acceptable insofar as users are confident that revenues so generated are hypothecated to public road and transport investments. This sort of confidence may not eventuate with PPP tollways, since toll revenues are the source of return on private capital, and it is rare that these revenues are available for government apportionment<sup>52</sup>.

We are unaware of any study of the public's attitude towards private ownership of tollroads. Anecdotally, labouring under the perception that they own the roads through their tax contributions, the public has been finding it difficult to accept the concept of private ownership and private operation of the roads. Many early PPP roads ran into this problem, experiencing the public's refusal to use these facilities (Chung, 2008).

Governments have a vested interest in reducing public aversion and are active in this respect. Currently, public perception is managed by Australian governments in two tangible ways: the Value for Money Statement (VFMS) and the Environmental Impact

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<sup>52</sup> The recent Australian PPP tollroad concessions provide provisions for governments to share upside gains. The private proponent is contracted to pay an incentive rent to government only when the actual revenue receipts are greater than the predetermined threshold (CityLink, 1995; RTA, 1998; NSWAGO, 2000; RTA, 2003a; 2003b; 2004; EastLink, 2004). To date, no evidence suggests that any incentive rent has been received by any Australian governments.



Statement (EEA VIC, 1978; EP&A Act NSW, 1979; EP&A Regulation NSW, 2000). The VFMS is a government-endorsed public document through which the project procurer communicates to the community about how the procurement can get value for money. The idea underlying VFMS is to pressure governments to structure the deal so that the community can have confidence and assurance that the tendering competition, the way that the tolling model is structured and the approach that the procurement is offered to the market, are designed to get value extraction for the community. Many respondents were convinced that community perception should be managed early in the process, right back at the EIS stage. If the authority takes on board the community's views at that stage, public resistance can be minimised. An example is the \$A60 million shared lane for bikes that was scoped into the design of Sydney's M7 by the RTA and was subsequently financed and built by Macquarie Infrastructure Group (MIG) together with other members of the consortium.

Most public misconceptions about tollways come from the lack of understanding of the benefits they generate. Tollways can produce significant positive externalities such as savings in travel time and fuel efficiency from reduced congestion (Verhoef et al., 1997), increased property values in the neighbourhood from higher accessibility, and greater business productivity and economic vitality from increased mobility (Munroe et al., 2006). The private sector is partly responsible for inadequately conveying all these benefits to the public. In the past, private operators allocate little resources for promoting the benefits of tollways due to the myopic focus of cost minimisation. This has proven to be one of the impediments to CCT's patronage.

An often neglected issue is the market segments. An urban environment is not a homogenous market with risk perceptions, travelling and living habits all exhibiting strong localised patterns. Most tollway operation companies have the philosophy that if they build a tollway, people will use it, without actually understanding the market they are selling to. The private sector is gradually realising that the best mitigator of public disapproval is to make the project part of the community. Transurban positions itself at the forefront of this initiative, followed by the MIG. They adopt a good corporate citizenship model, actively engaging with both community groups and the whole of the corridor, regardless of whether they are potential users or not. Both companies take part in many community activities regardless of whether they are customer related or otherwise. Examples are tree planting initiatives, and shutting down the road to use it for "Run for the Kids" to raise money for charity. They have also donated toll money for a given period from its investments in a number of Sydney motorways to the 'Drive for Charity' day. Communities value these corporate inputs and public perception is slowly becoming supportive.



The overall impression signals that the risk of public misperceptions about PPP tollroads can be corrected by involving the public early in the EIS process. The EIS should promote the pros and convey the cons the project will generate as well as demonstrate how the public values will be considered and improved. Given the difficulty to hypothecate toll revenues to public reinvestment, there is a significant scope for private initiatives to enhance public confidence with respect to the derived benefits of tollroads.

