

## Chapter VI

# Analysis and Findings

In this study an attempt has been made to compare the performance of NHAI in all three modes of project execution viz. BOT (Annuity), BOT (Toll) and IRCC/EPC. This comparison is made on the basis of three parameters (i) Timely completion of projects; (ii) Cost effectiveness of different modes of project execution; and (iii) Contractual Disputes/Re-negotiations in all the three modes. All the projects completed by NHAI upto the year 2009 have been analysed. The findings of the study are discussed in detail in subsequent paragraphs.

### Timely Completion of projects

In BOT (Annuity) and IRCC/EPC mode, all the completed projects are parts of either NHDP-I or NHDP-II, whereas in case of BOT (Toll), the completed projects include those from NHDP-III and NHDP-V also. We also need to examine the timeframe within which the projects under different phases of NHDP and under different modes were executed so that comparability of data across different modes could be established. Details about earliest start and last start of projects under different modes and under different phases of NHDP are given in Table 6.1 below:

**Table 6.1 – Start Times of projects under different modes**

	BOT (Annuity)		BOT (Toll)		IRCC/EPC	
	Date of Start of 1 <sup>st</sup> project	Date of Start of Last Project	Date of Start of 1 <sup>st</sup> project	Date of Start of Last Project	Date of Start of 1 <sup>st</sup> project	Date of Start of Last Project
NHDP-I (1997 onwards)	May 2002	Oct 2002	Mar 1999	Aug 2003	Dec 1997	Feb 2006
NHDP-II (Dec 03 onwards)	Sep 2006	Sep 2006	Sep 2005	Dec 2006	Mar 2004	Apr 2006
NHDP-III (Mar 05 onwards)	-	-	Jan 2006	Sep 2006	-	-
NHDP-V Nov 05 onwards	-	-	Jan 2007	Jan 2007	-	-

It has been observed that among projects under study here, the majority under NHDP-I were started between 1999-2002; in case of NHDP-II majority of the projects were started in late 2005; NHDP-III is coterminous with NHDP-II in terms of start of projects with majority of projects being started in early 2006. Both the projects under NHDP-V started in Jan 2007.

Specific findings about projects under different modes of delivery are given below:

**(i) BOT (Annuity) Projects**

A total of 10 Annuity projects have been completed till 2009, out of which eight are part of NHDP-I and two are part of NHDP-II. The first project in this mode was started in May 2002 and the last was started in September 2006. Out of these 10 projects, two were completed before the scheduled date; one project was completed on schedule and the remaining seven were delayed, for periods varying from two month to nine month. The average delay for all the completed annuity projects was 2.7 months. The average delay for seven delayed projects was 4.3 months. The average project size (in Km) for annuity projects was 63.73 Km.

**(ii) BOT (Toll) Projects**

NHAI has completed 30 projects under BOT (Toll) till 2009. Out of these 30 projects, nine are included in NHDP-I; 12 projects are included in NHDP-II; Seven projects in NHDP-III and remaining two projects in NHDP-V. Unlike BOT (Annuity), which has only four lane roads projects; under BOT (Toll), major bridges; road over bridges; and six/eight lane road projects have also been executed, in addition to four lane highways. Among the 30 completed projects there are two road over-bridges, one major bridge and three six/eight lane roads. The first of these projects under NHDP-I was started in March 1998 and the last in January 2007.

Out of 30 completed projects, two projects were completed before scheduled date (One project seven months and another six months), seven projects were completed on time and the remaining 21 were delayed for varying periods from 2 months to 30 months (Delhi-Gurgaon Expressway). The average delay in completion of all completed projects

comes to 4.3 months. However, if we exclude Delhi-Gurgaon Expressway, which involved large scale changes in scope of work after award of concession, delays in transfer of defence lands and shifting of utilities all of which were attributable to NHAI, then the average delay per project comes down to 3.5 months, almost on par with annuity projects. The average delay for the 21 delayed projects comes to 6.7 months, (excluding Delhi Gurgaon Expressway it comes to 5.6 months).

