A PPP in roads sector is defined as a model of development in which the private sector essentially shares the burden of the responsibility of providing the road facility. This means that the private sector not only acts as a financer or simply a managerial entity but also shares a certain proportion of the risks associated with the operations. Thus semi-government entities, or private entities provided with heavy subsidies do not necessarily qualify as a PPP if the state covers all the risks of the project. Moreover, if a semi-government entity goes in for a partnership with a fully private owned entity in which the state covers the risks of the semi-government owned entity, the former is characterized as the public sector and a representative or extension of the state despite its autonomous status.

Given that, the most common characteristics of all PPP in roads sector are as follows:

• The infrastructure is financed by a private entity, at least substantially if not fully.

• The private entity operates the infrastructure for a given period of time, also known as the concession period. After this period, the infrastructure may be transferred to the state or the contract may be renewed.

• The private entity receives revenues related to the operation of the infrastructure. These revenues may be collected directly from road users or indirectly from the government. The revenues are always dependent on quantitative or qualitative measures for the services provided.

PPP in roads sector has been tried out in numerous countries over the years, and two international surveys give a comprehensive picture of the same.

The U.S. Department of Transportation, Federal Highway Administration commissioned a study in 2005 (carried out by AECOM Consult team) that used the 2004 version of the International Public Works Financing Projects database.

According to the study, since 1985, roads sector has seen the maximum investment through the PPP mode worldwide, both in terms of number of projects and amount of investment.
Regionally, Europe has the maximum number of PPP projects in roads, followed by North America and Asia. In terms of average project costs, Europe has the largest highway projects at $679 million, followed by Asia with average projects costs of $612 million.

Several type of contracts are used globally for PPP projects in the roads sector. They range from the typical BOT model, Build Own Operate (BOO), Design Build (DB) or Design Bid Build (DBB) to simple concessions or Management Contracts. Other than these, outright Asset Sale too has been experienced, though very limited in number.

Of them all, Concession and BOT form the maximum number of contracts globally accounting for 41% and 31% respectively. Overall, the following conclusions are derived:

- Most of the projects in Europe are Concession and BOT/BTO contracts. Project costs average about $690 million in Europe.
- Most of the projects in Asia & Far East are Concession and BOT/BTO contracts, including several Joint Development Agreement (JDA) projects and Asset Sale projects. Project costs average about $675 million in Asia & Far East.
- Most of the projects in Latin America & Caribbean are Concession and BOT/BTO contracts, with project costs averaging about $255 million.
- Most of the projects in North America are Concession contracts (particularly in Mexico which include several Asset Sale projects) and DB contracts (particularly in the U.S.). DMOB projects have the largest average contract value in North America. Overall, project costs average about $435 million in North America.
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- Few projects are in Africa & Middle East, mostly BOT/BTO and DBFO contracts. Project costs average $400 million in Africa & Middle East.

- On a worldwide basis, PPP projects in the road category use a variety of contract types, with projects averaging about $540 million. The exception to this is Management Contract, whose average cost is less than $130 million.

- In the U.S., the predominant PPP contract types have been DB and Management Contract. In addition, there are selected road projects using BOO, BOT/BTO, DBOM, DBFO, or Joint Development Agreement contracts, which reflects the growing interest in using various forms of PPPs to expedite projects in the U.S.

In terms of road project types, non-tolled roads form a very small minority with only 80 such projects recorded in the database.

Most non-toll highway projects involving PPP arrangements for financing or delivery are in Europe, predominantly in the U.K., Spain, and Portugal. Many of these projects were financed by shadow tolls and involve either a DBFO or DBOM contract with terms of generally 30 years. However, the practice of shadow toll is declining in Europe. Other non-toll highway projects are in the U.S. and Canada, many of which are DB contracts. Other contract delivery approaches in North America include DBFO (most involving shadow tolls of 20-30 years duration, primarily in Canada), DBOM (of 10-20 years duration), and Contract Management (of 5-7 years duration).

Tolled highways form a clear majority of road projects globally with all regions resorting to this project type. In Europe, Spain Germany Greece and Ireland have maximum number of tolled roads, with U.K. recently shifting from shadow tolling to direct tolling. The main form of contract for toll roads in Europe is concessions or BOT. In Asia, China Malaysia South Korea and India have maximum tolled road projects; predominantly BOT projects though China has some examples of Joint Development Agreements (JDA). In Latin America, Brazil, Chile Peru and Argentina have maximum tolled roads under predominantly Concession and BOT type of contracts. Mexico has mostly Concessions though it has some of the recorded Asset Sale projects as well. Most of the projects in the US are Design Build or Design Bid Build format.

