CHAPTER-VI

ROAD PRICING AND WILLINGNESS TO PAY TOLLS

6.1 INTRODUCTION

SECTION-I: THEORETICAL BACKGROUND

6.2 THEORETICAL ASPECTS OF ROAD PRICING AND WILLINGNESS TO PAY

6.2.1 Are Roads Public Goods?

6.2.2. Travel Demand And Application of Tolls

6.2.3. Marginal Social Pricing And Average Pricing Of Roads

6.3 ISSUES OF SECTORAL TAXES ON INDIAN ROAD SECTOR

6.4 TOLLING LEGISLATION IN INDIA

6.5 BOT PROJECTS AND APPLICATION OF TOLLS

SECTION-II: EMPIRICAL ANALYSIS

6.6 FIELD SURVEY FOR IDENTIFYING ISSUES RELATED TO WTP OF ROAD USERS

6.6.1 Availability of Standards And Recent Trends To Carry Out WTP Survey :

6.6.2 Structuring WTP Questionnaire For Car Users And Truckers On Vadodara – Halol Toll Road

6.6.3 Sampling Method For Car Users And Truckers For WTP Survey

6.6.4. WTP Results For car Users and Truckers

6.6.5 Model Building Process Of WTP For Toll Road

6.6.6 Regression Analysis For Explanation Of WTP For Car Users

6.6.7 Regression Analysis For Explanation Of WTP For Truckers

6.7 CONCLUSION

CHAPTER-VI

ROAD PRICING AND WILLINGNESS TO PAY TOLLS

6.1 INTRODUCTION:

As seen in earlier chapter, the success of commercial approach to development of roads is ultimately linked to the public response to direct tolling operations. Under direct tolling, the third dimension of PPP agreement i.e. public itself is asked to pay for Government's decision to develop the roads on tolling basis. But tolling has many implications and externalities which are assumed beyond the scope in a typical concession agreement. If a bidder fails to understand tolling implications at given locations, he faces many hurdles (mainly from local users) as seen in some of the case studies. Tolling of a segment in a transport network creates "Rat Running" behaviour on long distance users. It is necessary to understand what are aspirations of road users and issues emerging out need due attention. Hence in this chapter, road users are directly interacted for realizing their perception of such a complicated operation of a toll project through concession agreement wherein user's recourse is never addressed. The whole chapter is divided into two sections: Section-I (Theoretical Background); Section-II (Empirical Analysis) and is presented below.

SECTION-I: THEORETICAL BACKGROUND

6.2 THEORETICAL ASPECTS OF ROAD PRICING AND WILLINGNESS TO PAY:

The road pricing has old history as was observed under Chapter-II for literature review. Historically, roads were never public goods considering the road developments on toll basis by Trust/Corporation in UK/US during 17^{th} and 18^{th} centuries (Benson & Moore 2002). The tolling has been implemented either as funding tolls (earlier turnpikes in UK/US and now in form of BOT/BOOT agreements) or a decongestion tolls. The first category of tolling is based on equity in pricing the road usage whereas latter is related with efficiency aspects of road usage. The arena of road pricing should have been explored by economists for efficiency and equity in the society. But it has been observed that there is some chaos in framing road pricing. The economists do agree to solve highway congestion by road pricing

but beyond this primary insight, there is much disagreement over setting of tolls (marginal versus average costs), how to cover common costs (choice of imposing various fixed charges on ownership of vehicles), what to do with excess revenue (shall the tolls neutralize existing taxation in the sector?) etc (Lindsey 2004). The road development carrying significant externalities, roads have been covered under domain of Government provisions. Hence, present society perceives road as a Public Good but now the concession agreements are allowing tolling on individual road user for funding or efficiency objectives and that sparks row in terms of toll resistance. The resource crunch expressed by Government is yet to make impact on road users' aspirations for free utilization of this commodity. The willingness to pay (WTP) among the users is not so elaborate for public nature of this commodity. The commercial investors under BOT agreement are at the stake under such circumstances when there is no established tolling culture among the users of facility.

6.2.1 Are Roads Public Goods?

The very public nature of roads and mostly free provision of this infrastructure has lots of implications when a toll road project is implemented and viability of project is pinned to toll revenues of the project. The commercial calculations of project feasibility often overlook willingness to pay aspects of road users and hence merely by coercion, the toll projects are awarded monopolistic conditions to operate where demand and supply equilibrium seldom matters (imperfect market).

The various pedagogical texts recognize four kinds of goods in the economics:

A) **Private Goods**: Excludable and Rival e.g. congested toll roads.
B) **Public Goods**: Neither Excludable nor Rival e.g. uncongested nontoll roads.
C) **Common Resources**: Are Rival but not excludable e.g. congested nontoll roads.
D) **Natural Monopolies**: Are Excludable but not Rival e.g. uncongested toll roads.

Hence the status of roads shall be depending on institutional arrangements provided by policy makers. A toll road may behave like a private good or natural monopoly good whereas a free road may lose the acceptance if it is congested and it turns up to

be matter of common resources. In general, public nature of roads (by continued building up of free roads using general tax revenues) and already travel based taxation faced by road users generate a gamut of issues regarding direct pricing of the roads. In fact the concept of "Public Goods" is felt confusing within three analytically distinct characters: Excludability; Rivalry and Public Finance, nevertheless the user's perception of roads as public goods helps in understanding problems of pubic decision makers. The recent trend of pricing of the publicly and privately funded roads is yet not met with consensus even among economists world over (Lindsey 2006). The diminishing spending capacity of Governments is spearheading for attracting private sector participation in this sector. When a good does not have a price attached to it, market forces can not ensure such good is produced and consumed in proper amounts and at proper time and hence policy makers are gradually communicating between commercial and public interest for sustainable PSP in this sector.

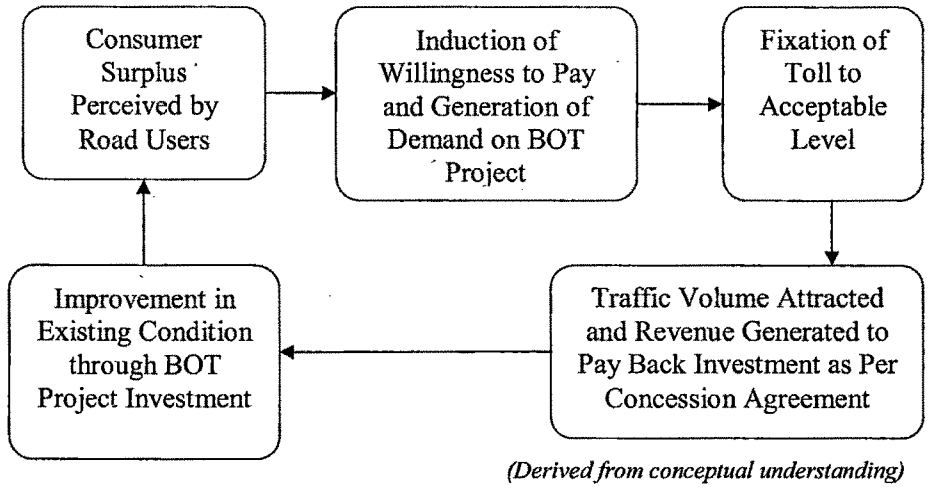
6.2.2 Travel Demand And Application Of Tolls:

The demand for travel for a human being is the results of need to engage in certain activities e.g. work (Business), Shopping, Leisure, School, social etc. The travel demand being thus a derived demand, it usually does not have any value or utility by itself. Hence traveling itself can not be increased or decreased using incentives or disincentives Moreover, it is more guided by spatial allocation of various activities of a traveller at a given point of time. A road user if travels frequently (repetitious choices) an individual is unlikely to make a rational decision each time. In such case, habitual behaviour or inertia may prevail over rationality and utility maximization may be sidelined. Similarly it is quite possible that an individual hardly travelling may not be aware of attributes for utility maximization and thus may not be rational while incurring travelling cost (Emmerink 1998). So demand for travelling and thus cost of travelling may be severely affected by individual's behavioural response which may be even changing time to time. Under such complex conditions, imposing road user charges or toll on an individual can generate varied responses and imposition of such charges may alter their activity pattern and hence the travelling decision. The concept of road pricing is in practice since long in many countries and more advanced concept of congestion pricing is being implemented to recover marginal social cost incurred by one user on others. The concept of consumer surplus due to improved road

conditions is often discussed by the transport economists (Heggie 1972 and Glaister 1981). The direct benefits like reduction in vehicle operating cost (VOC), comfort, convenience and saving in travel time, reduction in accident costs, environmental improvements and indirect benefits like increase in land cost (mostly applicable in urban zones), multiplier and accelerator effects etc. contribute to the consumer surplus of a road user. Hence for a given demand function of a road user, reduction in expenditure to maintain constant level of utility in case of change in travel cost explains the consumer surplus. This consumer surplus is giving measure of willingness to pay under improved road conditions. It is very important to note that consumer surplus forms the basis of willingness to pay and WTP forms the basis of fixation of toll levels. The toll levels in conjunction with year wise traffic projections form the foundation of viability of any BOT project (Figure:VI-1).

Figure:VI-1

Conceptual Relation of WTP with Viability of BOT Project



(Derived from conceptual understanding)

6.2.3. Marginal Social Pricing and Average Pricing Of Roads:

Theoretically, every individual vehicle (assuming all are identical) will incur some mechanical and time related cost per Km. of road use. But both these costs per km. will be function of No. of vehicles plying on the road (or congestion on that Km. of road). Suppose that private cost is represented by C (x). Every individual thinks that

he is incurring only cost C (x) under the presence of x-vehicles in the traffic flow but what cost he makes on others is never accounted by him. This marginal cost is marginal social cost effected by an individual. Now for each vehicle marginal private cost will remain less than the marginal social cost so it forms a basis for introducing toll on marginal vehicle. Hence, it is optimum to toll such that marginal private cost plus toll equals the marginal social cost. It means one shall be tolled for the cost he imposes on others by his marginal effect. Hence it is possible to argue that on uncongested road / bridge where no congestion occurs due to marginal vehicle, no toll is admissible. This is true for economic analysis (Glaister 1981) and hence the evaluation may suggest taking up such projects from public investments, or the loss to a private toll operator may be compensated from public purses due to exempted tolling. The economic analysis available in various literatures (Emmerink 1998, Heggie 1972 and Glaister 1981) is explaining how to internalize the social cost of marginal vehicle on the basis of economic efficiency taking recourse of tolling. This concept will require tolling to vary with level of congestion. Hence in case of no congestion, direct tolling may not be the suitable tool to charge the users. The above stated theoretical explanation for tolling can be useful in case of BOT projects being tolled to recover the investments done by the concessionaire on the assumption that such projects are taken up on congested corridors. However, the tolling on BOT projects is applying uniform tolling but rates are classified as per size of vehicles. This is called Average Cost (AC) pricing and is targeted to recover the investments rather than worrying for efficient use of road space.

The ideological difference among economists is regarding application of Short Run Marginal Cost (SRMC) based pricing for efficient road use versus average cost (AC) pricing for cost recovery. The idea of average cost pricing was disliked by many for over investments and SRMC was found too theoretical. Of course, SRMC based pricing may require host of factors like, demand elasticity, externalities etc. and hence may require sophisticated technology to inform and apply toll variations in smooth manners. This is now getting possible using cameras and satellite based global positioning systems and already in use in UK, US, Hong Kong, Australia etc. known as electronic pricing. In the Indian context, concessions are granted on average cost basis for new constructions and maintenance agreements. But capacity augmentation in terms of four lanning and six lanning are so much delayed that rationing and

efficiency factors for decongestion are automatically addressed in many cases where alternatives are available. Whether it is SRMC or AC based pricing is adopted for BOT roads, the Public concern is use of monopoly power being granted to private firm especially when concession agreements are not providing any user's recourse.

6.3 ISSUES OF SECTORAL TAXES ON INDIAN ROAD SECTOR:

In India the road sector is already heavily taxed by Central and State Governments as detailed below. The incidence of taxation on road sector has been so far labeled as general revenue except recently created dedicated fuel cess by Central for NHAI and by few State Governments. The myriad taxes imposed on road users are listed in Table: VI-1:A and values for FY 2002 are given under Table: VI-1:B which are illustrative of weightages of various taxes. As given in these tables, State and Central i.e. both Governments are almost drawing equally from this sector totaling to the tune of Rs. 500.1 billion per year. In this, cars are found contributing totally Rs.115.8 billions which is closely followed by trucks and buses. Considering occupancy ratio or carrying capacity of trucks and buses, cars are leading in paying for roads at much higher proportion than given under Table: VI-1:B. The fuel based charges are collected on per km usage and hence are very much relevant to toll projects.

Table: VI-1:A

Range Of Taxes on Road Sector

	Central Government	State Governments
Vehicle Purchase	– Central customs/Excise duty on motor vehicles – Central sales tax on inter-state transactions and shipment of vehicles	– Sales tax on vehicle/chassis and cab/ body
Vehicle Owner ship	-----	– Motor vehicle tax (annual or lifetime) – Registration fee – Certificate of fitness – Taxes levied on passengers and goods vehicles – Entry tax1
Vehicle Use	– Excise duty on fuel – Cess on fuel – Excise duty on spares/lubes/accessories – Road user tolls	– Sales tax on spares/ lubes/ accessories – Sales tax on fuel – Cess on fuel – Road user tolls – Permits and licenses – Fines and penalties

1= Applicable to vehicles purchased / registered in one state and brought into another state

(Source: India Financing Highways : World Bank Report 2004)

A striking revelation is, fuels are contributing 53% of the total sectoral revenues of Rs. 500.1 billion. The World Bank has assessed that total tolls collected on Indian roads amounts to Rs. 1500 crores during the FY 2002 which is merely 3% of total sectoral revenues of Rs. 500.1 billion. Hence, it seems logical to charge a bit more on fuels and get rid of tolling modalities. But it is required to be noted that existing tolling of Rs. 1500 crores is not applicable to all vehicles attributing Rs. 500.1 billion of revenues. The city buses for example are not exposed to tolling on highways. By adding toll requirements to fuel taxes, all vehicles are paying for every development in roads irrespective of individual utility. Thus, an interstate long distance trucker will be unduly subsidized at the cost of urban or local journey making vehicle. The equity (geographical equity) concern will not allow planners to do so. More over, changing perspectives of fuel type and efficiency will distort the actual levy of fuel taxes across various vehicles and this will not really help in rationing or efficient use of limited road space.