## 5. Summary of findings and future research agenda

This chapter has investigated risk perceptions of PPP tollroads in the following dimensions: a) benefits and gains arising from PPP tollroads; b) the public/private sector's capacity to manage risks; c) considerations that drive each party entering into a PPP tollway contract, and the extent to which these considerations influence their approach to negotiating risk allocation; and d) the process in which the levels of toll are determined.

All participants felt strongly that significant value for money that is translated into commercial and social benefits has been generated by partnerships. Experience accumulated over time and across projects has contributed to the betterment of risk sharing optimisation amongst PPP parties. Yet many PPP tollroads have experienced teething problems between the contracting parties as the result of misconceptions, and hence the misallocation of risks. Noticeable disparities over which a party should bear certain risks reveal the chronic tension between the public and private sectors in a number of areas. The matter of concern lies with the perception that certain risks are best left alone to the party that is understood to be 'best able' to manage those risks. Our investigations suggest that most risks should be best shared by both sectors even though they may be perceived to be in the domain of respective sector's field of expertise

All participants confirmed that risk perceptions about which party is best able to manage certain risks bear a powerful influence on final risk allocation. Both sectors perceive that the private sector has developed sophisticated approaches to manage commercial risks, partly due to accumulated experience, and partly due to the increasing market competition. The most prominent commercial risks in tollroads are identified as traffic risk, financial risk and risks associated with ownership. The private sector's capacity to cope with these risks is reflected in that: i) it is better equipped with traffic modelling expertise; ii) it has wider access to financial instruments to package the best deal to handle



financial distress; and iii) it has greater incentive and operational flexibility to drive outcomes forward and achieve cost efficiency over the asset's whole-of-life cycle.

The private sector is most concerned with network risk, sovereign risk, force majeure, media risk, and risk of public misperception. They perceive that these risks are beyond their expertise and yet the public sector should have handled these risks in the manner that assures the profitability of private investments in roads. Armed with these perceptions, the private sector seeks to negotiate with government for preventive measures to minimise risk occurrences. Some of the common measures impose constraints on transport network development; others may demand financial compensation from government under the MAE approach.

The public sector is perceived to be best able to manage risks that are in the domain of public governance, including network risk, sovereign risk and risk of unclear project objectives, for the reasons that network planning matters, assurance of certainty and consistency in legislation, and the setting of project objectives and enforcement of these objectives through public policy all require government's judiciary power. Governments are most concerned with issues of transport network disintegration, projects being unwelcome by the community with the possibility of political and reputational repercussion, unpopular media coverage and public misperception. The task of balancing the conflicting objectives between the two sectors is not without difficulties. This mission is in part executed with a careful trade off between a politically sensitive object-toll pricing and other economic (e.g., subsidy) and engineering (e.g., project scope) means. We have seen that restraint on the levels of tolling a private operator is permitted to charge is a common approach of minimising political risk. But engineering and other economic means implemented at public cost to compensate private capital for the reduced unit price often place government's reputation at risk.

Both sectors hold reservations regarding the willingness of the other party to invest in understanding the risks they are managing. The private sector's capacity is handicapped by its myopic focus on cost minimisation and self profitability, notwithstanding that the financial success of any tollroad is indispensable to an integrated transport network. The problem is compounded by the different views regarding the bandwidth of risk tolerance held by various parties within the SPV which may create distortions in traffic estimates.



The subject of the public sector's capability of managing risks that are in the public governance circle is more complex. Many participants argued that the apparent lack of exercise of public accountability by government authorities indicate that governments do not know how to measure these risks; and public authorities' indifference to the financial eventualities of these tollroad projects has led to the underestimation of reputational risk. Further, roads are vital components of the transport network and urban development. Many portfolio ministers such as ministers for planning, transport, and roads, and even local councils, have vested interests in roads. The intricacy of reconciling conflicting interests amongst public sector agencies obscures the clarity of project objectives.