While the USDOT study gives some details about the types of PPP road projects, a survey by PIARC (1999) of 25 countries gives a comprehensive understanding of the practice of PPP in the roads sector. The overriding motive for engaging in PPPs is
shortage of public funds, as expected. Often, it is not a lack of funds but rather other financial considerations that prompt states to engage in such partnerships. For example, in Belgium, the deterioration of road surfaces called for a large scale investment that equalled a ten year budget. The authorities decided to engage in PPP to spread the financial risk over time. The Australian road agency has a fixed budget over time, but they opted for PPP given their cash flow profile that required upfront investment to reduce life cycle costs. Countries like Portugal and USA (in certain states) went for PPP simply to accelerate the construction of ongoing road projects by involving the private sector to meet certain predetermined deadlines.

Often, the lack of public funds coerces the state to opt for a change in outlook which they expect to fulfil by engaging in PPP. South Africa went for PPP in roads sector to entrench public awareness about the ‘user pays’ principle amongst the people as the future mode of sustained development of the country. Portugal went for PPP as the state wanted to make a conscious shift from the provider/operator to a facilitator in infrastructural facilities, to comply with strict EU norms. The United Kingdom wants to spread cost of road schemes away from those years in which there are constraints on public expenditure. The Government of Pakistan is trying to involve the private sector in order to reduce pressure on public resources and generate revenues from existing roads to meet other expenses.

The second most cited motive of engaging in PPP is improved quality of services. Often backlog of maintenance, inability to cope with growing traffic pressures etc call for a desired change in quality/technology that act as the primary motive of engaging with the private sector. For example, Belgian authorities believe that to ensure user comfort needs during renovations, it is important to make the same company responsible for maintenance and renovations. Many countries consider innovations provided by private entities as the reason for engaging the private sector. For example, New Jersey (USA) engaged private operators to solve their congestion problems. Hungary went on to implement state-of-the-art financial, quality insurance, operation and toll collection systems by importing know-how through PPP. The City Link toll way in Victoria, Australia saw the introduction of a fully electronic tolling operation with no toll plazas as a result of PPP.

The most common query regarding PPP in roads is about the cost recovery mechanism and dedication of user fees, and these are often the most contentious issues. A survey
result on the different cost recovery studies adopted by the respondent countries (if adopted) and their natures is presented below.

Table 2.2 Cost Definitions of PIARC member countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Study?¹</th>
<th>Cost Definition²</th>
<th>MultiModal³</th>
<th>Are External Costs Considered?⁴</th>
<th>Are Economic Impacts Assessed?⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Yes</td>
<td>Expenditures (Local, part)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>No</td>
<td>N/A⁶</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Czech and Slovak</td>
<td>Yes</td>
<td>Expenditures and Total Road Costs</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Republics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Yes</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>France</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Germany</td>
<td>No</td>
<td>Expenditures</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Hungary</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Yes</td>
<td>Expenditures</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Norway</td>
<td>Yes</td>
<td>Expenditures</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Portugal</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Quebec (Canada)</td>
<td>Yes</td>
<td>Depreciation of Roadways and Opportunity Costs of Capital</td>
<td>Sometimes</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>South Africa</td>
<td>No</td>
<td>Expenditures</td>
<td>Proposed</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Yes</td>
<td>Expenditures, Depreciation &amp; Capital Cost</td>
<td>Separately</td>
<td>Proposed</td>
<td>No</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Yes</td>
<td>Expenditures</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>United States</td>
<td>Yes</td>
<td>Expenditures</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

1 Study? indicates whether or not a cost recovery study was done which attributes costs by vehicle type.

2 Cost Definition is the definition used within the cost recovery study to determine whether highway user taxes meet highway expenses. Typically, costs are measured by programme expenditures for highway infrastructure. Alternatively, costs can be defined as the capital investment in, and depreciation of, the road network; or as the replacement cost of the highway system. Potentially, multiple costs definitions could be considered within a single study.

3 Multi-Modal indicates whether different modes of transportation or only highway vehicles were included in the study. The inclusion of bus traffic only or bus and other forms of mass transportation is indicated here.

4 External Costs Considered? indicates whether costs of safety effects, noise, pollution and congestion were considered in the study.

5 Are Economic Impacts Assessed? indicates whether the study included economic competitiveness effects or potential adverse impacts on economic growth. Productivity benefits, if known, could be included in this discussion. Opportunity costs of capital invested in the highway infrastructure, if not previously included in the cost definition, may also be indicated.

6 "N/A" indicates not applicable or not available.