Table: VI-1:B

Total Taxes On Vehicle Type (Assessed for FY2002, Rs. in billion)

	Total	2 Wheeler	Car	Jeep/ Taxi	Bus	Freight vehicles		
						LCV	HCV	MAV
Central Government								
Excise on Fuels	150.9	32.8	52.2	4.4	10.1	15.8	34.3	1.3
Excise on motor vehicles	31.7	6.6	15.0	5.0	1.1	1.5	2.3	0.1
Excise on tyres	11.2	1.5	1.6	0.4	1.0	1.8	4.2	0.2
Excise on motor parts	15.3	1.4	2.5	0.9	1.8	2.7	5.8	0.2
Cess on fuel	28.1	2.8	4.4	1.4	3.2	5.0	10.9	0.4
Total* Central Govt.	**237.3**	**45.1**	**75.6**	**12.3**	**17.5**	**26.8**	**57.5**	**2.3**
State Governments								
Sales Tax on Fuels	87.9	9.4	15.0	4.2	9.7	15.2	33.0	1.3
Sales Tax on motor vehicles	39.0	11.2	14.5	4.8	1.9	2.5	4.0	0.2
Sales Tax on tyres	6.2	0.4	0.3	0.0	1.5	0.6	3.2	0.1
Sales Tax on motor parts	4.9	2.3	0.9	0.1	0.5	0.3	0.8	0.0
Taxes on vehicles**	124.8	7.4	9.4	2.8	81.9	5.2	16.7	1.3
Total State Govt.	**262.8**	**30.7**	**40.2**	**11.9**	**95.5**	**23.8**	**57.8**	**2.9**
Grand Revenues	**500.1**	**75.8**	**115.8**	**24.2**	**113.1**	**50.6**	**115.3**	**5.2**

* not including customs duties which are payable on import/export, a further Rs77 billion in 2001-02

**including fees, fines, penalties, passenger and goods taxes

(Source: India Financing Highways : World Bank Report 2004)

It is also to be noted that out of the total sectoral revenues of Rs. 500.1 billion, 50% is collected from users of NH and or SH whereas urban road users are contributing 34% of sectoral revenues (India Financing Highways : World Bank Report 2004). Hence, direct tolling of main links of Indian road network i.e. NH and SH raises large repercussion when road users are tolled on road use in addition to other taxes. Also, taxes on purchase/ownership of vehicles are covering about 40% of the sectoral revenues. So in absence of tolls, fixed cost of running a vehicle is high enough to use the vehicles extensively. This fact is good enough to explain the commercial road users e.g. truck owners/operators to reduce the travel time for enabling more no. of journeys during efficient life cycle of say 15 years. This fact shall mean higher value of time saved if the fixed cost of vehicle ownership is taken in to account. A generalized data on actual revenue collected per vehicle–km basis for various vehicles

is given in Table: VI-2 with some assumptions for efficient life of vehicles. Using the same data, per passenger per km taxes are calculated and it shows the car owners seem punished for perceived luxury of the commodity.

Table: VI-2

Realization of Per Vehicle Taxes on Road Sector (Rs.)

	2 Wheelers	Car	Jeep/ Taxi	Bus	Freight vehicles		
					LCV	HCV	MAV
On Purchase	680	8087	9087	8863	4428	7488	10818
On Ownership	266	2487	2487	210340	5515	17628	33663
Road use(other than direct tolls)	1778	19947	10026	71228	43460	96499	91071
Total annual tax per vehicle	**2724**	**30521**	**21600**	**290431**	**53403**	**121615**	**135551**
Total tax per vehicle-km	**0.44** (=0.22 per passenger km)	**2.39** (=0.60 per passenger km)	**1.03** (=0.17 per passenger km)	**5.69** (=0.14 per passenger km)	**1.48**	**2.03**	**2.51**

(Source: Derived From India Financing Highways : World Bank Report 2004)

But economists are not ready to spare truckers considering that they are only paying 80% of costs imposed by them by damaging the road pavements due to heavy loads (India Financing Highways : World Bank Report 2004). In addition, trucks are found to impose substantial delays on other road users through their slow speeds, even on the highway network. Hence researchers often suggest the policy makers to charge the fuel for them (i.e. diesel) on higher side and to impose higher taxes/ tolls to pay for their share of investment needs in road sector. The problems of these long distance travellers are aggravated further due to the fact that interstate SH and NH are under-maintained in India. As per data under Table:VI-3 for FY 2002 the extent of actual maintenance is only 22% for NH and 40% for SH of the normative requirements.

This deficit is attributed to lower returning back of revenue collected from road sector, back to this sector.

Table: VI-3

Total Revenues and Expenditure Mismatches (FY 2002)

(Rs. in billion)

	Tax / charge revenue	Road Expenditure	Expenditure % o f Revenue
National and State Highways	254	63	25%
District and Rural Roads	77	64	83%
Urban Roads	169		
Total	500	211	42%

(Source: India Financing Highways: World Bank Report 2004)

6.4 Tolling Legislation in India:

As evident from previous subsection, direct tolling has very small contribution to overall sectoral revenues. But due to inefficiency in collecting the revenues and spending the allocations on Government side has provided platform for private sector to spend and earn himself in terms of tolls under PPP projects. There are basically three Acts that empower either State or Union Government to impose user fee/ tolls for use of highways.

They are:

1. The Tolls Act of 1851.
2. The National highways Act 1956
3. The National Highways Authority of India Act 1988.

The Tolls Act 1851 authorizes State Governments to levy toll on users of any roads or bridges (excluding NH) and State can lease the collection rights of tolling. The NH Act 1956 is related to tolling on NH and declaring any road as NH. The NH Authority Act allows a highway authority to assume obligations of NH and collect tolls on behalf of Central Government.

Since very few states have enforced toll policies on SH, the State highways are many of times found as free roads. But The NH Act 1956 originally provided for fees for services or benefits on use of ferries, temporary bridges and tunnels on NH (Section 7 of NH Act 1956, GOI). The NH rules framed under the Act in 1964 also provided to lease out collection of fees on yearly basis. These fees were mainly for Dolly/ Palki hauling or non mechanical carriage pulling charges. However, it also mentioned fees for car at Rs. 10.0 plus Rs. 0.25 per occupant and Rs. 50.0 per loaded truck/ passenger bus which were quite high for 1964 period. The rules also mentioned fees of Rs. 0.06 per dog and such fees for other animals which is beyond imagination in present context.

The NH Act 1956 was amended in 1977 to include all permanent bridges constructed with cost or above Rs.25.0 lacs (built and opened to traffic after date 1-4-76) for collection of fees on use but GOI was at discretion to omit any bridge in public interest (Amendment to Section 7 under NH Amendment Act 1977, GOI). The corresponding fee structure was issued in 1978 which was having fees only for mechanical vehicles like 2 Wheelers, cars, bus/ trucks as per cost of the bridge. For example, fee for car was Rs. 2.0 and Rs. 10.0 for bus/truck in loaded condition (unloaded will pay Rs.5.0) on bridge costing more than Rs. 100.0 lacs. Now the fee difference for loaded/ unloaded conditions is not allowed. Also, the rates are felt quite high if toll rates of NICE (Rs. 14.0 for car and Rs. 42.0 for bus/ truck in 2007) for Narmada bridge costing more than 100.0 crores are compared. The Fee Rules 1992 enhanced the fee rates for bridges constructed and opened to traffic after 1St April May 1976 and stated to discontinue tolling after recovery of costs.

Subsequently, it is the NH (Amendment) Act 1992 that has levied fees on use of sections of NH. The consequent fee Rules 1997 made historical amendments for bridges and sections of NH on four lanning not only to imply new fee structure but allowed entry of 'ANY PERSON" to collect the fees for investments of that person in development and maintenance of NH which required amendment of Section8-A of NH Act 1956. Originally the Act was authorizing only public bodies for development and maintenance of NH. More over these rules imposed fees for use of facility created by public funds in perpetuity. These Rules of 1997 provided capping rates for section of NH roads as below which can be construed as a bench mark for private investment

toll road projects under BOT /BOOT. The Rules of 1997 are providing toll rates to be linked to Whole sale price index for any subsequent year. These adjustments are not really understandable remembering that any road project will be completed by upfront payments and hence passing over the inflation to users is like further spiraling up the effect of inflation for users. Knowing the fact that BOT projects are evaluated and awarded based on applying some discount factors to the future cash flows, the tolls adjusted for inflation are actually like real hike in toll levels. And the toll tenure in perpetuity is not at all linked to service standards in case of publicly funded projects. For BOT projects, after end of concessions the project is handed over to public authority and then onwards, indiscriminately above toll rates are levied to the users as if the investment is yet to be recovered. Hence, by virtue of these Rules, tolling on NH has become pervasive and it has gathered resistance from users like any country in the world. The above Rules from beginning are framed to recover the costs but keeping in view savings in vehicle operating costs and liability for facility maintenance costs. The foundation of tolling the road sections is thus based on cost recovery and not for congestion or efficiency of road space or road network. More over, the introduction of tolling on four lanned road sections can be interpreted like creating "exclusion" and hence converting a pubic nature of roads in to a natural monopoly spurring lot of reaction. Once the tolled road starts getting congested and even after willingness to pay the price, the users are denied access or pricing is exercised restrictively the facility turns up to be a private good and public concern is shown exit from the operations. In India, dynamic pricing is yet to be set up but a facility not accommodating increased traffic even after paying tolls will be like private good. Because in this case the traffic already entered will not be replaced by new entrants in a flow and new entrants will feel as if the facility is a private club. The present legislation is not providing any user's recourse for availing stated facility even after paying tolls. Like, people paying for four lanning bridge facility at Narmada bridge have to queue up at bridge site for their turn to cross the river even after paying four lane tolls when the old bridge is closed for repairs and the facility works as a two lane facility. Neither CA nor NH Act is providing for any refund/rebate in such cases.

Table: VI-4

Toll Rates on NH sections on four lanning at base level and adjusted for inflation for 2006-2007

Sr. No.	Type of Vehicle	Capping rate as on June 1997 per km	Adjusted toll rate as on 1-4-2006 per km(ΔWPI % = 100*(196.8-131.4)/131.4 = 49.8%
1	Car/jeep	Rs. 0.40 per km	Rs. 0.60 per km
2	LCV	Rs. 0.70 per km	Rs. 1.05 per km
3	Truck/ Bus	Rs. 1.40 per km	Rs. 2.10per km
4	Heavy Construction machinery and earthmoving equipment	Rs. 3.00 per km	Rs. 4.50 per km

(Derived from GOI:NH Rules 1997)

6.5 BOT PROJECTS AND APPLICATION OF TOLLS:

In practice for any BOT project, the consultants try to estimate savings accruing to users in their private costs with the help of Indian Road Congress (IRC- the apex body in preparing standards and guidelines for highway sector) standards for road user cost (IRC:SP-30:1993) under various levels of services and establish the viability of tolling. The problem with users is they do not know consultant's assumptions for savings accruing to users and the said savings are not secured/ guaranteed for users. Under the tolling concept on Short Run Marginal Cost (SRMC) basis, it is expected that the user will bear the toll cost from savings in his private costs under improved conditions. As far as facility is not crowded, the users may agree to sacrifice all of the savings perceived for paying the tolls but as the traffic grows, it contradicts the foundation of tolling based on VOC savings. If the tolling is based on marginal social cost pricing and traffic intensity is heavy, the social cost to marginal vehicle will be higher for every next vehicle. So, it is expected that user will enter the facility to the extent he wipes out his whole savings in private costs. After this stage, a user will not have any incentive to enter the facility. Hence any facility with excessive traffic will operate to collect maximum toll on the name of social costs and will bring in efficiency of usage. In case of the BOT projects, irrespective of congestion, users are charged uniformly at all hours to wipe out most of the savings in private costs due to improved conditions and users do not have any obvious alternative. Hence, some times tolls are more than savings when congestion is prevailing or roads are damaged

especially in monsoon. So, there may be clash between interest of private investors and public interests since the user may face congested conditions though he has paid the toll and thus he wipes out his theoretical benefit for paying the toll and after entering the facility he faces the congestion / poor service standards to add in to private costs. The planners and bidders of BOT projects are practically not covering such issues in taking up BOT projects.

The bidders of BOT projects mainly concentrate on traffic volume and toll levels as per NH Fee Rules are adopted as input to financial model prepared for a BOT project. As known from established practices, no bidder tries to check up with WTP aspects while framing his bid. The willingness to pay is assessed by consultants before floating the bids for BOT projects by asking the road users for their willingness to pay for future benefits in the absence of tolling. But such contingent questions may have following issues.

- The consultant is asking for future facility (e.g. four lanning) on a congested substandard road and hence the WTP response may be higher to reflect present state of grievances. Or to lessen the future liabilities, users may opt to express lower WTP than toll levels required recovering the investments.

- The issue is, WTP is expressed on anticipation of benefits and concessionaire faces the situation almost after three to four years of such surveys. For example, WTP expressed for trucks and cars on Vadodara – Halol road were Rs. 28 and Rs. 17 respectively in the WTP survey conducted by a consultant in 1996 for preparing feasibility report. This survey did not differentiate between six wheel trucks and ten wheel trucks. Also, it did not classify trucks based on number of axles. These 1996 survey results are supposed to hold good for toll rates of minimum Rs. 85 per truck (six wheels) and Rs. 30 per car during 2006-07. Since the feasibility report is not mentioning 10 wheel trucks, Rs.28 can be considered WTP at design stage which is now Rs. 140 during survey period of this study. Hence, the WTP surveys conducted beforehand does not convey meaningful information of user perspective in long terms. The introduction of new category of tollable vehicles after feasibility report creates issues of acceptance as compared to traditional vehicles.