The most vexed issue centres around risks that have been transferred to the extent that they have imposed a threat to public values for the sake of risk transfer. Gradually, market competition has transformed PPPs from an approach of risk guarantee by government to a paradigm of risk dumping by government (Chung, 2008). On occasions, competition drove private bidders to compete on levels of risk that they were prepared to accept. It seems that the danger warned by Arndt (2000) that government would use competitive pressure to over-transfer risks has materialised. A true partnership needs a continual multi-facet dialogue between all levels of government and the private sector to facilitate mutual learning of each sector's perceived ability of managing risk.

Some of the findings of the current study concur with that identified in Arndt (2000) suggesting that different parties' conflicting aims have a prolong effect on risk allocation, and the misuse of market competitive force may distort the ethos of optimal risk sharing. Nevertheless, new risks gradually emerge as the PPP market evolves. The most prominent issues are associated with social dimensional risks and public misperceptions about what a PPP project is set out to achieve. The Media is a powerful channel through which the PPP scheme is embraced or rejected by a malleable public perception. At present, it seems that transparency and coordination between the two sectors may have imparted the scheme some welcomeness, yet it remains far from clear which party is best positioned to take responsibilities for these emerging risks. The new challenges faced by governments and private proponents warrant further research that is aimed to simplify the complex risk allocation process in order to adapt to the continuously evolving nature of PPPs.

The findings herein have identified the key risk dimensions and the likely levels associated with each risk attribute that a range of stakeholders have suggested are the main drivers of the PPP risk allocation process. Given that Australia has been a pioneer in tollroad projects



under PPPs, and that many Australian construction companies and banks are now active in this field on the international stage, the evidence herein is of global interest.



Appendix: Risk Attribute Matrix

Risk Attribute	Definition	Level	Public Sector	Private Sector
Traffic risk	This is the risk that traffic volume is lower than forecast which results in total revenue derived from the project over the concession term varying from initial expectations.	high	the private firm inflates traffic forecast in order to win the contract and raise finance; forced to bail out/subsidise the project when demand fails to meet projections	patronage is substantially lower than forecast during the ramp-up
		medium	The SPV does not invest to understand the demographic composition being affected; forced to increase subsidy; unable to redeem concession notes or share upside gains	traffic forecast and demographic changes stated in the EIS are not robust causing erroneous forecast in the traffic model; difficulty in predicting travel patterns of short trips vs long trips
		low	private operator has no recourse to government	government provides revenue assurance
Network risk	This risk arises when the contracted services or method of delivery of those services are linked to, rely on are otherwise affected by certain infrastructure and other services or methods of delivering the contracted	high	the private operator only concerns the profitability of each individual road; network dis-integration	the private road is in direct competition with neighbouring public roads that are free to use
		medium	concession inhibits the flexibility of future transport network development	future transport network development will adversely affect traffic volume of the private road



	services. Road projects are particularly concerned with the access to the existing road network and the feasibility of connecting to future infrastructure.	low	the private operator is willing to contribute to the cost of creating the physical connection to an existing road network and future network development that will improve the network efficiency as well as the profitability of the private tollroad	willingness of government to allow for renegotiation or financial compensation if future network development adversely affects the profitability of the private road
Financial risk	This risk primarily refers to the variability in returns that the project is expected to earn. It is affected by a number of parameters, including market confidence, public perceptions, consumer attributes, etc.	high	as most PPP tollroads are developed using non-recourse financing, the organisations involved must be reputable to raise the funds needed for each development; this risk is high when the private consortium does not have a strong balance sheet to sustain the project in the long run	project does not generate sufficient cash flows; fails to achieve required hurdle rate of return; new road represents greater risk and higher cost of capital; low acceptance of user-pays by motorist
		medium	the project mainly relies on debt financing, driving up the cost of risk premium	government's approach to evaluate the business case focuses only on capital costs without giving adequate consideration to life cycle cost savings
		low	the project is non-recourse to government; the SPV exercises due diligence in assessing the risk, and it is able to package an innovative project finance to manage the risk	funding structure has a low debt to equity ratio; the main party in the SPV has a strong balance sheet; the market exhibits greater acceptability of user-pays
Risks associated with ownership	This category includes design and construction risks (D&C) and operation and maintenance risks (O&M).	high	design is unwelcome by the community; the SPV barely delivers the project and associated services to its specifics	time and cost overruns; the facility cannot be operated within cost and within the constraints of the concession agreement