Source: Cost Recovery and dedication of road user fees, PIARC, 1999

Methods for detailed cost recovery efforts vary across member countries with two broad parameters: (a) focus on whether their cost recovery policy results in more or less than full cost recovery; (b) focus on costs caused by different classes of users; i.e., commercial vehicles, buses, private automobiles. Both approaches have credence for different member countries. It is interesting to note that most countries that do have a cost recovery study mostly consider project expenditures with very few considering depreciations in their calculations. External costs are often not considered in these
calculations. But most glaringly, the economic impacts are not considered in any of the studies (barring Australia) even though the main argument for PPP is that it generates positive economic benefits. This means that even though some countries do figure in effects on other factors like environment, economic externalities caused by the projects are not considered in the cost recovery studies.

It is interesting to note here that the most common form of cost analysis followed is the conventional cost-benefit analysis. Some countries engage in more complex multi criteria analysis (a process under which different factors like environment, traffic safety etc are given numeric values with pre-determined weightages and incorporated in the calculations). The most common indicator for project worth considered in decision makings is the C-B ratio, with some countries using the first year rate of return as the parameter.

### Table 2.3 Different evaluation methods adopted by PIARC member countries

<table>
<thead>
<tr>
<th>Indicator for project worth</th>
<th>Discount rate</th>
<th>Appraisal period</th>
<th>Residual value of capital calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>benefit-cost ratio</td>
<td>3%</td>
<td>30</td>
</tr>
<tr>
<td>Sweden</td>
<td>benefit-cost ratio</td>
<td>4%</td>
<td>40</td>
</tr>
<tr>
<td>Belgium*</td>
<td>net present value</td>
<td>4%</td>
<td>30</td>
</tr>
<tr>
<td>Netherlands*</td>
<td>net present value</td>
<td>4%</td>
<td>30</td>
</tr>
<tr>
<td>Finland</td>
<td>benefit-cost ratio</td>
<td>6%</td>
<td>30</td>
</tr>
<tr>
<td>Spain*</td>
<td>benefit-cost ratio</td>
<td>6%</td>
<td>30</td>
</tr>
<tr>
<td>Denmark*</td>
<td>first year rate of return</td>
<td>6%</td>
<td>30</td>
</tr>
<tr>
<td>UK</td>
<td>benefit-cost ratio</td>
<td>6%</td>
<td>30</td>
</tr>
<tr>
<td>Israel</td>
<td>net present value</td>
<td>7%</td>
<td>15</td>
</tr>
<tr>
<td>Australia</td>
<td>benefit-cost ratio</td>
<td>7%</td>
<td>30</td>
</tr>
<tr>
<td>Norway</td>
<td>benefit-cost ratio</td>
<td>7%</td>
<td>25</td>
</tr>
<tr>
<td>Portugal*</td>
<td>net present value</td>
<td>8%</td>
<td>20</td>
</tr>
<tr>
<td>France*</td>
<td>first year rate of return</td>
<td>8%</td>
<td>-</td>
</tr>
<tr>
<td>New Zealand</td>
<td>benefit-cost ratio</td>
<td>10%</td>
<td>25</td>
</tr>
<tr>
<td>South Africa</td>
<td>benefit-cost ratio</td>
<td>15%</td>
<td>30</td>
</tr>
<tr>
<td>USA*</td>
<td>benefit-cost ratio</td>
<td>7%</td>
<td>40</td>
</tr>
<tr>
<td>Switzerland</td>
<td>benefit-cost ratio</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Italy*</td>
<td>benefit-cost ratio</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The Czech Republic</td>
<td>benefit-cost ratio</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Canada</td>
<td>net present value</td>
<td>7-10%</td>
<td>30</td>
</tr>
</tbody>
</table>

* values from EURET 385/94 report
* Different indicators within the benefit-cost analysis are used, in most cases the benefit-cost ratio itself
* The basic framework is the multi-criteria analysis where the results of the benefit-cost analysis is one of the criteria
* implies that information was not available at the time of writing

Source: Economic Evaluation Methods for road projects in PIARC member countries, PIARC, 1999

The issue of dedication of user fees is another contentious issue. Strongly advised by all proponents of PPP, it is rarely practiced. Though there are some instances of regional level governments levying dedicated user fees, countries like Canada, UK, France, Germany Slovak Republic, Norway Portugal etc do not have national level policies of dedicated user fees. A World Bank report on PPP in Roads and Highways in the African
nations like Benin, Chad Ghana, Mozambique etc also point out this problem. The main objection for dedicated user fees is that it restricts fiscal flexibility and undermines the unified budget concept.

Other than these countries, Japan, Argentina Columbia and Russia are some of the countries that have dedicated user fees, though their operations have numerous shortcomings. The advantages of dedicated user fees is that it allows greater flexibility for the concerned authorities to formulate projects without depending on the central government’s budgetary outlays that may differ over time. With the evolution of PPPs giving rise to the evolution of independent autonomous bodies to govern them, such dedication of user fees could be crucial for the sustenance of the PPP model. However, there are potentials of conflict of interest arising out of this factor as pointed out in the case of the African nations by the World Bank study.
As economic impacts are not usually studied by the countries before implementing PPP in roads sector, it is difficult to have a comprehensive assessment of the same. However, there are numerous country specific studies that give us some insight into the matter.