- The tolls are justified based on positive signals from WTP surveys conducted by consultants at project approval stage. The WTP results are used in preparing base case for the project. The revenues are estimated for every year (average 8% of inflation on initial toll levels was assumed by consultants for Vadodara- Halol road) and are discounted along with other accounts of expenses at desired rate. It means the tolls are discounted for assumed rate by planners and bidders (it is 20% for Vadodara- Halol road) in preparing bids. The planners/bidders design their bids based on such base case and toll periods are fixed. Now the user's discount rate for paying these tolls may not be same as planners/bidders. Alternatively, users may not value future benefits due to improved facility while responding to WTP questions at feasibility stage. The problem is serious when concession period is as long as thirty years. The argument may demand review of WTP or in practical sense, actual savings accruing to the users while revising the toll rates every year. Such important aspect of reviewing the benefits is not embedded in any Concession Agreement (CA) practiced so far in India. When there is imperfect market of road services (due to no alternatives and administered/ fixed tolls), the users may be the only losers in the PPP in want of review of actual benefits.

- In above paragraph, the inflationary increase of revenue is also discounted at assumed rate which means inflation is treated like real increase in toll levels. The users are not availed any increase in service standards to assimilate such hike in price. Some times, tolls are revised as per scheduled date but particularly in those days, service standards may be at worst level. The WTP measure in such case may hamper sustainability for such projects.

- The consultants are not measuring any externalities due to proposed project of highways. Hence, they are passing all cost on the users as a direct toll. But the externalities may occur like, construction of expressway between Ahmedabad –Vadodara will relieve the NH-8 of some pressure. Now the expressway is a tolled facility whereas NH-8 between Ahmedabad –Vadodara is free road except some tolls on two bridges. Here the benefit of expressway is externally passing freely to NH-8 users at the cost of tolls paid by users on expressway. To solve such problem, quoting Roth (1967) on external economies, Block

(1983) discusses either to charge the beneficiaries of externalities due to a road project or Government may invest to that extent (it can be subsidy on tolls) in the project to remove distortion in road pricing. Block (1983) thinks that the direct tolling for full cost recovery is affecting toll acceptance and it is in turn leading to underinvestment by the private investors in such projects. This argument alternatively hints at scope for supporting PPP projects from general taxation to certain extent. The GOI decision to provide capital grant up to 40% of project cost in a BOT project is a step towards such measures. This approach will require the consultants to derive actually required percentage of capital grant from measurement of externalities. Or the consultant may study the proposed road project as a part of overall development of region and a corridor development approach may serve the purpose of creating road infrastructure spreading cost over larger mass of beneficiaries. In absence of such analysis, it seems that consultants for the BOT projects are either leading to excessive tolls or indefinite tenure of tolling. Also, such limited analysis by consultants renders many projects non viable when public component of such project is not separated from competitive bidding process. Also, the bidders are not really able to compete on a project which has so pervasive beneficiaries beyond ambit of tolling. Thus it suggests to define and separate out percentage of public component from BOT project by Government itself at planning stage (being best party to define) to make BOT projects possible to cover otherwise non viable with acceptable toll levels for finite time.

Thus Government has incorporated WTP surveys in assessing feasibility of road project on PPP format which carry above said limitations and need to review WTP at intermediate stages is felt needed for PPP projects. To assess revised WTP on an existing toll road will require atleast continuous three days long traffic survey which will generate lots of public pressure and it is beyond scope of this study. However, a field survey of randomly selected cars plying on Vadodara- Halol Toll Road and truckers concerned with this route was conducted as discussed in subsequent subsections to understand planning and management issues related to direct tolling on selected case study road.

SECTION-II: EMPIRICAL ANALYSIS

6.6 FIELD SURVEY FOR IDENTIFYING ISSUES RELATED TO WTP OF ROAD USERS:

In this study, on site WTP survey is conducted for cars and trucks as a representative of public and goods carrier respectively. The survey is done to understand various underlying issues of users who pay the tolls as required by NH Act 1956 (on NH) or Tolls Act 1851 (on SH) for carrying out their journey. The survey is focused for users of Vadodara- Halol State Highway (VHTRL case). The selection of this toll road has no specific reason except that other aspects of this road project are covered under this study and this SH is catering to interstate traffic like NH. Unlike bridge projects, the users of road sections will have better alternative free (comparatively) roads to choose from. The field surveys on NH could have been difficult to conduct looking to the exorbitant volume of traffic beyond 60,000 PCU per day. Practically the surveys for cars were done on toll road itself. The law and order conditions were handled with the kind help of VHTRL personnel. For trucks, looking to the limited decision making capacity of truck drivers in choosing toll roads versus free roads and communication problems with truck drivers, it was preferred to make dialogue in the offices of truck owners/operators (which are located near Golden Chokdi near entrance point of Vadodara- Halol Toll Road) in presence of truck drivers.

6.6.1 Availability of Standards And Recent Trends To Carry Out WTP Survey:

No elaborate case studies explaining willingness to pay for a toll road project are available in academics and also no guidelines as such are available from the Government / IRC for conducting WTP study especially on existing toll roads. The MOSRT&H uses guidelines published by Indian Road congress for project formulation and approval including BOT Projects. viz. " Manual for Survey, Investigation and preparation of Road Projects" (IRC : SP : 19 : 2001) . This manual is focused on various surveys and preparation of Reports at – Pre-feasibility level, Feasibility level, (Preliminary Project Report) and detailed Engineering and Construction planning level (Detailed Project Report). At Feasibility level, the project proposal is studied for soundness of engineering design and more importantly for the expected benefits from the project investments. Hence, during feasibility stage,

socio-economic aspects are studied in terms of population, productions and growth rates at regional/state level and project influence Zone level, but all leading to the economic evaluation. This manual suggest to include financial analysis with different financial scenarios (Sensitivity analysis) exhibiting cash flows, minimum construction time and toll (revenue from the project in the BOT Projects) but no specific details are given and no where mentions for willingness to pay from the user side. In fact, the feasibility reports are the basis for according administrative approval, while making an investment decision. But the important aspect of WTP from the demand side of the service is not yet touched at planning stages of project.

The international consultant have introduced trend to conduct some survey in India for estimating willingness to pay of all the modes of traffic offering them a range of toll level to choose from. For example, the users of Vadodara –Halol road were given options of Rs. 0.5/km; Rs. 0.75 /km; Rs. 1.0/km and Rs.1.5/km to respond within available options of – Totally not acceptable; Not acceptable; Neutral; Acceptable; Highly acceptable. This approach is found like WTP surveys conducted for environmental public goods wherein stated or revealed preferences of respondents are collected for proposed improvements using contingent or hedonic valuation(Field 2001; Kolstad 2000 and Perman et al. 1999). The non marketability of environmental goods however differentiates environment goods from established market of toll roads. Still methodology followed by consultants' world over for conducting WTP at planning stage for toll projects has been on the lines of environmental public goods. Thus, respondents are explained about improvement and future benefits of the toll road project and their preferences are gathered. This survey becomes part of the feasibility report and the results are used to fix the toll levels for each type of vehicle. The questions asked for a toll project can differ consultant to consultant but in any case the WTP survey practiced by the consultants does not quantify and inform the respondents for their likely savings (like gathering revealed preferences). The purpose of such survey is mainly to gather response for likely acceptable toll level (e.g. acceptable toll to atleast 70% of respondents is considered as acceptable to all). The consultants also use Road users' cost study (IRC : SP: 30 : 1993) which is in fact a manual for economic evaluation of highway projects. The manual considers all vehicles under a mode (e.g. car, truck, LCV) as a generalized vehicle irrespective of brand and age of manufacturing (differentiating between old technology and new

technology in case of cars). The approach is more focused on road way factors viz. pavement width (two lane, four lane etc.), roughness of riding surface (mm. per Km.), vertical profile (rise and fall in meter per Km.) etc. The manual is like ready reckoner for finding per Km. distance related vehicle operating cost in terms of cost for fuel, tyre, lubricants, spares and maintenance along with fixed and depreciation cost as a time related operating cost. Similarly, money value of travel, time of passengers (Rs./Hr.) and value of commodity in transit (Rs./Day) are specified. The manual suggests calculating vehicle operating cost, accident cost with and without improvement and thus deriving the benefit from a project to a user. The manual does not link the calculations to the toll payments or revenue generation. Instead it considers cost of construction and regular road maintenance cost of construction as a cost and benefits as it comes from improved road conditions, which in turn derives Benefit/cost ratio, Net present value or Internal rate of return. Thus, the manual is not covering toll/revenue related aspects. Also, the manual is estimating cost per km averaging for life of vehicle. Hence the cost estimated per km is not instantly payable for every km travelled; benefits derived are not instantly gained on hand.

Given this background, the estimation of WTP for a road project seems to be academically yet new area for planning and operating a facility. Of course, the WTP study undertaken herewith is not intended to focus on project viability, likely toll income and fixation of toll level by means of WTP results (as normally the consultants do) but to understand the attributes for WTP and reasoning underneath .

6.6.2 Structuring WTP Questionnaire For Car Users And Truckers On Vadodara – Halol Toll Road:

As discussed above, field surveys are conducted for car and trucks to understand WTP for use of Vadodara – Halol Toll Road. A pilot survey for truckers and car users was conducted to structure the questionnaire that was like informal discussions with car users and truckers at toll plaza without carrying written questionnaire and that helped in shaping the questionnaire for inclusion of various aspects on WTP. The survey questionnaire is prepared on basic tenets of exploring vehicle operating cost of sample vehicle (car/truck) and perception of savings due to use of above toll road. The questionnaire for car and truck are structured on same line except minor change in

some questions. The questionnaires administered for present study of cars and trucks is appended at **Appendix: 1** and **Appendix: 2** for ready reference.

6.6.2.1 WTP Questionnaire For Car Users:

The questionnaire for gathering WTP on Vadodara- Halol toll road in case of cars is structured in following parts.

1.0. Awareness of respondent for tolling concept and toll roads.

The questions are hinting at shortage of funds in public exchequer and hence levy of tolls/cess. The respondent is made aware of tolling principle in case he is not. He is expected to perceive that toll roads are built from private investments in absence of Government's incapacity and are meant for better service levels. Then the respondent is asked for his experience as such on any toll road. The fuel cess and project based tolling are put up to the respondent for his preference, given the idea of financial crunch in the Government sector.

2.0. Origin / Destination and Purpose of current trip :-

The respondent may be on business trip or social trip. He may be traveling only on project road or beyond that. His frequency on the project road can be an important factor. Some personal details are asked for income, ownership of car and education.

3.0. Mechanical data of vehicle:-

Registration number, vehicle brand, age of vehicle, fuel type, average, monthly km. travelled by the respondent, monthly fuel bill (fuel mileage per liter), monthly average maintenance and monthly total tolls being paid etc. details are collected.

4.0. Presentation of study project details:-

The project road provides a services road on the both side of carriageway (it is 4 meter wide) which is meant for local people for access to their villages and no through traffic is admissible but in fact, service road is used as an alternative free road and more to add, it is the tendency of two wheelers, and cars to travel on parts of toll road illegally. Under this reality, a comparative scenario for four lanned divided

carriageway toll road- service road- earlier two lane state maintained road is provided to the respondent. He is given idea of likely saving in mechanical cost and time (as per IRC: SP: 30) in each case. He is asked for his views on this estimated savings, if he agrees upon. This is in fact perception of consumer surplus available to him.

5.0. Response for WTP :-

Given the perception of occurrence of savings to the respondent, response for toll level is requested on given value of Rs. 0 (i.e. preference for as it was when maintained by Government as a two lane road), Rs. 15 (i.e. half of present official toll rate for car at the time of survey), Rs. 30 (prescribed official toll at the time of survey), Rs. 65 (estimated saving) and for any otherwise value he feels to quote. But the response is asked in terms of highly acceptable, acceptable, OK, not acceptable and totally unacceptable. The tolling authority has provided option of commuter's passes wherein average toll per journey is Rs. 15 but they carry limits on No. of journey per pass or time limit. The tolling authority has not much publicized this option on the site. The response for pass holders is requested on percentage above / below the present toll level for them. If the project facility is required to be improved further and what additional WTP will be offered by the respondent is also requested. This sub question also consisted to ask perceived savings on Vadodara- Halol road as compared to savings derived from available standards (IRC-SP-30). But practically the respondents were not clear about perceived savings and hence the perceived savings data was not available from many respondents. The respondents were replying some times that they think the saving derived using standards might be right or they refused to answer within available interaction time.

6.0. Quality of Road on Other parts of Journey :

Since, Vadodara and Godhra are well connected on various aspects and hence Halol-Godhra stretch is also important for those who travel beyond Halol. A separate sheet is attached to main questionnaire to assess WTP on Halol-Godhra road which is also a good quality road improved under World Bank aided Gujarat State Highway Project (GSHP) in 2002. It is with 10.0 mt. wide bituminous carriageway without divider Central verge. For the given traffic level, Halol-Godhra road is also having comparable features and hence WTP on this stretch (given the estimates of savings

due to improvement) is checked on the same lines as toll road between Vadodara-Halol. Though Halol-Godhra is at present free road (it is free from the beginning) the respondents were asked for their response under the circumstances Government imposes tolling on this stretch. Hence, respondents are asked to envisage that both the stretches between, Vadodara-Godhra are tolled. It was asked for convenient burden they can carry owing to this tolling. As emerged from pilot study, tolling experience on other stretches carried significant impact on WTP on toll road project. The respondents are interested in getting better quality of road in full length of journey. The response for WTP on Halol-Godhra road is useful in deriving worth of service felt by the users and total tolling the respondent feels acceptable when he travels between Vadodara and Godhra . As emerged out from the discussions during surveys (especially pilot survey), people often consider what ever toll levied on Vadodara-Halol Road as a total toll from Vadodara to Godhra (i.e. toll for full journey while traveling between Vadodara and Godhra. Hence, WTP expressed on Vadodara-Halol toll road and WTP expressed on Halol-Godhra road are quite correlated. The WTP expressed on Halol-Godhra free road is indicative of level of satisfaction being drawn on this stretch and in turn indicating level of satisfaction in total length of journey between Vadodara and Godhra. One can presume that if the Halol-Godhra road is well maintained, WTP on Vadodara-Halol road will be positively affected and vice versa. Extending the idea, WTP on Vadodara-Halol Toll road can be considered dependent upon tolls being paid on other parts of journey and or level of satisfaction accomplished on other stretches.