		medium	project is not delivered on time (cost overrun is passed on to the consortium); poor handling of O&M by the private operator reduces the asset's residual value; the private operator does minimum in order to save costs	the public procurer is inflexible with the output specifications; implementation of new technology (with no prior field experience) may render post construction performance inefficient
		low	the SPV possesses 'learning efficiency' and awareness of the broader community	government is flexible with the process of delivery; there exists legal enforcement for non-payment to be financially sanctioned
force majeure	This refers to the risk that events may occur which will have a catastrophic effect on either party's ability to perform its obligations under the contract.	high	occurrences of force majeure event will trigger financial compensation under the MAE clause	MAE events are not adequately insured or are uninsurable
		medium	the SPV will renegotiate under the MAE clause to demand tariff increase and contract extension	mechanism of redress for the aggrieved party is not transparent; MAE clause is too restrictive
		low	the SPV is willing to renegotiate in good faith in the event MAE occurs; MAE events are sufficiently insured by the SPV	government is willing to renegotiate in good faith in the event MAE occurs; MAE approach is transparent



Sovereign risk	Sovereign risk is the uncertainty in legislation and government policy that may adversely affect the project's profitability and the possibility of a new government abandoning or changing PPP schemes. It is particular relevant to PPPs because of the long duration of contractual obligations.	high	changes in policies at the federal government level, such as tax, that are outside the judiciary power of state/local government	the government has records of exercising its power and immunities, including but not limited to the power to legislate and determine policy in a way which disadvantages the project's profitability; introduction of new government will make policy changes that will impair the project's profitability
		medium	unstable economic environment will increase the cost of private capital	policy fragmentation with respect to PPPs and tolls at different levels of government; changes in the taxation framework may impact on the financial assumptions of the project
		low	there exists a consistent, uniform approach to PPPs	The country is a democratic economy and has a uniform approach to PPPs
Risk of unclear project objectives	Unclear and poorly-defined project objectives will expose government to a series of new risks including weakening bargaining power and adverse equity impact. Offering an uncertain project to market tender opens unlimited scope for negotiation. A properly managed EIS process can reduce this risk.	high	EIS procedures are not followed; project proposal is unsolicited; project concept comes from a non-compliant bid	after committing to the project, project scope requires significant modification due to community rejection
		medium	project development is not transparent, inadequate communication with the community	community expectations are not managed properly upfront during the EIS process



		low	project has community approval; clear communication maintained throughout the project development	project objectives and benefits are made clear to the market
Political and reputational risks	These are social-dimension risks. Political risk relates to questions about the continuing commitment of key political parties to the project and is closely associated with reputational risk. These risks are common to virtually all PPPs in every area.	high	the public perceives the government offloading public accountability through the PPP vehicle and henceforth forms adverse perception about the PPP scheme	government does not realise that these risks should be retained in hand and internalised within the public sector
		medium	changes in project scope are seen as providing windfall gains to the private operator	government is inexorable regarding the levels of toll
		low	government understands the social dimension embedded in the essential services PPP projects designated to provide	users are subsidised by government
Media risk	Media serves as the medium of community expectations	high	media has an adverse opinion on PPPs	bad press results in negative public perception hence reduction in demand for



	and public perception management, its impact can be instant and extensive.			the service
		medium	media's interest in PPPs exerts pressure on bureaucracy	government backs down from supporting the project
		low	the media is generally supportive and the private sector is willing to work with government to promote project benefits to the media	the public agency has a public relations team dedicated to keeping media informed and managing the public relations; the agency is willing to work with the private firm to manage public relations
Risk of public misperception	This risk arises when there is a lack of public support which can be detrimental to the proposed PPP road.	high	low public acceptance of private ownership of roads; the public expects that tollroads deliver little public benefit	refusal of usage by users leads to low patronage; lack of public understanding about the benefits of tollroads
		medium	private sector's negligence of different market segments; ignorance of demography around the project locality and the impact of prospective changes on the project	community resentment not handled adequately during the EIS process
		low	the SPV is actively engaging in community activities and promoting project benefits	community concerns have been adequately handled via the EIS consultation phase