One of the most talked about study in this regard was a study by the Washington State Department of Transport (WSDOT), USA. In a survey of five states and British Columbia, the study was an ex-post study of different PPP projects. Though most of the projects were outsourcing of maintenance of highways, there were some cases of BOT projects including construction of newer routes or expansion of more lanes. The study found out that “cases are found where costs may have gone up instead of down, services deteriorated rather than improved, administrative and supervisory arrangements proved problematic, and contractor failures left states scrambling to provide services or caught in the distraction of litigation. Massachusetts did not expand a much-criticized pilot program. Virginia’s highway maintenance asset management program has been off-again, on-again, with significant mid-stream reshaping. Oklahoma cancelled its pilot program. Texas is evaluating whether or not to renew its contracts. Florida is poised to expand highway maintenance outsourcing programs as part of a government wide privatization commitment. British Columbia has been left with no choice but to continue a program that displaced its own-force capabilities, despite unclear cost results and shrinking competition among vendors.” The study finally concluded that:

- Audits and other after-the-fact reviews of state highway maintenance outsourcing projects have shown that the initial claims of projected benefits and cost savings are at best difficult to substantiate and at worst demonstrably overstated.

- These programmes tend to underperform as usually they are all characterised by political motivations, leading to inadequate studies and agreement contracts, failure to assure true market mechanisms, wishful disregard of the need for a strong continuing contract administration and supervision besides other problems.

The study went on to conclude that “The entire body of material rings with the conclusion that business, not politics, must lie at the heart of the evaluation and design of a highway maintenance outsourcing opportunity.”

Quite understandably, this study created some furore in USA with numerous criticisms of the study being put forward by the construction industry. However, there are other studies, often at international scales that conclude that the claims of economic efficiencies, cost estimates etc in terms of promised estimates cannot be substantiated for
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the numerous PPP projects been practiced globally. It is often reiterated that the decision to outsource roads and highways sector through PPP was more of a political decision which was not backed by sound economic rationale.

A study on four PPP road projects in Latin America of the Concession form (Beato 1997) provides some analysis on similar veins. The study gives a detailed study of different issues pertaining to PPP projects, including the problems of legalities, shortcoming on part of the public authorities, problems associated with implementing a new concept like PPP with no former benchmarks etc. However, there are certain specific issues raised by the study that demand attention.

The study states that road projects differ from other infrastructural projects like telecommunications or power supply in the sense that the input provider (Construction Company) dominate the private sector involvement. They have good experience in short term public works contracts but are not very comfortable about long term financing and operating the facilities. They therefore tend to insist on financial structures with reduced recourse to sponsors. Moreover, there role as shareholder and input provider often leads to contradictions in incentives. As an input provider it is interested in raising construction costs while as a concessionaire it should be willing to minimize the same. The profit associated with high building costs accrues in the short run while that of low costs is realized in the long run. Thus bid projects differ according to equity participation of the concessionaires. If construction companies have higher equity, they tend to force for short term financing structures, whereas lower equity participation of constructors mean that they tend to opt for short term profit maximization with higher construction costs.

This problem is further aggravated as revenue projections are mostly upward biased, often intentionally to present the projects as more lucrative. Higher revenue projections often cover higher constructions costs ex ante, but non realization of the same leads to problems. Traffic forecasting is by itself a highly complicated exercise, with no universally accepted foolproof method. Different studies have found that short and midterm projections have higher rates of success, but they are useless for investors. The latter require long term traffic projection (usually for the life time of the concession) which are statistically not very significant.

Traffic risks are ex ante borne by the concessionaire in the contract terms but experiences show that ex post they are borne by the public authorities. Since the option of a
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concessionaire going bankrupt not only spells trouble for the private company but also raises questions on the economic viability of PPP projects (along with serious political liabilities) for the public authorities, the latter more often than not bails out the private players, usually by passing on government grants/ compensations, or extending the contract period through re-negotiations.