7.0. Ranking of common attributes for toll payment :-

The respondents are given a list of attributes like time saving, lower maintenance higher speed, access control and safety, comfortable journey and road side amenities. They are asked to rank from 1 to 3 for each attribute indicating weightage an individual attaches to each of attribute while paying toll. e.g. a respondent may attach =1 (Highest) for higher speed and = 3 (Lowest) for road side amenities.

6.6.2.2 WTP Questionnaire for Truckers:

The questionnaire for gathering WTP on Vadodara- Halol toll road in case of truckers is structured just like for car users except some minor changes. All aspects like-

awareness of respondent for tolling concept and toll roads; origin / destination related details; frequency of journey on Vadodara- Halol road; mechanical data of vehicle (fixed/variable cost of vehicle per km); presentation of study project details (earlier situation and improvement details supported with estimates for saving in VOC and time) ; quality of road on other parts of journey; ranking of common attributes for toll payment; perceived savings and stated value of WTP etc. were maintained as per car users. Deleting sub questions like purpose of journey, income, education etc. was suitable to respondents. The mechanical cost data for fixed cost was found almost same for all trucks on long distance travelling and hence thrust was more on collecting diesel cost per km and tolls paid per km on full length of journey. Most significantly, the data for WTP response was found coming more under irritation and was responded as a point data unlike case of cars where response was ranging from OK to Highly Acceptable. The response to details for Halol- Godhra stretch was found lackluster mainly due to truckers travelling extensively beyond Vadodara-Godhra. A question for WTP on expressway between Vadodara- Ahmedabad was asked for testing inclination for long distance access control facility which was not entertained by respondents. However; WTP was asked for existing full length of journey at status quo and also for point to point access control 4-lane facility if provided. The idea was to identify underlying issues when a trucker passes through any toll road e.g. Vadodara Halol road and the questionnaire was structured to recognize a major stretch of journey under taken by that respondent and collecting details for full journey(one side) and then reducing the arena of dialogue for Vadodara- Halol road.

6.6.3 Sampling Method for Car Users And Truckers For WTP Survey:

The sampling of car and trucks in a traffic flow on Vadodara-Halol Toll road is practically difficult to exercise as all the road users prefer toll roads to reduce the travel time. Any random stoppage of car or truck can create bottlenecking effect on traffic. The stoppage of vehicle on toll road was personally felt creating hostile conditions as the road users were feeling that survey is being conducted for commercial purpose may be establish toll acceptance of prevailing toll rates. This situation required good dialogue with respondents on academic line and was felt possible in case of car users who were aware of such academic exercise and prestige

of MS University of Baroda. Hence, only cars were surveyed near toll plaza and law and order conditions were taken care of by staff on toll booths to guide the traffic smoothly when a car is being surveyed in the flow of traffic.

6.6.3.1 Sampling Method for Car Users:

The survey of cars traveling towards Halol was physically conducted on 27/4/06 at Vadodara side toll booth and on 2/5/06 at Popatpura village (near Godhra on Halol-Godhra Road) for cars going towards Vadodara with kind consent of the concessionaire. The sampling was done on random basis and respondents were asked to opine on the site or were requested for contract number. Since the respondents would be in hurry, attention was paid on queries and discussions during personal interview and response was documented before proceeding for next respondent. There are hardly 200 to 250 cars (total for both directions) plying per day on Vadodara-Halol – Godhra Road and 33 samples per day (this is 16.5% of daily population) could be collected (i.e. total is 66 No.) which is felt quite meaningful for the given per day population. The consultants in this field are found generally taking 10 to 15 % of sample from daily population in conducting WTP survey. On an average, maximum five respondents were interviewed per hour.

Native wise these 66 observations were mainly cars either registered in Vadodara District (i.e. GJ-6 or in Panchmahals i.e. GJ-17) and were local traffic. The breakup of these observations is given below :-

Vadodara District	:	26 Nos.
Panchmahals District	;	23 Nos.
Other District	:	13 Nos.
Other states	:	04 Nos.
Total	:	66 Nos.

Moreover, out of 66 observations, 5 respondents were found using hired car. (i.e. small fraction of less than 8%) This is very small fraction. During the discussions it was emerging that, earlier cars were hired at about 7 to 8 Rs. per Km. Then diesel was costing around Rs. 15 per liter where as despite diesel costing at Rs. 35/- per liter the market rate of hiring same car is at Rs. 4 to 5 per Km. Hence the market is stated to be

too competitive. It is argued by the rental car providers, any benefit to the Mechanical cost saving of a car is reflected into benefits to the car hirer, in terms of better cars and lower rent. Looking to this, no discrimination is made on this matter and no such discrimination was observed from response side. It is also necessary to note that, as found in survey results, respondents do not seem to calculate savings in vehicle operating cost due to improved road conditions. It is like intangible benefits to the car users. Basically it is saving in time, safety and comfortable journey which really mattered in expressing WTP, of course, keeping some vague idea of saving in VOC in mind. Hence hired cars are not discriminated from owned cars in general.

6.6.3.2 Sampling Method For Truckers:

Unlike the onsite survey of cars, during month of September 2006, survey of truckers was conducted for total 40 respondents mostly in the offices of truckers. The spontaneous response of car users (who were generally educated any belonged to local districts) was felt not meaningfully possible from truck drivers on toll road itself. More over, stopping a trucker on toll road was like creating bottle neck in a traffic flow. The respondent was having fleet of one to many (some times more than 250) trucks traveling on Vadodara-Halol road. The sampling was done on random basis among total 250 of population (as known from office of Baroda Transporter Association) of transporters in Vadodara. Some times the business of transportation was found being handled by an established transporter who will hire the services of petty truck owners or transporters themselves owned large fleet of trucks. But in all case, the market fare was collected by transporter and he was found fixing terms with actual drivers who were many times owners of one or two trucks. The drivers were found given contingency money to pay for variable costs for diesel and toll costs. Any savings in this cost was meant like bonus for drivers. In any case, if perceived savings on toll road were real, the demand for services were to respond positively and making dialogue with transporter in presence of truck driver was envisaged as fruitful to study issues in using a toll road. More over, the trucks of 6wheels and 10 wheels were found being used by truckers. Looking to changing technological preference, all samples of 10 wheel trucks were selected. Hence these vehicles were found paying Rs. 140.0 per one side journey on Vadodara – Halol toll road.

6.6.4 WTP Results For car Users and Truckers:

The survey response gathered for both the modes of surface transport are some what subjective but some answers given on analytical aspects are found useful to conduct empirical analysis of WTP for selected toll road. The quantitative analysis is conducted using Microsoft Office Excel Worksheet.

6.6.4.1WTP Results For Car Users:-

As discussed in subsection 6.6.2.1, the WTP response for car users is gathered on three levels- Highly Acceptable (that is bare minimum), Acceptable (perceived fair enough) and OK (that is upper threshold). The respondent is free to quote any amount of toll preferable to him keeping present toll level and savings in his VOC and time in view. Before exploring analytical dimension, survey response and subjective findings for car users are found as below.

1) Due to nature of site survey, questions related to income and education were not appreciated. Thus these questions lost their significance at the survey stage itself. Similarly, regarding common attributes guiding to pay toll were recognized by the respondents while ranking. They responded that every attribute (attributes are listed in questionnaire- time saving, lower maintenance higher speed, access control and safety, comfortable journey and road side amenities) is responsible for generating WTP and ranking was not possible to reply meaningfully. Though, the response to ranking was recorded but the personal feeling was they responded in hurry without analyzing much. So users were familiar with these attributes but no hedonism for individual attribute was observed.
2) Most stunning finding was none has expressed zero tolling for Vadodara-Halol stretch. The zero tolling was meant to be understood as road is maintained as per availability of State funds and no early improvements/widening. It is very significant to see that users have accepted to pay separately for improved road conditions under existence of multiple taxes especially on transportation. On Halol-Godhra road, except meager exceptions of 16 respondents, remaining 50 respondents (i.e. 75%) have favored some tolling. This is remarkable response knowing the fact that this stretch has been freely used by the users since last three years and it is improved/maintained comparable to Vadodara- Halol by

the state administration. Thus, the user's perception and behavioral response for positive aspects of tolling is coming out explicitly.

3) The response to estimated VOC and time savings was affirmative but not conclusive. Everybody agreed to lower operating cost of vehicle under improved conditions where as time saving was evident by itself. The explanation to WTP on the basis of these savings in VOC and time is not found appreciable in surveys. Many users admitted that they have no exact idea on this and hence they simply said "OK" to estimated value of VOC informed to them. Some have given qualitative response like " Less" or "More" . Few also quoted lower side actual figures. During discussions, argument for under quoting of VOC savings was related to rash driving at higher speeds. Though the project road carries maximum speed limit board of 80 Kilometer per hour (Kmph), the tendency to drive around and above 100 Kmph is natural in case of new generation cars. The fuel efficiency is hampered at this high speed. More over, braking on such speed can be dangerous and may exert higher wear and tear. Another argument is, practically the estimated VOC saving is too high to be realized. They said, the State roads in Gujarat were never those bad to produce such a big savings in mechanical cost. To generalize, most of respondents do not have exact idea for savings occurring to them due to lower VOC and they do not really carry clear idea for even their time value. On the dates of sample survey, service roads were available like alternative free roads for cars. But the quantitative comparison of VOC and timesaving given to them were really new to them. As being the foundation of charging toll, VOC and timesaving shall be known to the users in better tangible manner. A consensus shall be arrived on that. Vague ideas for such important component can distort generation of WTP. In fact, proper understanding on this can generate better WTP. Most importantly, the fuel economy for each vehicle can differ due to type of fuel (diesel, petrol, CNG /LPG), age of vehicle and type of manufacturing. If input fuel cost by itself reduces, the improvement in road condition may not effect any significant net saving owing to low input cost.

4) If a user is having long journey including this 32 Km. on project road, the VOC losses on other stretches can be high enough to eliminate gains on the project road. In such cases, WTP on small stretch of 32 Km. cannot be at appreciable level despite obvious improved conditions. This fact has often

compelled the consultants to target only 2/3 of estimated gains from improved road conditions while deciding toll levels.

5) Despite lot of chaos in estimated and actually perceived VOC savings, users have responded to WTP questions on positive note. The questionnaire provided WTP in three levels- Highly Acceptable, Acceptable and OK The response for highly acceptable and acceptable was like deciding worth of services. For OK level response, some effect of existing enforced toll level on project road was felt prevailing. Also, it is the highest toll level a user thinks he can go with. Totally 12 no. of respondents expressed additional WTP if hitches like plying of two wheelers on toll road, better access control (e.g. barricading like Ahmedabad-Vadodara Expressway) and illegal entry of vehicles from service road is attended. Hence these users showed positive response in further development of project road, learning from better toll roads like expressways. Regarding Not Acceptable and Totally Unacceptable category, no values were quoted by the respondents. This is due to non availability of alternative comparable route and tentativeness in understanding of savings accrued due to improved road conditions.

6) The respondents significantly expressed unwillingness to pay higher tolls on Vadodara – Halol toll road claiming that they pay huge amount around Rs. 50,000/- to State government (R.T.O.) while registering the vehicle, fuel cess, road taxes, octroi, income and sales taxes/ VAT etc. Out of 66 respondents, 45 respondents strongly criticized other taxation effects even then reasonable tolls were quoted by them (around Rs 20/-) for the worth of services of toll road. But this odd lot raises the perils of political unacceptance of tolling policy. Respondents are agreeing that VOC and time savings are in general substantial as compared to WTP shown by an individual. For this discrepancy (i.e. lower WTP as compared to savings accrued) they strongly represented that State shall provide a free road for already prevailing taxes and hence they think the present toll level on Vadodara –Halol road is too high and hence the lower WTP. This is understandable.

7) The Vadodara – Ahmedabad Expressway is almost three times in length but the toll rate is Rs. 64/- for cars and here it is Rs. 30/- for 32 km length. This comparison is also brought to the notice by some prudent respondents.

6.6.4.1.1 Analytical Results of WTP For Car Users:

The mean value (along with standard deviation) of WTP for all three levels (Highly Acceptable, Acceptable and OK) is tabulated in Table:VI-5 for sample size of 66. It is also done separately for both sampling locations i.e. each side 33 samples.

Table: VI-5

Mean For Car Users On Vadodara-Halol Toll Road (Figures in Rs.)

(A) Mean WTP For Cars On Vadodara-Halol Toll Road For All 66 Samples			
Parameters	**Highly Acceptable Wtp:Y1**	**Acceptable. Wtp:Y2**	**Ok Wtp:Y3**
MEAN	**18.15**	**20.13**	**23.11**
STD DEVIATION	6.95	8.05	8.94
NO. OF OBSERVATIONS= 66			
(B) Mean WTP For Cars On Vadodara-Halol Toll Road For Each Side 33 Samples			
Parameters	**Highly Acceptable Wtp:Y1**	**Acceptable. Wtp:Y2**	**Ok Wtp:Y3**
(i) Origin At Vadodara And Going Towards Halol - Godhra			
MEAN	**19.03**	**20.78**	**24.16**
STD DEVIATION	7.57	10.06	10.65
NO. OF OBSERVATIONS =33			
Parameters	**Highly Acceptable Wtp:Y1**	**Acceptable. Wtp:Y2**	**Ok Wtp:Y3**
(ii) Origin At Popatpura And Going Towards Vadodara			
MEAN	**17.27**	**19.48**	**22.06**
STD DEVIATION	6.26	5.45	6.83
NO. OF OBSERVATIONS=33			

(Source: Derived From Field Survey Results For Car Users)

The following findings are deduced from results given in Table:VI-5.