## **7.4 European Legislation of Pricing in Transport**

This appendix summarizes the existing community policies regarding the charging principles used in infrastructure. It also analyzes to what extent the SMCP principle is implemented in the current EU legislation.

### **7.4.1 Road infrastructure**

The EC intervention in the domain of road infrastructure pricing relates to competitive problems within the road freight sector caused by the existence of very different methods and levels of charging for infrastructure use in different Member-States. Below summary presents the EU legislation which is currently applicable to the road infrastructure pricing principles.

Directive 99/62/EC as modified by Directive 2006/38/EC sets common rules on distance-related tolls and time-based user charges for goods vehicles for the use of certain infrastructure. The directive applies to vehicle taxes, tolls and user charges imposed on a motor vehicle intended exclusively for the carriage of goods by road and having a maximum permissible gross laden weight of over 3.5 tonnes.

The charging principle is based on the user pays principle and the ability to apply the polluter pays principle. Furthermore, individual States are allowed to integrate the “external costs” of road transport into toll prices including congestion costs, environmental pollution, noise, landscape damage and social costs such as health and indirect accident costs which are not covered by insurance.

#### Vehicle taxes

With respect to Vehicle taxes, the Directive indicates per country the vehicle taxes that each member state is allowed to levy. Taxes shall be charged solely by the Member State of registration. Member States may not set vehicle tax rates any lower than the minimum rates set out in the Directive. Under the Directive, Member States also have the option, in certain cases and subject to certain conditions, of applying reduced rates or granting exemptions.



## Tolls and user charges

With respect to Tolls and user charges, the following conditions which should be met by Member States wishing to introduce and/or maintain tolls or introduce user charges, are important in this respect:

- Tolls and user charges shall be imposed only on users of motorways which are part of the trans-European road network;
- tolls and user charges may not both be imposed at the same time for the use of a single road section;
- application of the principle of proportionality of rates for user charges, based on the duration of the use made of the infrastructures and differentiated in relation to the costs caused by the road vehicles;
- user charges and tolls should apply homogeneously by laying down certain rules such as characteristics of infrastructure, maximum rate and general provisions to be complied with;
- toll revenue should be used for the maintenance of the road infrastructure concerned or to cross-finance the transport sector as a whole;
- tolls should be based on the principle of recovery of infrastructure costs;
- as of 2010, countries which already apply tolls or user charges will be obliged to vary their prices according to vehicle pollution standards (Euro standards series) in order to favour the cleanest ones;
- authorities may decide to exempt isolated areas or economically weak regions from applying tolls or user charges;
- an extra 15% mark-up charge can be levied to finance new alternative transport infrastructure projects such as rail or inland waterways (the mark-up can be raised to 25% for cross-frontier projects in mountainous regions);
- discounts will be possible for frequent users.

Whereas 'tolls' means payment of a specified amount for a vehicle travelling the distance between two points on the infrastructure and 'user charges' means payment of a special amount conferring the right for a vehicle to use for a given period the infrastructures.

In addition to the taxes provided for by the Directive, Member States may apply:



- taxes or charges levied upon registration of the vehicle or imposed on vehicles or loads of abnormal weights or dimensions;
- parking fees and specific urban traffic charges;
- charges aimed at combating road congestion.