This brings in the issue of government contributions and guarantees. Often the public sector might offer outright financial support to reduce project costs or give guarantees to ensure financial operations of the project. While contributions are not pegged to traffic flows or other demand parameters, guarantees usually are. This makes assessing the impact and financial burden of contributions simpler and more easily calculated, and thus the government agencies usually prefer it. The public sector might often opt for periodic contributions, as it allows them to defer public expenditure. However, the most common form of public sector support in Latin America is minimum traffic or revenue guarantee. Private sectors opting for such guarantees usually run the risk of public sector default. Investors cannot impose financial regulations on the public sector or ask for collaterals as they can with private borrowers. Usually, in case of minimum revenue guarantees (since it is not possible to predict the amount of shortfall of revenue in the current year) most often the provisions of payment are not made in that year but feature in the next year’s public budget after the specific amount is determined. Thus, the private sector runs a liquidity risk in case of government guarantees in the short run. Even then, given lack of credit records of many government agencies, the risk of default is pretty high. Thus government guarantees do not reduce the risk profile of the project, but only transform a certain proportion of the traffic risk into credit and political risk. However, the private sector is much more willing to take it than bear the whole traffic risk as the risk coefficient of the later is perceived to be higher than the others.

keeping in lieu with the issue of traffic risks and the question of user charges (both of which are interlinked), a study by A. Leiman (2003) on the South African experience with user charges bring forth the other side of the picture. The tolling principle followed in South Africa is a conventional one and hence acts as a good proxy study for other countries. According to the government transport policy document “Moving South Africa”, tolling is targeted to be economically efficient with full cost recovery from users. Economic efficiency means that the users must pay for the marginal social cost incurred. It requires that each road user pay toll fees equal to the incremental costs which the user is imposing:
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a) on maintaining the road – (marginal operating costs)
b) on other road users – (marginal external costs)
c) for the road itself – (amortisation/interest on capital expended).

The policy of South Africa has a caveat that no type of user should cross subsidise others. This maybe a departure from other developing nations where freight transport is cross subsidised heavily. However, to follow the principle of equitable user charges, factors like road quality, options of alternative routes, vehicle axle number, load per axle, total loading etc have to be accounted for. As in most countries, tolling in South Africa is only based on axle numbers, which is an easier method of tolling but is nonetheless economically inefficient. Moreover, for tolling to be efficient, the same rates must be applicable for all roads. However, issues such as congestion charges, environmental damage recovery etc create a rift between user charges between urban and rural areas, which in the long run creates discrepancies in overall user charges levied. They in turn tend to affect traffic patterns, which in turn affect total revenue earnings, often resulting in shortcoming vis-à-vis projections.

Nonetheless, some of the effects of the tolling system are as follows:

One obvious weakness is that the tolls levied in South Africa are not based on actual axle loading, but on potential vehicle capacity (number of axles). A vehicle laden to the legal limit pays no more than one carrying a far lesser load. The implicit incentive is to reduce the number of vehicles and to load them more heavily. This reinforces the effects of existing scale economies in road transport, which already induce overloading. This holds equally true for India.

Even more central, an increase in the number of axles reduces the damage done by a given load, yet the South African tolling system increases the charge as the number of axles rises. A true ‘user-pays’ toll should be based on a combination of: loading per axle/number of axles/distance covered. In South Africa the transactions costs of establishing and monitoring such a toll are the immediate constraints on its introduction. It is to be noted that such problems are not only endemic for South Africa but are applicable for almost all countries.

At first sight tolling appears to reduce the distortions in the freight transport field, making road haulers at least partly liable for the damage they do. Unfortunately, the tolling process has two weaknesses that tend to increase externalities and reduce the
efficiency of the transport system. First, tollbooths slow traffic flow, increase accident risk and add to noise and air pollution in their vicinity. Second, and far more important, rather than simply 'levelling the playing fields' between road haulers and railways freighters, tolling an open highway shifts costs onto the state and local residents as heavy vehicles divert themselves onto secondary roads to avoid tolls. A common principle for tolling roads incidentally is the provision of non tolled options such that the users are not forced to pay. Theory suggests that rational individuals paying the tolls themselves will use the side roads till the incremental costs of doing so matches the tolls on the main roads. However, in a scenario where a driver can pocket the money and the company/owner picks up the incremental costs of extra mileage, additional repairs, time etc, the incentive to use side roads is even greater. Since such alternate routes are generally narrower and have lighter foundations, whenever tolling shifts a heavy vehicle to a side road it increases road damage, reduces revenue recovery, slows traffic flows and increases accident risk. The situation in South Africa does not seem to be very different from India in this regard.

Mainly, private involvement in roads and highways sector, whether it be in construction of new facilities or in simple maintenance contracting, was theoretically assumed to be more effective and was followed in many countries without any comparative studies. Later experiences and attempts to study the effects have repeatedly raised questions on the efficiency and justification of the practice. Though it would be rash to outrightly reject the policy as many countries have successfully implemented private participation, all literature on the topic identifies mainly two problem areas which must be resolved for success.