1) The mean value of WTP for above three levels (considering 66 samples) is found Rs. 18.15 (Std. Dev. 6.95) , Rs. 20.13 (Std. Dev. 8.05) and Rs. 23.11 (Std. Dev. 8.94) respectively. The incremental effect is due to the very definition of these three levels. In every case the individuals showed

WTP in very wide range of variation. Since, OK results are meant to explain upper ceiling of WTP, the mean for this level has given highest values whereas Highly Acceptable is meant to show most desirable and hence generally lowest value. The difference between these two bounds is found approximately of Rs. 5.0 and that is about 20% of OK values.

2) The mean values in all cases are lower than prevailing toll level of Rs. 30.0 for example; OK level is about Rs. 7.0 less than (or about 20% less than) prevailing toll rate. However out of 66 samples, 25 numbers of samples reported Rs.30.0 or more WTP in this survey including highest value of Rs. 45 for two respondents. This higher WTP is expression for removal of hurdles like two wheelers are forced to move on service roads and tolling process is made comfortable etc.

3) The bifurcation by survey location does not make large difference on values of mean WTP. The WTP for journey towards Vadodara was found showing little lower side results.

4) The petrol fuel cars are found 26 numbers in total sample size of 66. The mean and standard deviations are found Rs. 23.89 and Rs.10.48 respectively for these petrol users in OK category. This shall mean respondents are not differentiating between cheaper and higher fuel cost for paying tolls. The reasons could be, the stretch of toll road is only 32 km and hence, no substantial saving due to type of fuel is perceived by respondents.

5) Similarly, respondents travelling beyond Vadodara- Halol are 51 numbers out of total 66. They travel on Halol- Godhra stretch which is free road with good riding surface and has comparative standard of services. The mean and standard deviations are found Rs. 24.27 and Rs.9.0 respectively for these respondents. Practically it is no different to overall mean but looking to their numbers, they are 77% of total sample size. The remaining 15 respondents, who are using only Vadodara- Halol stretch, have mean and standard deviation Rs19.15 and Rs. 7.74 respectively for OK level. Hence, in fact total 66 samples have reached the WTP to the level of Rs. 23 to 24 in OK category due to these respondents who use Halol- Godhra road also.

6.6.4.2 WTP Results For Truckers :-

As discussed in subsection 6.6.3.2, the WTP response for truckers is gathered on single level unlike three levels attempted for car users. This was practical consideration taken into account while surveying truckers who were in fact found not interested in discussing and understanding purpose of survey. In case of car users, perceived savings on toll road were found not tangible in response to survey. Here, truckers being commercial operators and having all India exposure of road categories and service standards, the perceived savings was emphasized in gathering survey response. This has helped in analytical aspect of this survey. Before exploring analytical dimension, survey response and subjective findings for truckers are found as below.

1) All truck vehicles surveyed were paying Rs. 140.0 per journey on Vadodara-Halol toll road. Similar to car users, tolling has now seems accepted by transporters as indispensable charge on use of facility. Now the tone from users is for rationalization and value for money spent.

2) The major issue that emerged in discussions with every respondent was heavy fixed cost of owning and driving truck on national or three state permits. The cost of tyre renewals, servicing, body work were cited as other huge attributes for variable cost. After getting in to thorough discussions with some of experienced transporters, such expenses other than diesel consumption and tolls paid were generally found at Rs. 3.9 per km. The prevailing market fare for a typical to and fro Vadodara- Delhi journey was found around Rs. 15.0 per km. Hence the fixed cost forgone while accepting transport job was found around 25% per km. The next attribute was found major one for diesel consumption. This was found around Rs.10.0 per km for an average condition of a truck. This is further 66% of the total fare demanded. If we add Rs. 1.6 per km for tolls being paid on above route, it results in to further 10% of running cost and practically the business is claimed with meager profits except during some peak period e.g. festival days. The thorough discussion revealed that truckers can get consignment for one side at good rate and return journey is generally at little more than half rate except the operator has good offices on both ends. The overloading and sundries collected for enroute short distance consignments were told helping many of times.

3) A major feeling received from respondents was, there was no waiting business opportunity at any end. Hence, a driver has to stay for days to grab proper fare or has to accept lower fare for his return journey.

4) A major touching woe of truckers was they were always treated inferior by State authorities for highways and also by toll plaza staff. They complained of insulting behaviour despite paying hefty tolls on all tolling locations and compared that the toll plaza staff do not dare to misbehave so with car users. The facilities were mostly told missing for comfortable journey e.g. break down services at reasonable price, toilets, potable water, parking lanes etc.

5) Another complaint from truckers was for inconvenience on interstate borders that waste lots of time and money rendering savings on toll roads meaningless. Some transporters suggested conduit type travelling where irrespective of State borders, through passage up to destination is assured saving lots of money and time for them. Knowing the fact it is utopian situation, the WTP for tolling in section or full length of journey is stated to remain lower.

6) The transporters working in a formal manner said that they are booked for annual contracts on Metric Tone basis mutually agreed rate by companies like Reliance, Sun Pharmaceuticals etc. Such agreed rates do not include tolls and insurance charges. Hence, any hike in tolls is to be borne by transporter only. Some of the agreements even do not protect for increase in diesel cost which requires renegotiation under compromise. Such renegotiation is not allowed for toll rates in market.

7) The transporters were found handing over truck drivers the consignments with predecided provision for enroute tolls, diesel costs and maintenance. The owners were skeptical for actual expenses claimed by drivers after improved road conditions all over India especially on NH. A spontaneous response for perceived savings on 4-lane toll road per 100 km was given as 3.5 liter of diesel as an instant gain and Rs. 100 for maintenance on long term basis saved. Thus it should mean saving of Rs. 1.3 per km on diesel and Rs. 1.0 per km on maintenance shall give total savings of Rs. 2.3 per km. But the perceived savings and WTP are not quoted that high while replying for questions. It was expressed that diesel saving is generally cornered by drivers and maintenance savings was felt reaching to owners. The irregularities at diesel selling pumps were also suspected by transporters for not realizing actual savings in fuel.

8) Unlike trains, trucks can not carry freight travelling more than six hours at a stretch. However, it was conceded by the respondents that substantial time saving is now possible on Vadodara- Delhi route due to improved conditions o this corridor. This has reduced journey of two to three days into 24-30 hours only. This journey was said possible to reduce merely to 18-20 hours if extra/reliever driver was available in the journey and time is saved on State borders and at toll plaza. However, time saving on Vadodara-Halol being meager, the respondents were not enthusiastic for this aspect on this limited stretch.

9) The respondents significantly expressed unwillingness to pay higher tolls recalling heavy taxes paid to Government while registering the vehicle, excise, fuel cess, road taxes, octroi, income and sales taxes/ VAT etc. Respondents are agreeing that VOC and time savings are in general substantial as compared to WTP shown by an individual. For lower WTP as compared to savings accrued, they strongly represented that government shall provide a free road for above taxes and in absence of it they think the present toll level on Vadodara –Halol road is too high especially for additional axle. All of the respondents blamed other taxes affecting WTP.

10) The issue of saving in VOC is very technical and is dependent of prevailing rate of fuel. If a vehicle is adapted to consume some alternative fuel, WTP and perceived savings will differ dramatically. Hence, WTP data gathered in any survey is invalid when fuel price changes or vehicle undergoes major technological change. Despite lot of chaos in estimated and actually perceived VOC savings, users have responded to WTP questions on positive note.

11) One important aspect featured in discussions with respondents was about cessation of tolls. The respondents were skeptical for cessation of toll on any road after recovery of costs. In fact they wanted transparency in tolling account demanding access to data for number of days left to recover the cost of project. Hence, basically they agree to cost recovery concept but expects that it should have logical end. The users frequenting on Vadodara- Halol were more concern about such aspect.

6.6.4.2.1 Analytical Results of WTP For Truckers:

The mean value (along with standard deviation) of WTP for Vadodara- Halol Toll road and also for overall length of journey is tabulated in Table:VI-6 for sample size of 40. Here, the response is gathered on per km basis for savings on Vadodara- Halol Toll road. Since damaged conditions of roads in remaining leg of journey was felt influencing the WTP on Vadodara- Halol Toll road, the WTP for full journey was explored in this case. The WTP response is gathered for Vadodara- Halol Toll road and for full journey length (for as it is scenario and imagining four lane road like Vadodara-Halol for full journey).

Table: VI-6

Response For Per Km Saving and WTP For Trucks

Parameter	Perceived Saving on Vadodara-Halol road (Rs. Per Km)	WTP on Vadodara-Halol road (Rs. Per Km)	WTP on existing condition of full stretch of journey (Rs. Per Km)	WTP on existing condition of full stretch of journey if all 4-lane (Rs. Per Km)
Mean	2.17	1.93	0.74	1.14
Std. deviation	1.14	0.87	0.44	0.44

No. Of Truckers Surveyed =40

(Source: Derived From Field Survey Results For Truckers)

The following findings are deduced from results given in Table: VI-6.

1) It is pertinent to mention that all vehicles surveyed were paying Rs. 140.0 per journey on Vadodara- Halol toll road which meant toll being paid was @Rs. 4.4 per km. Hence, around half of toll being paid is found justified by the respondents considering perceived savings of Rs. 2.17 per km. Also despite many problems narrated by respondents, the tolling has acceptance to significant level. The user's perception and behavioral response for positive aspects of tolling is coming out explicitly. The respondents are ready to pay Rs. 0.74 per km even in existing condition of road where samples included various highway stretches of really pathetic quality spread in many States. In case of improved service standards of access control four lanning, the WTP is

found @ Rs. 1.14 per km. This is again 50% of prescribed toll level of Rs.2.10 per km for trucks on any 4-lane NH as per NH Act 1956 (See Table:VI-4 Subsection: 6.4).

2) The mean value for per km WTP on Vadodara- Halol Toll road is found higher than WTP for full length of journey (with proposed 4-lanning and existing conditions). This is mainly due to absence of tolling on further stretches up to Gujarat State border despite improved road conditions. The respondents were found ultimately crosschecking overall burden of tolling in full journey. Hence, RS.1.14 per km is actually better estimate of WTP but it is only 25% of tolls being paid by truckers on Vadodara- Halol Toll road. As discussed in Chapter-V, subsection 5.6.4.2, the length between Halol to Shamlaji (State border) is under four lanning and will be a tolled road and this toll liability will influence WTP on Vadodara- Halol Toll road. As emerges from survey response, truckers will be willing to pay only at the rate of Rs. 1.14 per km and hence WTP of Rs.1.93 is not a real preference for truckers.

3) The perceived savings of Rs.2.17 on Vadodara- Halol Toll road is however more than Stated Preference of Rs.1.93 per km. But the factors discussed in above subsection 6.6.4.2 are not allowing respondents to pass on savings for WTP on Vadodara- Halol Toll road.

6.6.5 Model Building Process of WTP for Toll Road:

The present practice adopted by international consultants is based on contingent valuations of Environmental problems. Wang et al. (2004) in a World Bank Study have used a contingent valuation framework while studying WTP for improvement of a lake Sevan in Armenia for the value of an individual's utility function V_o at status quo condition as

V_o = V (Income, Price vector, initial environmental quality, vector of socio-economic variables, uncertainty related error term)

Wang et al. have solved above utility function for WTP while improving environmental quality from E_o to E_1. They have identified relevant variables and questionnaires were prepared for stated preferences. The results were useful in deriving a regression model for explaining significance of all such variables in

explaining WTP. Taking the base of this utility function, brief theoretical framework is outlined as below for conducting WTP survey on Vadodara- Halol road. The subjective discussion given under subsection **6.6.4.1** and **6.6.4.2** is helpful in identifying attributes helpful in explaining a road user's utility function. Hence, a general utility function is first assumed and it is transformed in to a multiple variable regression model as below subject to conditions that each attribute (i.e. independent variable) is individually turning up statistically significant along with whole regression model.

A generalized utility valuation framework under uncertainty of travelling characteristics of road and user himself can be assumed as

U_o : $U (Y, P_o, E_o , Z, \in)$.....(i)

Where, Utility at Original situation (U_o) is dependent upon

Y = Income,

P = Price payable per Km journey

E = Service Level of the road/ bridge in terms of comfort, safety etc affecting VOC of vehicle

Z = Vector of Socio-economic variables and

$\in$ = Uncertain factors which are not reflected in Y, P, E and Z

Assuming that an individual is willing to pay a maximum amount (keeping same level of utility U_o) termed as WTP for improvement of service level (E_o to E_1) of Road/bridge also measured in terms of change in total prices payable by the user (P_o to P_1) such that

$U_o (Y- WTP, P_1, E_1, Z, \in) = U_o (Y, P_o , E_o, Z, \in)$.....(ii)

and it yields

$WTP = WTP (Y, P_o, P_1, E_o, E_1, Z, \in)$ .....(iii)

Where, WTP can be a random variable transformed as

WTP = E [WTP] $+\epsilon_1$; ϵ_1 is a random term with mean value of zero. Every individual respondent has a distribution with a mean μ (μ =E [WTP]) and variance σ^2. The mean and variance may vary across different individuals. Now this WTP is assumed to follow a regression model as below. (Wang et al. 2004).

$$WTP_i = \beta_o + X_i\beta + \epsilon_1 \quad \text{..... (iv)}$$

Where X_i is a vector of explanatory variables with unknown coefficients β ; β_o is the intercept and ϵ_1 is usual random term. For simplicity, it is assumed that WTP for an individual i is following a linear specification. The model will be tested statistically and model will emerge out significant if the linear specification really exists.