Proposal of 8 August 2008 amending Directive 1999/62/EC

Besides legislation currently applicable, the European Parliament and the Council of 8 July 2008 introduced the proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures. Although not applicable yet, below follows a brief description of the proposal:

- The amendment of the “Eurovignette” Directive should allow Member States to internalise the costs related to pollution and congestion caused by heavy goods vehicles (external costs);
- They will thus be authorised to integrate in tolls levied on heavy goods vehicles an amount corresponding to the cost of the air and noise pollution due to traffic and the cost of congestion imposed upon other vehicles;
- This amount will vary according to the Euro emission category, the distance travelled, the location and the time of use of roads;
- Member States will have to allocate the revenue received in this way to projects relating to the sustainable development of transport;
- Tolls must be collected through electronic systems which do not create hindrance to the free flow of traffic and which do not produce local nuisance at tollbooths;
- In addition, the scope of the Directive is extended beyond the trans-European transport network.

#### Fuel taxes

The taxation of energy products and electricity in the Community is governed by the provisions of Council Directive 2003/96/EC restructuring the Community framework for taxation of energy products and electricity. For fuels, only the structure of excise duties is harmonised across the Community. The Directive contains some derogations to the general rule of minimum rates in its Annexes II and III. The rates themselves still differ from one Member State to the other.



## 7.4.2 Railway infrastructure

### Railway infrastructure charges

Directive 2001/14/EC (part of the first rail infrastructure package) focus on the levying of charges for the use of railway infrastructure. The Directive applies to railway infrastructure used for domestic or international rail services (with some exclusions which are not further discussed). Charges are set and collected by an independent charging body, generally the infrastructure manager.

Member States shall take the measures necessary to ensure that the accounts for business relating to the provision of transport services and those for business relating to the management of railway infrastructure are kept separate. Aid paid to one of these two areas of activity may not be transferred (direct or indirect) to the other.

The Directive lays down charging principles such as:

- charges must be paid to the infrastructure managers and used to fund their business;
- in principle, the charge for the use of railway infrastructure is equal to the cost directly incurred as a result of operating trains;
- the infrastructure charge may include a sum reflecting the scarcity of capacity;
- the infrastructure charge may be adjusted to take account of the cost of the environmental impact of operating the trains;
- the charging and capacity allocation schemes should permit equal and non-discriminatory access for all undertakings;
- charging and capacity-allocation schemes should encourage railway infrastructure managers to optimise use of their infrastructure;
- Investment in railway infrastructure is desirable and infrastructure charging schemes should provide incentives for infrastructure managers to make appropriate investments where they are economically attractive;
- Discounts which are allowed to railway undertakings must relate to actual administrative cost savings experienced; discount may also be used to promote the efficient use of infrastructure.





By way of exception to these charging principles, the Directive allows infrastructure managers to levy mark-ups, on the basis of efficient, transparent and non-discriminatory principles, while guaranteeing optimum competitiveness, especially of international rail freight. For specific investment projects, in the future, or that have been completed not more than 15 years before the entry into force of this Directive, the infrastructure manager may set or continue to set higher charges on the basis of the long-term costs of such projects if they increase efficiency and/or cost-effectiveness and could not otherwise be or have been undertaken. Such a charging arrangement may also incorporate agreements on the sharing of the risk associated with new investments. Subject to certain conditions, railway undertakings may be granted discounts on charges. Discounts which are allowed to railway undertakings must relate to actual administrative cost savings experienced; discounts may also be used to promote the efficient use of infrastructure.

The Directive also contains provisions on:

- compensation schemes for unpaid environmental, accident and infrastructure costs;
- a performance scheme to encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network;
- capacity reservation charges (for capacity booked but not used).

Finally, Member States must establish a regulatory body which is independent of infrastructure managers, railway undertakings or any other authority involved in the award of a public service contract. Any undertaking which considers that it has been unfairly treated or discriminated against may appeal to this body.