One is the issue of quality; whether the private sector delivers better quality and that too at lower cost, as pointed out by the WSDOT study. Some studies on maintenance contracting (Sergio Miquel and James Condron, 1991; Torbjörn Stenbeck 2007) have look specifically into this issue.

The former study (based on a survey in Algeria, Belgium, Brazil, British Columbia (Canada), Chile, England, France, Kenya, Malaysia and Pakistan) concludes that:

- In most countries surveyed, the primary reason for using contract maintenance was to improve the effectiveness of maintenance while accommodating reductions in public employment. In all cases, these reductions are the result of political decisions to reduce the overall size of government.
• None of the selected countries actually carried out comparative studies of the costs of force account versus contract maintenance before initiating the transition from force account. While data is readily available about unit costs for maintenance work performed by contract, overall, the selected countries collect very little information about the cost of performing work by force account.

• There is little hard data available in the countries studied to support the general perception that contract maintenance is more cost-effective than force account. Even when cost information is available, it is difficult to make valid comparisons because of different execution methods, quality standards and accounting practices. However, it is generally accepted that force account work units become more efficient when they have to compete with private contractors.

Torbjörn Stenbeck's study, an attempt to quantify the cost effect of contracting vis-à-vis in-house provisions in Canada based on the hypothesis (derived from the Swedish experience) that outsourcing reduces the cost of highway maintenance, perhaps at the expense of quality or long term technical development. The hypothesis is itself based on numerous studies done in the Swedish case. This specific study concludes that after having neutralized different ways to measure the length of the highway network, weather and traffic effects, 26% higher cost for contracting remained. Quality and technical development was not observed to be noticeably higher nor lower in the contracted provinces.

The issue of qualitative improvement can be dealt by introducing proper monitoring, penalty clauses in the contract for shortcomings etc. The problem is that the cost for better quality is often higher than that promised. However, as repeatedly pointed out in the numerous studies, the decision to involve the private sector is often a political one which makes admission of these problems and their correction an extra economic issue.

The second pertinent point is that introduction of PPP in roads sector like any other sector leads to a departure from a traditional approach to a more commercial approach of utility delivery. In the traditional approach, roads are treated much like public goods and financed from general government revenue. There is little connection between the costs of road provision and the taxes or charges paid by road users (though fuel is often heavily taxed for general revenue purposes), and no attempts at direct road pricing. In the commercial approach, governments deal with roads as a business sector. Roads are treated as capital assets, commercial accounting is applied and users are charged, either
directly or indirectly, for their use of the roads. Road transport remains a source of
general revenue, but taxes are designed to minimize distortions to transport patterns or
choices. In some countries, road finance is being separated from general government
expenditures and road users are increasingly involved in decision-making.

More often than not, the shift to the commercial approach triggers numerous kinds of
problems and risks for the projects. While on one hand the shift to a commercial
approach introduces demand or market risk associated with the financial operations of
the project, in extreme situations it might give rise to serious political risks if public
resentment reaches a certain level. The issue of user charges is thus central to the PPP
concept for roads sector and therefore warrants a deeper in-look.

In the commercial approach, it is stated that to maintain efficient allocations between
sectors, no category of vehicle should pay less than the sum of the following.

- The economic cost of the fuel and the other resources consumed in making the trip.
  These may be termed the private marginal costs of using the road network.

- The marginal road maintenance cost: additional traffic, especially heavy commercial
  traffic, increases road deterioration, reduces the pavement life and increases the cost of
  road maintenance and renewal.

- The marginal environmental cost: increased traffic raises the levels of vehicle
  emissions, noise pollution, etc. These costs are not borne by the road user but by society,
  mainly those people living and working close to the roads.

- The marginal congestion cost imposed on other vehicles: as vehicle flow increases,
  vehicle speeds decline. The individual road user considers only his/her personal time and
  cost; but their use of the road may well increase the travel time and costs of all users of
  that road.

The instruments for charging road users are fuel tax, annual license fee and toll taxes.
Alternatively, the beneficiaries of the roads may be taxed for the benefits of the new
developments. This may refer to the industries that would benefit from the new road
construction, the residents of the regions being connected, etc. This may take different
forms. One method is to charge a land value increment tax (which is a form of
betterment tax) for recovering the costs. Public and private property developers build
roads and develop other facilities and then recover their costs from subsequent
purchasers of the property, taxes imposed on industries of the region that benefit
especially from the new facility or from general tax revenues (local). In South Korea for example, in some municipalities it is mandatory for car owners registering their cars to buy a municipal bond for road construction and maintenance. There can be other forms of beneficiary taxes.