The X_i carries host of variables as briefed in equation (ii). This will include income level, Socio-economic variables like education, vehicle ownership, frequency of journey on project road, purpose of journey on project road, mechanical and time related prices (costs) payable under with and without improvement conditions and other prices payable (Other taxes, tolls etc.) in the journey. The qualitative satisfaction (E_o to E_1) is due to improved riding quality. Hence, actual regression model shall be of multiple variables as X is consisting of many variables as construed below (Gujarati 2006).

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_2 + \beta_3 X_{3i} + u_i \quad \text{..... (v)}$$

Where Y_i= Dependent variable, here it is WTP for study road expressed by individual i

X_1, X_2, X_3 and X_4..etc. = explanatory variables, here it is perceived savings, frequency on toll road, per km operating cost for vehicle etc.

u_i =disturbance term which is unexplained portion of equation

β_0 = intercept or WTP when all factors explaining WTP are zero

$\beta_1, \beta_2, \beta_3, \beta_4$ = partial regression coefficients, here each gives change in value of mean WTP when there is unit change in corresponding explainable variable X when other variables are unchanged. For example, change in mean WTP when "perceived savings" is changed by unit holding other variables constant.

The equation (v) is to be solved for given samples and estimates for above coefficients are to be found. This task is done using widely available Computer Software - Microsoft Excel in Microsoft Office 2003 (or the same is available under Window XP). The results are tested for goodness of fit (multiple coefficient of determination R^2) for making sure all variables in combine explain variation in Y significantly. The standard practice of regression analysis also requires (Gujarati 2006):

1) to look at adjusted R^2 to be significant that will take care of degree of freedom while estimating goodness of fit.
2) testing the individual partial regression coefficients for individually having influence on Y (i.e. testing for example individually $\beta_2 \neq 0$ holding other variables constant) either using t- statistics compared with critical t- value for given degree of freedom or p-values obtained for individual coefficients may be verified for being less than 0.05(i.e. accepting 95% of confidence).
3) testing the overall significance of the sample regression that all variables jointly do not become zero. This will ensure that Y is linearly related to both X_1 and X_2 etc. An analysis of variance (ANOVA) technique provides F-test. The p-value of F-results if found negligible (near zero), the overall significance is assured.

Since the survey data is gathered for cars and trucks using toll road, separate regression model will be constructed and tested for them. The generalized attributes (independent variables) under the general term X_i will be chosen from subjective discussion given under subsection 6.6.4.1 and 6.6.4.2.

6.6.6 Regression Analysis For Explanation Of WTP For Car Users:

To understand WTP, many attributes influencing the WTP need attention as discussed earlier. The regression analysis can help in estimating dependence of WTP on explanatory variables and predicting mean value of WTP. The independent variables (X_i) are identified as below to explain WTP for car users. Since WTP for car users is recorded in three levels- Highly Acceptable (Y1); Acceptable (Y2) and OK (Y3) all these three are dependent variables and a separate regression model is constructed from same available set of independent variables. These independent variables are as below.

1.0 One side frequency of trip on toll road(X_1):

How often a respondent enters toll road in a specified time interval (here it is per month) will make him think for his expenditure function seriously. This can affect positively if respondent has agreed with savings and are perceived more than tolls being paid.

2.0 Monthly km travelled on all roads (X_2):

The respondent will have many journeys on various roads (with and without tolls) of varying standards. Also, this variable is implying volume of total travelling and any acceptance of savings and savings perceived more than tolls being paid on toll road will affect the response positively.

3.0 Per km operating cost (X_3):

Due to intangibility felt by the respondents for VOC savings and timesaving, a theoretically very important variable "benefits" could not be included in the analysis. Hence, variable namely per km operating cost is utilized which is also representative of mechanical properties of any car. This cost is derived from addition of fuel cost, maintenance cost and tolls paid per month. This is characterized by age of vehicle, type of fuel, fuel efficiency, technological aspects of given car, type of routes generally taken up for travelling. This is expenditure function to say. The per km operating cost is having fuel cost in major then maintenance (and least is tolls). This variable means how costly is to travel with this vehicle. This can affect positively if respondent has agreed with savings.

4.0 WTP on Halol–Godhra free road (X_4):

This variable will quantify the level of satisfaction being drawn by the respondent on other stretch of his journey. The relevance of this variable is emerging from discussions held during surveys. This variable shall affect positively as explained earlier.

5.0 Other factors (multiple taxes) (X_5):

This factor has been surfacing while surveying some car users and they underquote WTP despite acceptance of adequate savings in cost and time while using toll road. Here an indicator variable is chosen taking value =1 if respondent attributes his lower (lower than prescribed toll of Rs.30/-) WTP with other taxes and = 0 for those who are not really bothered for them while expressing WTP. This variable shall have negative effect on WTP, i.e. as the severity of other factors increases, WTP decreases.

6.0 Purpose of journey(X_6):

As explained earlier, purpose of journey coupled with frequency of such journey is expected to affect WTP. Here also an indicator variable is chosen taking value =0 for social purpose and =1 for business, education and other purposes. It is simple to understand that a social journey is rare to occur and the respondent may prefer prestige by paying tolls and will ignore the economics. For business activity, the respondent is expected to be calculated while disposing off his earnings. If the perceived savings are adequate enough to affect WTP positively, the business journey may support WTP positively. Here, the logical value of 0 and 1 are selected to differentiate both class of journey. The sign expectation can be both the ways. The positive sign shall mean basically acceptance of tolling and negative sign shall mean basically resistance to tolling.

7.0 Intercept (β_0):

The intercept is to be interpreted as WTP before starting the journey or absolute WTP without being affected by any independent variables. The existence of non zero value of intercept and its sign can be useful for understanding WTP *per se*.

Here, the multiple variable regression model is assumed to take linear specifications incorporating six independent variables to explain WTP (Y) for car users as

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + u_i \quad \text{.....(vi)}$$

6.6.6.1 Regression Analysis For Highly Acceptable WTP (Y1):

The results for individual partial regression coefficients and F- test under analysis of variance (ANOVA) technique for Highly Acceptable ($\mathbf{Y_1}$) WTP are summarized under Table: VI-7.

Table: VI-7

Analysis For Highly Acceptable WTP (Y1):

Variables	Coefficients Estimates	Standard error	t-Statistics	p-value [Pr(>|t|)]
Intercept	24.15834	3.060573	7.893403*	8.29E-11
X_1	0.065823	0.037719	1.745087	0.086176
X_2	2.32E-05	0.000186	0.124458	0.901376
X_3	0.13247	0.729906	0.181489	0.856606
X_4	0.208342	0.071343	2.920298*	0.004946
X_5	-9.27771	1.399838	-6.62771*	1.15E-08
X_6	-3.82307	1.656834	-2.30745*	0.024556

* Indicates significance of variable at 95% confidence level.

Regression Statistics: Adjusted R^2=0.56, Standard Error=4.62 For 66 Observations

ANOVA Results: p –value of F-test i.e. Significance of F = 3.55E-10;
degree of freedom for regression=6 ; degree of freedom for residual=59

(Source: Calculated from Survey results)

The regression model from this result can be written as below.

$$\begin{array}{lllllll} Y_1 = 24.16 & +0.07X_1 & +(2.32E\text{-}05)X_2 & +0.13X_3 & +0.21X_4 & -9.28X_5 & -3.82X_6 \\ (7.893403)^* & (1.745087) & (0.124458) & (0.181489) & (2.920298)^* & (-6.62771)^* & (-2.30745)^* \end{array}$$

.....(vii)

As discussed under subsection **6.6.5**, three aspects (i.e. adjusted R^2, significance of individual partial regression coefficients and overall significance of model) are

required to be observed from regression analysis. For Highly Acceptable WTP case, the overall significance of model is found very good as seen from extremely small value of p-value of F-test (3.55E-10) though adjusted R^2 has moderate value of 56%. But individually, some coefficients have come out insignificant as evident from their p-value or alternatively checked with critical t- value at 95% confidence interval with 59 degree of freedom (this is no. of observations minus no. of variables minus 1). The calculated t- value for $\mathbf{X_1}$, $\mathbf{X_2}$ and $\mathbf{X_3}$ is less than critical t- value of 2.0. Hence, these variables are statistically insignificant to explain WTP for this set of data. More over, numerical value of partial coefficient β_2 is almost zero and hence it is insignificant to explain WTP.

The sign of independent variables are found positive except for $\mathbf{X_5}$ and $\mathbf{X_6}$ in the analysis for Highly Acceptable WTP (**Y1**). This is in line with discussions made in subsection **6.6.4.1** and **6.6.6.** The positive sign of ($\mathbf{X_4}$) that is WTP expressed on Halol Godhra road substantiates discussions made earlier under subsection **6.6.4.1** and **6.6.6.** Higher the WTP for this free stretch of 32 km length, higher WTP for Vadodara-Halol Toll road. The respondent is happy to use full Vadodara- Godhra road by paying tolls only for Vadodara-Halol. Alternatively, any improvement in quality of road in remaining leg of journey will help in improving WTP for Vadodara- Halol Toll road if there no further tolling. The negative sign of ($\mathbf{X_5}$) explains the WTP has adverse relationship than acquaintance of other taxes on road sector resulting into quoting lower WTP. Similarly negative sign of X_6 explains resistance to tolling irrespective of purpose of journey and it has significant explanation power. A similar exercise is repeated for Acceptable ($\mathbf{Y_2}$) and OK ($\mathbf{Y_3}$) WTP cases as below.

6.6.6.2 Regression Analysis For Acceptable WTP (Y2):

The results for individual partial regression coefficients and F- test under analysis of variance (ANOVA) technique for Acceptable ($\mathbf{Y_2}$) WTP are summarized under Table: VI-8.

Table: VI-8

Analysis For Acceptable WTP (Y2):

Variables	Coefficients Estimates	Standard error	t- Statistics	p-value [Pr(>|t|)]
Intercept	28.84633	2.887855	9.988843*	2.68E-14
X_1	0.055144	0.03559	1.549416	0.12663
X_2	-2.3E-05	0.000176	-0.12967	0.897267
X_3	-1.06751	0.688715	-1.55	0.12649
X_4	0.33975	0.067317	5.047047*	4.59E-06
X_5	-10.9895	1.32084	-8.32011*	1.58E-11
X_6	-1.63883	1.563333	-1.0483	0.298778

* Indicates significance of variable at 95% confidence level.

Regression Statistics: Adjusted R^2=0.71, Standard Error=4.36 For 66 Observations

ANOVA Results: p –value of F-test i.e. Significance of F =2.78E-15; degree of freedom for regression= 6; degree of freedom for residual=59

(Source: Calculated from Survey results)

The regression model from this result can be written as below.

$$Y_2 = 28.85 + 0.06X_1 - (2.30E\text{-}05)X_2 - 1.07X_3 + 0.34X_4 - 10.99X_5 - 1.64X_6$$
$$(9.988843)^* \quad (1.549416) \quad (-0.12967) \quad (-1.55) \quad (5.047047)^* \quad (-8.32011)^* \quad (-1.0483)$$

.....(viii)

As discussed for Y_1 , three aspects (i.e. adjusted R^2, significance of individual partial regression coefficients and overall significance of model) are required to be observed from regression analysis. For Acceptable WTP case, the overall significance of model is found very good as seen from extremely small value of p-value of F-test (2.78E-15) and adjusted R^2 has good value of 71%. But individually, some coefficients have come out insignificant as evident from their p-value or alternatively checked with critical t- value at 95% confidence interval with 59 degree of freedom (this is no. of observations minus no. of variables minus 1). The calculated t- value for X_1, X_2 , X_3 and X_6 is less than critical t- value of 2.0. Hence, these variables are statistically insignificant to explain WTP for this set of data. More over, numerical value of partial

coefficient β_2 is almost zero and hence it is insignificant to explain WTP. Regarding signs, unexpected negative sign for X_2 and X_3 is like denial of saving by use of toll road. The X_2 and X_3 are indicating total km travelled per month on all roads and per km cost of running vehicle respectively. The increase in travelling or cost of travelling can be expected to welcome toll roads if they were perceived beneficial. Hence, negative sign explains more they travel and more they spend on operating vehicle, additional burden of tolling is resisted. The signs for other variables are found as expected.

6.6.6.3 Regression Analysis for OK WTP (Y3):

The results for individual partial regression coefficients and F- test under analysis of variance (ANOVA) technique for OK (Y_2) WTP are summarized under Table: VI-9.

Table: VI-9

Analysis for OK WTP (Y3):

Coefficients	Estimates	Standard error	t- Statistics	p-value [Pr(>|t|)]
Intercept	29.42457	3.659103	8.041471*	4.66E-11
X_1	0.02131	0.045095	0.472565	0.638267
X_2	-0.00011	0.000223	-0.48461	0.629744
X_3	0.243342	0.872647	0.278855	0.781331
X_4	0.42836	0.085295	5.022118*	5.03E-06
X_5	-8.95528	1.673592	-5.35093*	1.5E-06
X_6	-6.39952	1.980847	-3.2307*	0.002021

* Indicates significance of variable at 95% confidence level.

Regression Statistics: Adjusted R^2=0.62, Standard Error=5.52 For 66 Observations

ANOVA Results: p –value of F-test i.e. Significance of F =5.44E-12;
degree of freedom for regression= 6; degree of freedom for residual=59

(Source: Calculated from Survey results)

The regression model from this result can be written as below.

$$Y_3 = 29.42 + 0.02X_1 - 0.0001X_2 + 0.24X_3 + 0.43X_4 - 8.96X_5 - 6.40X_6$$
$$(8.041471)^* \quad (0.472565) \quad (-0.48461) \quad (0.278855) \quad (5.022118)^* \quad (-5.35093)^* \quad (-3.2307)^*$$

..... (ix)

For OK WTP case, the overall significance of model is found very good as seen from extremely small value of p-value of F-test (5.44E-12) and adjusted R^2 has good value of 62%. But individually, some coefficients have come out insignificant as evident from their p-value or alternatively checked with critical t- value at 95% confidence

interval with 59 degree of freedom. The calculated t- value for X_1, X_2 and X_3 is less than critical t- value of 2.0. Hence, these variables are statistically insignificant to explain WTP for this set of data. More over, numerical value of partial coefficient β_2 is almost zero and hence it is insignificant to explain WTP. Regarding signs, unexpected negative sign for X_2 is like denial of saving by use of toll road as explained for Y_2.