Proposal 8 July 2008 "Rail noise abatement measures addressing the existing fleet"

As part of tackling noise pollution, the European Parliament and the Council of 8 July 2008 propose to launch a programme of noise reduction for freight trains. In order to encourage railway undertakings to proceed with retrofitting wagons, the Commission foresees, in particular, establishing noise-differentiated track access charges. This is in line with the principle that infrastructure charges may take account of the cost of the environmental impact of train operations.



### **7.4.3 Inland waterways**

Roughly 7.6% of European transport occurs using inland waterways. Of this, over 70% of traffic occurs on the Rhine, where, under the Mannheim Convention, charges for the use of inland waterways are prohibited. For most other waterways, Member States levy charges on a variety of principles not regulated by EU legislation. Currently no EU legislation exists with respect to inland waterway charging principles.

The Council Directive 96/75/EC on the systems of chartering and pricing in national and international inland waterway transport in the Community only states the principle whereby, in the national and international carriage of goods by inland waterway within the Community, contracts must be freely concluded between the parties concerned, and the prices negotiated freely, where appropriate within charter clearing houses.

Besides the currently applicable EU legislation, the European Commission is promoting inland waterways transport by introducing amongst others the NAIADES Action programme. Part of the NAIADES Action Programme is the proposal to introduce legislative instruments for the harmonisation of amongst others infrastructure charging as from 2013. No further communication with respect to these charges has been published yet.

### **7.4.4 Maritime Transport**

So far, ports have not been at the centre of the common transport policy. The financing of ports and maritime infrastructure and policies on charging their users vary from one country to another, reflecting the considerable differences in the approach taken towards their ownership and organisation. Ports may be owned by the State, regional or local governments or by private enterprises. In the past, ports tended to be seen mainly as suppliers of services of general economic interest provided by the public sector and financed by the taxpayer, whereas now the trend has moved towards considering ports as commercial entities which ought to recover their costs from port users who benefit from them directly. The port industry can therefore be seen as an industry in transition. Currently, no EU regulations are applicable with respect to charges in the maritime transport sector.



For the future, the Commission advocates a general framework in the port area requiring charges to be linked to costs. The most frequent port charges are:

- charges for the provision of services and facilities to enable a ship to enter safely and use the port;
- charges for specific services or supplies rendered;
- rents or charges for the use of land or equipment owned by the port.

## 7.4.5 Aviation

### Airport charges

Airport charges are usually established and levied in accordance with a set of principles and criteria which make up the airport charging system. These systems are in many instances imposed and governed by the national authorities. Given the comparatively high degree of harmonisation and differentiation of current charges, and since as present charging mechanisms reflect the actual infrastructure costs, and partly the congestion ones, this is not an area in need of immediate action by the Commission.

The Commission is presently looking into ways in which the issue of airport charges in the EU could be best addressed. To develop more efficient charges based on the principles of user pays and polluter pays, charging structures should expand to also emission and noise costs which vary with engine size and time of travel. If charges can reflect these different costs in a significant way, so that airspace users pay for the services they use and the costs they impose, then such users can respond by changing routes, times, aircraft, fuel, engines, and so on .

Therefore, the commission prepared Directive 2009/12/EC of the European Parliament and of the Council of 11 March 2009 on airport charges (coming into force on March 2011). Based on this Directive, Member States may allow the airport managing body of an airport or airport network (group of airports) to introduce a common and transparent airport charging system to cover the airport network. These airport charges should correspond to the infrastructure and/or the level of service provided as air carriers have a legitimate interest to require services from an airport managing body that correspond to the price/quality ratio.



The Directive shall apply to any airport located in the Community whose annual traffic is over five million passenger movements or to airports in a Member State where no airport reaches the minimum size, the airport with the highest passenger movement. The Directive shall not apply to the charges collected for the remuneration of en route and terminal air navigation services or to the charges collected for the remuneration of ground handling services. With respect to these services please see below.

Airport charges means a levy collected for the benefit of the airport managing body and paid by the airport users for the use of facilities and services, which are exclusively provided by the airport managing body and which are related to landing, take-off, lighting and parking of aircraft, and processing of passengers and freight. Member States shall ensure that airport charges do not discriminate among airport users, in accordance with Community law.