A fuel tax or cess is an additional charge set on fuel consumption in lieu of road user charges, as in done in India in the form of the 2% cess on account of the Central Road Fund (CRF). Even though fuel taxes are easier to implement and given inelasticity of demand non-distortionary, it has certain other problems. The prime consideration is that in many countries diesel is used for other purposes as well (e.g. used for running pumps and motors especially in the rural sector) and charging them for road user charges does not make sense. In India, this problem is sought to be resolved by charging CRF on High Speed Diesel (HSD) only which is used mainly for personal transportation. Secondly, price differences between diesel and kerosene gives rise to problems of adulteration. So, using fuel tax for funding road developments can give rise to other inefficiencies in the economy.

Annual vehicle taxes are ideal for recovering fixed costs. Another advantage with annual taxes is that it can distinguish between vehicles, according to the weight and/or axle configuration, thereby giving greater flexibility to charge base on the degree of road damage.

A toll tax is the most common form of user charge imposed for PPPs in roads. The question of tolling is debatable and has often met with serious political and social opposition. Proponents of toll taxes argue that toll taxes can indeed be beneficial under three circumstances.

- Where the toll is necessary to finance, or accelerate, the provision of a facility that would not otherwise be provided.

Benefits of this type are particularly important for developing countries where the growing demand cannot be met as general taxation/road user charges are insufficient to meet the desired level of investment. However, the issue of greater social cost remains to be resolved.

- Where the tolled facility is itself congested and the toll secures a more optimal level of utilization (fewer users, moving more quickly). These benefits arise as a consequence of deterring some trips with a net marginal value (above private
operating and time costs) less than the toll and hence improve the performance of the system for those trips with higher values.

In such circumstances, often in urban areas, overall user charges might be increased to reflect the prevailing congestion. However, to maintain parity, alternative modes of public transportation have to be offered to the public.

- Where the whole system, including the tolled road and alternative untolled routes, is congested. The tolls “sort” the traffic so that the vehicles with the highest value of time savings use the faster tolled route, while those with a lower value of time, and hence a lower willingness to pay, use the untolled route.

Such an argument is problematic in countries where there is actually a shortage of road facilities. Thus the option is often not available to the users, compelling them to pay charges for a service normally considered under free goods. Moreover, given that transporters are more concerned about short term immediate profits, it may so happen that the bulk of the traffic prefers for free services even if it may be time consuming.

The issue of user charges has proved to be highly contentious. Numerous cases of public outcry on this issue has jeopardised private involvement in road developments. Proponent of PPP profess that certain issues pertaining to user charges need to be adhered to in order to prevent such happenings. The first is the issue of equity. The three forms, as can be seen below, can give rise to contradictory solutions.

*Horizontal equity:* vehicles within the same category, imposing the same costs on society, should pay the same level of charges. Fuel tax is equitable, in this regard, as the payment is generally proportionate to road use. Different annual vehicle charges, depending upon the place of licensing as in India, may not be.

*Vertical equity:* charges paid by different vehicle categories should vary in proportion to the costs that the categories impose. Fuel tax is not equitable; the increase in fuel consumed, as vehicle weight increases, is not proportional to the increase in road damage imposed. Insofar as heavier vehicles use diesel, a rough degree of vertical equity may be achieved by imposing relatively heavier taxes on diesel than on gasoline.

*Distributional equity:* this is normally interpreted, as requiring charged taxes to be progressive, with higher income users paying higher charges. This would suggest higher taxes on gasoline that, in low and medium income countries, is used in the cars owned by the relatively rich.
Equity considerations may be particularly important to finance those costs that are not directly attributable to individual vehicles. Distributional equity, however, can also be interpreted as requiring road users to fund all the cost associated with the provision of roads.

There are certain non-variable costs in road maintenance that too must be considered under user charges. Since they are fixed costs and cannot be attributed to any definite user or vehicle classes as such, the appropriations of such revenues give rise to two considerations.

*Equity distribution approach:* Higher income groups, primarily private car owners, should finance the costs through higher charges (higher charges on gasoline) as they benefit from the road network and can afford to pay higher charges.

*Economic pricing approach:* Fixed costs should be financed by charges that impose the least distortion on the use of the road network. Such charges could be set by an annual vehicle license fee; once paid, there would be no impact on the individuals' decisions as to whether to use the network, the cost of the marginal trip would not be changed.

*Charges established through Ramsey pricing principles:* To minimize the impact on total use, the additional charges necessary to cover the fixed costs should be set in inverse proportion to the demand elasticity. Higher charges would thus be established for those vehicle categories with the lowest travel demand elasticity (World Bank, 2004).