For three different values of Y (i.e. Y_1, Y_2 and Y_3) the independent variables are same (i.e. X_1 to X_6). For three equations as above for Y, adjusted R^2 is high and some of the variables are insignificant and therefore the linear relationship among these variables is tested through the coefficient of correlation to detect multicollinearity. The results are given in Appendix – 3. These show that these variables are not highly related to each other.

6.6.6.4 Interpretation of Regression Analysis for Car Users:

The statistical analysis of known independent variables for explaining WTP for car users by means of regression tool provides following findings.

1) Looking to the reasonably good value of adjusted R^2 and extremely good overall significance of regression model for Acceptable and OK level of WTP in equation (viii) and (ix) respectively, the linear relationship assumption is found tenable. A couple of independent variables are significantly explaining WTP and sign for all six independent variables are as expected except for amount of travel(X_2) and cost of travelling (X_3). The results for Acceptable WTP are found statistically more relevant among three levels of WTP.
2) The existence of positive intercept in all levels of WTP is most encouraging outcome of this analysis. It simply means, Vadodara- Halol Toll road is worth paying tolls that too very near to prevailing toll level of Rs. 30 (Table:VI-10). The error in estimates of intercept is also found small enough to conclude that intercept has good acceptance in all respondents. As, expected it increases with level of WTP changes from most desirable (Y_1) to just tolerable (Y_3) level of WTP. The toll resistance is represented from other variables notably from impact of other taxes (X_5) on road sector. The corresponding value of coefficient (β_5) is also large enough to attract attention. This is a major policy

implication being under purview of planners of PPP. If the respondents do not get value for money, coercive taxation can not help to gather Public support for PPP policy. The negative sign for amount of travel(X_2) and cost of travelling (X_3) hint at denial of benefits of tolling. The rationalization of taxes on the sector, ploughing back more sectoral revenues to the sector etc. are the measures expected by the respondents.

Table: VI-10

Regression Results of Intercept For WTP (Y1 to Y3):

Coefficients	Estimates	Standard error
Intercept For Y_1	24.15834	3.060573
Intercept For Y_2	28.84633	2.887855
Intercept For Y_3	29.42457	3.659103

(Source: Summarized from models under Table: VI-7, VI-8 and VI-9)

3) Another major finding is about tolling of a section in full length of known origin-destination of journey. Even for short distance between Vadodara-Godhra, almost 50% of stretch is tolled and remaining is free despite comparable standards. The value of coefficient (β_4) is small but the effect of free stretch is positive as observed for this variable (X_4) in all levels. Once the remaining free leg is imposing new toll without significant improvement of standards, the WTP for existing toll road is likely to get eroded as revealed from above analysis. The Halol- Shamlaji stretch is under four lanning from year 2008-2009 and is likely to collect tolls earliest from year 2010-11. The tolls payable on this leg of journey is going to affect consumer surplus being enjoyed by respondents since existing road is already having comparable level of services. This understanding is leading to Corridor Development approach where wholesale pricing benefits are availed by interstate traffic and project cash flow is not only supported from user's tolls. Another way, the analysis suggests that any downfall on service standards on remaining leg of journey hampers the WTP on existing toll road adversely. Practically it can be stated that a pothole on Halol- Godhra stretch can influence WTP on Vadodara-Halol Toll road. This is nothing but influence of externalities on remaining leg

of journey. The planners of PPP shall get a major policy lesson that knowledge of origin-destination of toll road users shall be made known and as an active partner of PPP, the service standards of remaining leg (may be tolled or untolled) shall be ensured to the acceptable level for helping tolling on existing toll road. This may require additional expenses from Government if the stretch is maintained by public body. This is the partnership expected from Government in support of PPP on highways. Hence, this support is felt more required than prevailing practice of Government share in project cost under capital grant provision. Any BOT project can attract private funds if the project is designed with proper toll period and hence capital support to reduce the project cost may not be only option to support PPP. A combination of toll road with good supportive infrastructure in remaining length of total journey can help in maintaining viability of project by attracting traffic on toll road that is impossible by the toll project economics on standalone basis. The discussion is actually more concerned with maintaining atleast trafficable conditions on public roads which are having pathetic riding quality in want of adequate funds to maintain them. Timely maintenance of free public roads is bare minimum requirement emerging from above analysis in support of PPP.

4) The substantially insignificant statistical values of total kilometers travelled in a month (X_2) and per km operating cost (X_3) are indicative of the fact that WTP is not bearing any explainable relationship on how much respondent totally spends on his usage of car per month. Practically the per km cost of using a car is mainly fuel cost as tabulated under Table: VI-11. Hence, respondent is aware of the fact that he is paying very less on tolls (it is average 13% of total per km car usage cost of Rs. 3.62). Hence, he may not like to relate his fuel expenses with WTP on a small journey of maximum 70 km between Vadodara-Halol-Godhra. The frequency of travelling on Vadodara-Halol Toll road (X_1) is not really mattering for WTP on this line. However, the frequency for business purpose (X_6) is not in favour of WTP as the savings are not perceived to that extent.

Table: VI-11

Vehicle Operating Cost For Car Users

Parameter	Per km Fuel expenses	Per km VOC excluding toll payments	Per km VOC including toll payments
Mean	2.96	3.15	3.62
Std. deviation	0.74	0.76	0.85
Total samples = 66			

(Source: Derived From Survey Results)

6.6.7 Regression Analysis for Explanation Of WTP For Truckers

The independent variables (X_i) are identified as below to explain WTP for Truckers. Since survey response for WTP of truckers was found as a single value, the WTP analysis is simplified in this case. The independent variables in this case are as below.

1.0 One Side Frequency Of Trip On Toll Road (X_1):

How often a respondent enters toll road in a specified time interval (here it is per month) will make him think for his expenditure function seriously. This can affect WTP positively if respondent has agreed with savings.

2.0 Length of full journey (X_2):

The longer is the journey; wider shall be experience of toll versus free roads. Also, one can expect the respondents to seek safe and comfortable long distance journey at some price. Hence, truckers are expected to express positive response for WTP on this variable.

3.0 Per Km Diesel Cost (X_3):

Since, the fuel cost is huge in total vehicle operating cost; this cost is separately taken here. This is characterized by age of vehicle, type of fuel, fuel efficiency, technological aspects of given truck, type of routes generally taken up for travelling, behavioural pattern of driver etc. As discussed before, tolls are stated to increase mileage by 0.5 km per liter and diesel cost constitutes 66% of a typical fare per km. The benefit of toll road for a truck having fuel efficiency of about 3.5 km per liter sees rise of 14% in mileage. Hence, respondent spending more on vehicle fuel is likely to

react thoughtfully as far as diesel prices are soaring. The expected sign is positive for relation with WTP.

4.0 Per Km Toll Paid (X_4):

This is remaining tangible factor of vehicle operating cost and it represents extent of tolling encountered by respondent. The trucks serving interstate transport are more exposed to tolls as compared to car users. If the respondent faces higher tolls per km, WTP shall be lower. Thus, negative sign is expected in relationship with WTP. This variable was not considered for car users since the car users were found mostly local users plying between Vadodara- Halol-Godhra which involved tolling on only Vadodara- Halol road.

5.0 Percentages Of Bad Km In Total (X_5):

Assuming that toll roads provide good roads, percentages of bad roads will decide percentages of hurdles being faced in a journey wherein tolled portion is relief maker. More the percentage of bad road in total journey, it will wipe off benefits of this toll road hence one can expect negative sign.

6.0 Average Fare Prevailing Per Km (X_6):

The fares for trucking are found not symmetric for both parts of journey. The fare is also stated to be lower than what were required for comfortable business. The increasing competition from smaller/ medium size truckers who avail easy finance and then accept minimum fare to meet with debt repayment terms is quoted as problem for industry. One example states that Vadodara- Delhi fare was @ Rs. 22,000 per one side trip in 1995 (@diesel price of Rs. 7.0 per liter) which is same in 2006-07 (@diesel price of Rs. 37.0 per liter). Thus reducing fares and increasing operating costs are stated as concern for this industry. Under such circumstances, the tolling may not be welcome but more he fare, more could be the WTP. Hence, the expected sign is positive.

7.0 Perceived Savings On Vadodara –Halol Toll Road (X_7):

This variable is straight forward asking for savings perceived due to improved condition of toll road. The cars can often use free service roads, but trucks are not

allowed on service roads and hence the issue is discussed in comparison with other inferior stretches of journey. This variable is expected to carry positive sign.

8.0 Size Of Fleet (X_8):

The numbers of trucks handled by the respondent is a variable expressing influencing capacity of respondent on market. A positive sign is expected for this variable. The relevance of this variable is to be tested as actual size of fleet is generally not responded correctly by the respondents.

9.0 Travel Time of Total Journey (X_9):

Since the total journey is expected to be manifold of Vadodara - Halol stretch, the variable may not hold good relevance but sign is expected to be negative.

10.0 Intercept (β_0):

The intercept is to be interpreted as WTP before starting the journey or absolute WTP without being affected by any independent variables. The existence of non zero value of intercept and its sign can be useful for understanding WTP per se.

Here, the multiple regression model is assumed to take linear specifications incorporating nine independent variables to explain WTP (Y) for truckers as

$$Y_i=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\beta_8X_8+\beta_9X_9+u_i$$

.....(x)

6.6.7.1 Regression Analysis For WTP (Truckers):

The results for individual partial regression coefficients and F- test under analysis of variance (ANOVA) technique for mean WTP (Y) are summarized under Table: VI-12.

Table: VI-12

Analysis For Mean WTP (Y):

Coefficients	Estimates	Standard error	t- Statistics	p-value [Pr(>|t|)]
Intercept	42.17306	19.54655	2.15757*	0.039094
X_1	0.029965	0.05303	0.565055	0.576238
X_2	0.007715	0.008501	0.907557	0.371345
X_3	-1.84586	1.856584	-0.99422	0.328067
X_4	-12.1542	4.771868	-2.54705*	0.016231
X_5	-0.05219	0.181645	-0.28734	0.775824
X_6	0.754335	0.848912	0.88859	0.381293
X_7	0.632103	0.079748	7.926238*	7.59E-09
X_8	-0.03522	0.024218	-1.45411	0.156297
X_9	-0.12316	0.110148	-1.11811	0.272395

* Indicates significance of variable at 95% confidence level.

Regression Statistics: Adjusted R^2=0.74, Standard Error=14.08 For 40 Observations

ANOVA Results: p –value of F-test i.e. Significance of F = 2.18E-08; degree of freedom for regression=9 ; degree of freedom for residual=30

(Source: Calculated from Survey results)

The regression model from this result can be written as below.

$$Y=42.17+ 0.03X_1 +0.008X_2 -1.85X_3 -12.15X_4 -0.05X_5 +0.75X_6 +0.63X_7 -0.03X_8 -0.12X_9$$

(2.15)* (0.56) (0.90) (-0.99) (-2.54)* (-0.28) (0.88) (7.92)* (-1.45) (-1.11)

.....(xi)

As presented in Table: VI-12, the overall significance of model is very good as p-value of F-test is almost zero(2.18E-08). The adjusted R^2=0.74 and thus it explains 74% of variation in WTP with the use of above set of variables. Regarding individual partial regression coefficients from X_1 to X_9, for degree of freedom = 30 the critical t-value for 95% confidence level is 2.042. Hence except X_4 and X_7, all variables are found statistically insignificant to explain WTP. This is also seen from respective p-values for them as except X_4 and X_7, all variables have p- value in excess of 0.05 (i.e. 5%). As the value of adjusted R^2 is high and majority of individual coefficients are

statistically insignificant, the presence of multicollinearity is tested through coefficient of correlation given in Appendix – 4. As per this, it is found that variables are not highly related with each other and therefore it can be said that variables X_4 and X_7 are important variables affecting WTP.

Regarding signs, the discussions given under subsection **6.6.7** expects negative sign only in case of (X_4), (X_5) and (X_9). Here, all assumptions for sign under subsection **6.6.7** are coming true except unexpected negative sign for per km diesel cost (X_3) and fleet size (X_8). This reverse sign in these two variables is indicative of denial of savings due to toll road and hence it is resistance to tolling. The natural occurrence of negative sign for (X_4) , (X_5) and (X_9) are confirmed in this results. Here, only two variables namely per km toll paid (X_4) and perceive saving on project road (X_7) have turned up statistically significant. Among these two, the notably higher value of coefficient for (X_4) is however indicative of larger impact on WTP due to too many toll plaza being faced by respondents in their long journeys. Also unlike car users, standard error in case of intercept and both the effective independent variables (X_4 and X_7) is found remarkable and hence representative of wide range of response.

6.6.7.2 Interpretation Of Regression Analysis For Truckers:

The statistical analysis of known independent variables for explaining WTP for truckers by means of regression tool provides following findings.

1) Looking to the reasonable good value of adjusted R^2 and extremely good overall significance of regression model for mean WTP in equation (xi), the linear relationship assumption is found tenable. Two of the nine independent variables are significantly explaining WTP and sign for these two independent variables are as expected.
2) The existence of positive intercept for WTP is most encouraging outcome of this analysis. It simply means, Vadodara- Halol Toll road is worth paying tolls though it is far away from prevailing toll level of Rs. 140.0 (Table:VI-12:A). However the error in estimates of intercept is found large. This low value of intercept guides to conclude that truckers are not really happy with tolling of Rs. 140 for 32 km of Vadodara- Halol road. The toll resistance is also

represented by unexpected negative sign for per km diesel cost (X_3) and size of fleet (X_8).