The Council of the International Civil Aviation Organisation (the ICAO Council) in 2004 adopted policies on airport charges that included, inter alia, the principles of cost-relatedness, non-discrimination and an independent mechanism for economic regulation of airports. The ICAO Council has considered that an airport charge is a levy that is designed and applied specifically to recover the cost of providing facilities and services for civil aviation, while a tax is a levy that is designed to raise national or local government revenues which are generally not applied to civil aviation in their entirety or on a cost-specific basis.

Different systems exist in different Member States concerning the pre-financing of airport investments. In Member States where pre-financing occurs, Member States or airport managing bodies should refer to ICAO policies and/or establish their own safeguards.

#### Air navigation services

With respect to air navigation charges, Commission Regulation (EC) No 1794/2006 lay down a common charging scheme for air navigation services. The Regulation is intended to introduce a fairer charging scheme reflecting the costs directly or indirectly incurred in the provision of services. The common charging scheme must also comply with the International Civil Aviation Organisation (ICAO) Convention.



The Regulation applies to air navigation services provided by air traffic service providers and providers of meteorological services (except those that process fewer than 50,000 commercial air transport movements per year). The Member States must establish charging zones in their airspace in which the costs are calculated in accordance with the same base and on an annual basis. The base must be laid down so as to be compatible with traffic control operations and services. The Regulation also lays down rules on calculating air navigation charges such as en-route charges and terminal service charges.

#### Ground handling services

The market in ground handling services is covered by the Directive 96/67/EC dating from October 1996 which gradually opened up the services to competition. The Directive allows Member States to reserve for the airport operator, the management of the centralized infrastructure used for the supply of ground handling services whose complexity, cost or environmental impact does not allow for its division or duplication. The airport operator may make it compulsory for suppliers and self handling air carriers to use this infrastructure, and may impose charges for the use of the facilities. This provision has given rise to uncertainty concerning the definition of what exactly is centralized infrastructure as well as the cost of using it. A more pressing point is the way airports charge air carriers for the use of the centralized infrastructure: this varies from one airport to another and is not transparent. The airport management body may also give a discount on these charges to its own handling customers and this may distort competition.

#### Environmental aspects

With respect to environmental aspects, the Commission adopted a Communication in September 2005 setting a strategy for reducing the Climate change impact of aviation. The Communication, which was accompanied by an impact assessment, concluded that a comprehensive approach was necessary. Most elements of this were already in train but needed to be strengthened.

The main conclusion was that the EU Emission Trading Scheme (ETS) should be extended to include aviation. Since the Communication was published, a Working Group has considered the design options for doing this and published a report. The Commission is working towards publishing a specific legislative proposal by the end of 2006 or as soon as possible thereafter.



### Allocation of time slots

With respect to allocation of time slots, Council Regulation (EEC) No 95/93 was introduced to ensure that where airport capacity is scarce, the available landing and take-off slots are used efficiently and distributed in an equitable, non-discriminatory and transparent way. A slot is the scheduled time of arrival or departure available or allocated to an aircraft movement on a specific date at a coordinated airport.

The Regulation lays down the objective criteria on the basis of which an airport can be designated “coordinated” on the grounds that its capacity is insufficient. Calculation of an airport’s capacity is based on an objective analysis of the possibilities of accommodating the air traffic, taking into account the different types of traffic at that airport.

A carrier using a time slot that has been cleared by the coordinator is entitled to claim the same slot in the next scheduling period. In a situation where all slot requests cannot be accommodated to the satisfaction of the air carriers concerned, the preference is given to commercial air services and in particular to scheduled services and programmed non-scheduled air services. Slots may be freely exchanged between air carriers or transferred by an air carrier from one route or type of service to another. Any slot not utilized is withdrawn and placed in the appropriate slot pool.



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