International experiences on user charges for roads bring forward various other factors for consideration. There is the question of administrative costs and efficiency of the instrument used. Efficiency refers to the cost relative to the revenues raised, the question of evasion (illegally failing to pay), avoidance (using legal loopholes to avoid payments) and the impact of these user charges on the different sections of the society. It has been found from studies that the issue of efficiency depends on the country's stage of development and the effectiveness of its system of tax administration. For example, fuel charges are administratively the most efficient mean of collecting revenue. Toll on the other hand can be costlier to collect and requires substantial monitoring to prevent leakage and can lead to delays in traffic that puts an indirect cost on the road users. Beneficiary taxes are toughest to implement politically, and in rural areas it may not be economically feasible either.
The indirect impact of user charges too is an important consideration. Fuel charges can lead to different kinds of developments that may be causes of concern. The most obvious is the issue of adulteration with (say) kerosene as discussed before. Differential pricing may result in higher demands for diesel cars, even in the personal or luxury car section that can give rise to skewed fuel demands as well as environmental concerns. Moreover such skewed demand can lead to inefficient distribution of fuel subsidy that is usually followed, hence defeating the whole purpose.

Toll taxes are rather limited in their scope. Tolling can only be followed in roads with substantial traffic. Moreover, the success of tolling depends on the availability of other options for the users. If free routes are available for the users then that may be preferred, thereby leading to higher market risk for the tolled project, whereas the unavailability of free roads may cause serious resentments amongst the users that can give rise to political risks for the project. The general willingness of users to pay tolls is dependent on their wealth, the value they assign on the benefits of the tolled project and the cost and quality of the alternatives. Calculating toll revenues ex ante is therefore a tougher agenda.

Vehicle registration charges too can have indirect distortionary impacts. If differential rates are charged in different states (high charges in the states where the road projects are being implemented to ensure equitable user charges), this may give rise to a situation where owners would register their vehicles in other states with lower rates and then transfer it back. Additional regulations would be required to counter that. Higher taxes on spares and other automotive inputs (say lubricants, engine oils by variety if necessary to maintain equity) may coerce users to lessen car maintenance that can lead to higher road damages, environmental concerns and other inefficiencies.

Most countries using PPP in roads sector usually follow a combination of different user charges depending on the ground realities of the economy. A correct balance is required to ensure that the user charges being imposed are equitable and at the same time generate enough resources to fund the projects. It is often advised that the user charges levied should be fully utilized for the maintenance of the facility through a dedicated user fees system, where the entire revenue collected accrues to a fund designed for that sole purpose. However, this is not followed in practice (as exposed from the PIARC survey) and generally the revenue earned accrues to the central coffers from which certain amount is then earmarked for maintaining the facility. Problems arise when the revenue
generated from the facility is perceived as general revenue such that the collect is used for other purposes as well. In such cases the parity of the user fees system does not hold.

Usually, the problem of traffic revenue risk is accredited to inaccurate traffic projections. This inaccuracy stems from faulty historical traffic data (which is a shortcoming on behalf of the concerned authorities) but more importantly, inability to project future traffic volumes, which in turn stems from the inability to predict road user reactions to user charges.

Direct road user charges like tolls have met with stiff resistance, not only in India but also elsewhere. The problem is more prevalent in developing countries. The most common explanation given for it is that given historically roads have been perceived as a free good, the users today are reluctant to pay for the same. This reluctance leads to popular protests often leading to political issues, or simply switching off traffic to a free route, no matter how economically inefficient that might be for the user. The different equity considerations discussed before are meant to ensure that users are not charged unjustly. This in turn is supposed to ensure compliance on their part to pay for the facility. However, as experiences prove, it is often not the case. The issue is more than mere subjective mindset.

Ideally, user charges for a public good should charge the marginal cost incurred by the user for using the same. In that sense, the user should be charged for the maintenance of the facility. Infact, numerous examples of outsourcing of O&M of highways in developed countries like US Australia and several European countries have had successful runs over the last decade. However, when the capital or fixed cost is sought to be recovered from the users, the charge levied is to be higher than the marginal cost the user entails. Under private concerns, which seek to earn profits from their endeavours, an extra markup is added to it. In developing countries, given capital scarcity, the cost of capital is high and subsequently the profit margin sought by the private sector is higher. For a highly capital intensive project like roads infrastructure, coupled with the long gestation period, these charges are much higher. The result is a user charge required to cover investments which is often higher than the perceived benefits derived by the users who therefore resent paying it. This usually is the root cause of all market risks for PPP projects.

According to proponents of PPP, the market can ensure a proper solution to all these problems. The different risks involved in PPP as discussed in Chapter 1 or the specific
issues raised in this chapter are ultimately different forms of risks that need to be negotiated before a contract is signed. Thus, the contract is the market preferred mechanism to resolve all such contradictions.

Therefore, before engaging in a detailed study of the Indian scenario, a brief study of contracts is required. The following chapter looks into the whole gamut of contract and game theoretic literatures to try and evolve a common understanding.