3) The lower value of coefficient for perceived savings on Vadodara- Halol road is indicative of ignorance of such savings in total length of journey.

4) The lower value of intercept and statistically insignificant seven independent variables in above analysis is reflection of the discussions held during survey that truckers view the tolls as an additional tax. The disproportionate toll of Rs.140 per trip for a truck for merely 32 km of journey on Vadodara- Halol road (very small portion of total journey e.g. for Vadodara- Delhi it will be only 3% of total journey) is not capable of generating demand for tolled roads ("better roads?") even at intercept level.

5) A major variable of per km diesel cost (X_3) was important variable to reflect WTP with expectation of positive sign. The insignificance of per km diesel cost (X_3) and unexpected negative sign are denial of benefits due to tolling and it is also attributable to confusion of exact saving of diesel per km on toll road and question of beneficiary of such saving between owner and driver.

6.7 CONCLUSION

Knowing the fact that success of commercial approach to development of roads is ultimately linked to the public response to direct tolling operations, willingness to pay (WTP) is most important factor for any PPP project. The diminishing spending capacity of Governments is spearheading for attracting private sector participation in road sector. However, resource crunch expressed by Government is yet to make impact on road users' aspirations for free utilization of this commodity. The concession agreements are allowing tolling on individual road user for funding or efficiency objectives but user perceives road as a Public Good and that sparks toll resistance. The willingness to pay among the users is not so elaborate for public nature of this commodity. The commercial investors under BOT agreement are at the stake when there is no established tolling culture among the users of facility. The tolling by private investor on Indian roads is facilitated by Government through enabling amendments in legislation. But the existing heavy taxation on road sector is evident and is shadowing the basic tenets of direct tolling. Under such circumstances road users are viewing the direct tolling as just another tax. The non transparent

commercial operations of tolling authorities are annoying users who are interested to know when the cost recovery will end through tolls.

The planners of PPP projects are taking up toll road projects based on some WTP surveys conducted by international consultants who ascertain users' preferences based on site surveys at approval stage of work. The toll rates are suggested based on consultant's assumption of savings in vehicle operating cost and reduction in travel time. These results are deemed to be valid for full tenure of concession period.

In this chapter, the public (road users) are directly encountered to know about their cost economics of vehicle usage on toll roads and preferences on road pricing. A sample survey for car users and truckers is conducted taking case study of Vadodara-Halol Toll road. This is a 32 km long four lane State Highway and serves interstate traffic between Mumbai- Delhi, Vadodara- Indore and Vadodara- Banswada. The survey results are found useful in estimating mean value of WTP on selected toll road. Also, linear multiple variable regression is also carried out on WTP using known response for set of independent variables. The survey results are encouraging and establishes acceptance of tolling practice on *prima facie*. Following issues are emerging from these survey results that requires due attention.

1) The improved condition of road generates consumer surplus and planners attempt to measure this surplus using available standards for vehicle operating costs at planning stage of PPP project. But thenafter there is no user's recourse in concession agreement to see that users actually realize the consumer surplus on every day of tolling.
2) Economists/planners are debating for superiority between average cost road pricing and marginal social cost pricing. But in reality, the road sector is already heavily taxed and users start paying before putting vehicle on road. The road sector is providing considerable general revenue to the Government that is not returning back to the sector. Additionally, fuel cess is imposed as a means of dedicated funds for development of National Highways and other road network. Any direct tolling on users above this regime of road pricing is viewed as another tax and hence generates toll resistance.
3) In principle, tolls are set to allow the private investor to recover his investments (with some returns, applicable as per type of regulation) justified

with calculations of user's saving in vehicle operating cost and saving in time. These are generally within ceiling limits specified by the MOSRT&H and the rates are revised as per fluctuations in Whole Sale Price Index (WPI). In this mechanism, only users carry onus to repay the investors and large scale externalities are not covered in pricing policy. These leads to higher toll values or inordinate concession periods or render many PPP projects unviable at planning stage itself. The users are annoyed for paying tolls on every improvement or for maintaining the trafficable conditions. Especially when tolls are revised annually, users do not see value for this revision as many of times service standards are lower than earlier after revision of toll. This is happening because tolls are not linked with actual service standards and users see no rationale in paying for roads on revised rate.

The findings from response to WTP survey for car users are bringing out many issues beyond savings on Vadodara-Halol Toll road. These findings are summarized as below.

1) The car users were found not ready with perception of savings in VOC or in time. The car users agree with benefits of toll road like time saving, lower maintenance higher speed, access control and safety, comfortable journey and road side amenities. But they have no tangible response that required gathering response for WTP in three levels (i.e. Highly Acceptable, Acceptable and OK). This is reflected in mean values for WTP observed. The mean value of maximum (OK) level of WTP is found Rs. 22.0 to Rs. 24 (std. error =6.8 to 10.6) that is near to actual toll level of Rs. 30 despite myriad arguments for tolling of road. The same respondents have stated most acceptable toll level of about Rs. 17.0 to Rs. 19.0 (std. error = 6.3 to 7.6) that is only 60% of prevailing toll rate. But assured the service standards, scope for good WTP was evident. Most stunning finding was none has expressed zero tolling for Vadodara-Halol stretch. The zero tolling was meant to be understood as road is maintained as per availability of State funds and no early improvements/widening. On this ground, zero tolling was not favoured even for existing toll free Halol- Godhra road. The car users were mostly found coming from Vadodara or Panchmahal district and were thus local people. For

them, the total length of journey has improved and that was reflected in above response. The car users also discussed issue of existing taxation on possessing and using a car. Need to provide a free road for already prevailing taxes was discussed and present toll level on Vadodara –Halol road was stated proportionately higher than Vadodara- Ahmedabad Expressway.

2) As per regression analysis, looking to the reasonable value of adjusted R^2 and extremely good overall significance of regression model, the linear relationship assumption is found tenable. Thus, the WTP has very simple relationship with independent variables.

3) ***Statistical analysis proved existence of positive and remarkable intercept of about Rs.24 to Rs.30 considering all level of WTP. This is most encouraging outcome of this analysis. It simply means, Vadodara- Halol Toll road is worth paying tolls that too very near to prevailing toll level of Rs. 30.***

4) The gap between mean WTP stated by respondents and intercept of regression model is mainly explained by the toll resistance arising from impact of other taxes on road sector. This is statistically observed from significance of that variable in all three levels of WTP.

5) The WTP is found depending on service standards in full length of journey. The toll free good riding quality of Halol-Godhra road is found helpful in explaining WTP for Vadodara- Halol Toll road. Another way, the analysis suggests that any downfall on service standards on remaining leg of journey hampers the WTP on existing toll road adversely. Practically it can be stated that a pothole on Halol- Godhra stretch can influence WTP on Vadodara-Halol Toll road. Hence it is suggested that knowledge of origin-destination of toll road users shall be given importance and the service standards of remaining leg (may be tolled or untolled) shall be ensured to the acceptable level for helping tolling on selected toll road. This type of partnership can be expected from Government in support of PPP on highways. A combination of toll road with good supportive infrastructure in remaining length of total journey can help in maintaining viability of project by attracting traffic on toll road that is impossible by the toll project economics on standalone basis. In fact this is leading to concept of corridor development tapping externalities for project revenues and whole selling road facility for longer stretches in benefit of road users.

The findings from response to WTP survey for truckers are also bringing out many issues beyond savings on Vadodara-Halol Toll road. These findings are summarized as below.

1) The truckers are found too annoyed with tolling practices on highways. They have very clear understanding of savings in VOC due to improved roads. The stated mean value of perceived savings on Vadodara –Halol road for three axle trucks is only Rs. 2.17 per km (Rs. 69.44 per one side journey) as compared to prevailing toll level at Rs. 4.4 per km (Rs. 140.0 per one side journey). Similar to car users, tolling has now seems accepted by transporters as indispensable charge on use of facility. But the mean WTP for Vadodara- Halol Toll road is very low i.e. Rs. 1.93 per km (i.e. Rs. 61.76 per one side journey of project road). ***Thus truckers perceive benefits of half of toll being paid on project road and they have expressed WTP for selected toll road even less than half of prevailing toll rate.*** The trucks travel far beyond Vadodara- Halol and hence any positive or negative experience on this 32 km of small stretch has limited relevance for them. But any positive or negative experience on remaining huge length has definite impact on WTP for this project. Since road between Vadodara- Shamlaji borders has only this alone tolled section, the mean WTP on toll road is infact covering benefits of remaining contiguous untolled length also. This is evident from the fact that truckers state per km WTP for full length journey with four lane facility at only Rs.1.14 that is lower than per km WTP of Rs.1.93 on Vadodara- Halol road. The some of the reasons are common with car users. All of the respondents blamed other taxes affecting WTP. The heavy fixed and variable cost of owning and driving truck on national or three state permits, tyre renewals, servicing, body work and very competitive fares on other hand are stated as major hitch to pay this extra charge. One more intrinsic problem with truckers is stated as, diesel saving is generally cornered by drivers and maintenance savings is felt reaching to owners. The overloading and sundries collected for enroute short distance consignments were told helping many of times. Regarding time saving, there was no waiting business opportunity at any end stated as a major factor in underquoting WTP for selected toll road and for full length improvement. When business opportunity exists, trucks can not run at speed of

100-120 kilometer per hour and can not travel for more than six hours at a stretch to take benefits of toll roads. The absorption of tolls in overall business operations of transporters is not a planning issue here and statistically it has emerged insignificant too. Overall, the truckers view tolls as an additional tax imposed in-proportionately to savings. Hence, they are eager to know when the investments will be recovered resulting into cessation of tolls on all tolled sections. They are skeptical of tolling policy and demand transparency of tolling operations. These are all problems related with pricing the facility without precise estimates of users' benefits. If the users are the only payers of PPP project, the WTP can not be expected to match with prevailing toll levels. Important for planners is, user's recourse. The transporters have common experience of inferior treatment at toll plaza and lack of basic amenities on toll roads after paying heaviest tolls.

2) As per regression analysis, looking to the reasonably good value of adjusted R^2 and extremely good overall significance of regression model, the linear relationship assumption is found tenable. Thus, the WTP has very simple relationship with independent variables.

3) Here the intercept of regression model is positive, statistically significant but not remarkable (Rs. 42) as compared to prevailing toll level of Rs.140 for selected category of three axle truck. This is only Rs.1.31 per km as compared to mean of Rs. 1.93 per km. Overall, statistically significant model for WTP implies more to reduce effect of overall taxation than any enhancement measures. The variable of perceived savings on selected toll road is not having strong coefficient that could lead to increase WTP by increasing saving on selected toll road. Due to survey limitations, many variables are rendered statistically insignificant or many are yet to be explored which opens scope for further research. ***However it emerges from discussions during surveys, corridor type of hasslefree point to point superior roads for known origin-destination is one of the solutions to this. At broad policy level, rationalization of taxes on road sector and tapping externalities for project revenues are also worth applying measures to address to this issue of lower WTP for trucks.***

In a nutshell, WTP estimates need to take into account many factors beyond project benefits and time to time review of actual benefits from the project and from remaining leg of journey is required to sort out problems with users' recourse. Alternatively for a given WTP or for given estimate of quantum of benefits accruing to users due to improvement, the size of project and stages of investment shall be checked back since the project cost along with traffic volume are directly deciding the toll levels at present and viability gap shall be adjusted from other sources (externalities).

*

REFERENCES:

Benson and Moore (2002): **Are Roads Public Goods, Club Goods, Private Goods or Common Pools?** - a manuscript from Florida State University (garnet.acns.fsu.edu/~bbenson/hywys.doc accessed dated 16-3-07)

Block, Walter (1983): **Public Goods And Externalities: The Case Of Roads** Journal Of Libertarian Studies, Vol.VII,No.1(Spring 1983) From The Fraser Institute, Vancouver (mises.org/journals/jls/7_1/7_1_1.pdf accessed on net on date 16-3-07)

Dr. Emmerink, Richard H. M. (1998): **Information and Pricing in Road Transportation** Free University, Netherlands Chapter-3 page 46-47

Field, Barry C. (2001): **Natural Resource Economics- An Introduction** Mc Graw Hill Publication

Glaister, Stephen (1981): **Fundamental of Transport Economics**, Basil Blackwell-Oxford Publication

Gujarati, Damodar (1995) : **Basic Econometrics** McGraw Hill Book Co. (Singapore) Third Edition

Heggie, Ian G. (1972): **Transport Engineering Economics** McGraw Hill Book Co. (UK) Ltd.

World Bank (2004): **India Financing Highways** World Bank document report no.: 30363 – in energy and infrastructure sector unit (South Asia)

IRC Special Publication SP-19 (2001): **Manual for Survey, Investigation and Preparation of Road Projects** Government of India (First Revision)

IRC Special Publication SP-30(1993): **Manual On Economic Evaluation Of Highway Projects In India**: Government of India (First Revision)

Lindsey, Robin (2006) **Do Economists Reach A Conclusion on Road Pricing? The Intellectual History of an Idea** Econ Journal Watch, Volume 3, Number 2, (May) pp 292-379
(financecommission.dot.gov/.../Background%20Documents/Lindsey%20DoEconomists%20ROC%20on%20road%20pricing.pdf accessed through Google on net on date 21-3-07)

Kolstad, Charles D. (2000): **Environmental Economics** New York Oxford, Oxford University Press.

Perman, Roger; Yue MA; McGilvray, James and Common, Michael (1999): **Natural Resource And Environmental Economics**: Second Edition Longman Publishers (UK)

Wang, Hua; Laplante, Benoit; Wu, Xun; Meisner, Craig (2005): **Estimating Willingness to pay with random valuation models: An application to Lake Sevan, Armenia**. World Bank Working Paper 3367 (August)