It is also seen in case of BOT (Toll) projects that the average delays are progressively declining in every subsequent phase of NHDP. The average delay was 7.4 months in NHDP-I, 3.1 month for NHDP-II and 2.9 months for NHDP-III before coming down to two month for NHDP-V. The average length of projects awarded has also gone up from 50.46 Km in NHDP-I to 74.35 Km in NHDP-V.

### **(iii) IRCC/ EPC<sup>68</sup> Projects**

Under this mode a total of 144 projects have been completed till 2009, out of which 125 projects are included in NHDP-I and balance 19 in NHDP-II. The first project (Vijayawada- Eluru of NH5) in this mode was awarded way back in December 1997 under NHDP-I, and the last project in February 2006.

Out of 144 projects completed, 13 projects were completed before schedule (Maximum six months), 19 projects were completed on time and the remaining 112 projects were delayed for varying periods from two month to 74 month (Purnea-Gayakota section of EW corridor in Bihar). The average delay for all the projects was 14 months, for 125 NHDP-I projects it was 14.7 months and for 25 NHDP-II projects it was 9.5 months.

The average delay in case of 112 delayed projects comes to 18.4 months. It comes to 19.8 months for 95 projects under NHDP-I and 11 months for 17 delayed projects under NHDP-II. The average size of the projects (in Km.) has also been up since

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<sup>68</sup> Item-Rate Construction Contract/ Engineering Procurement and Construction

inception. Average size under NHDP-I was 34.35 Km which has gone upto 50.60 Km under NHDP-II.

## Analysis

The tables showing details of projects under different modes of project execution and its analysis on the basis of delay and project length are placed as Appendix-VI. The comparative analysis of different modes of project on the parameter of timely completion of projects is given in Table 6.2.

**Table 6.2 – Timely completion of projects under different modes**

Mode of Execution	No. of Projects	Projects completed before time		Projects completed on time		Projects completed with delay	
		No.	Per cent	No.	Per cent	No.	Per cent
BOT(Annuity)	10	2	20.00	1	10.00	7	70.00
BOT(Toll)	30	2	6.67	7	23.33	21	70.00
IRCC/EPC	144	13	9.03	19	13.19	112	77.78

Source: NHAI

It can be seen from the above table, that in case of both BOT (Annuity) and BOT (Toll) mode 30 per cent of the projects have been completed on or before time, while 70 per cent of the projects have been delayed. In case of IRCC/EPC contracts, 22.02 percent of projects were completed on time, while 77.78 percent of projects were delayed.

Based on the data available from NHAI analysis was also done for projects which are already due for completion before January 2010, but are yet to be completed. NHAI has fixed up expected dates of completion based on a thorough review with the contractors/concessionaires. The summary of the analysis is given in Table 6.3 below, while complete project wise data is placed at Appendix VII.

**Table 6.3 - Delay in completion of overdue projects**

Mode of Execution	No. of Projects	Total Delay (in months)	Average Delay (in months)
BOT(Annuity)	8	86	10.8
BOT(Toll)	14	277	19.8
IRCC/EPC	105	3497	33.3

Source: NHAI Data

It comes out clearly from both the situations of completed projects and overdue projects that BOT (Annuity) is the best mode of execution of road projects in India from the timely completion point of view. In case of overdue projects it can be seen that average delay for BOT (Toll) projects is nearly twice that of in case of BOT (Annuity). In case of IRCC/EPC the delays are nearly three times that of BOT (Annuity). One reason for early completion of Annuity projects has been the ease of financial closure, as the concessionaire does not bear the traffic risk; the financial institutions are comfortable in lending due to surety of revenue inflows after completion, which is not the case for BOT (Toll). In case of IRCC/EPC projects a large number of technical and contractual disputes are delaying the projects. This issue is discussed in detail in later section.

### Cost Effectiveness

The comparative cost of construction for four lane highway under all the three modes of construction has been calculated based on data available from NHAI till December 2009. The data for NHDP-V has not been considered as it involves just two projects of six laning under BOT (Toll) and it's not comparable with other modes. Similarly data from other six/eight laning projects and projects involving only structures like bridges, road over-bridges which have great distortionary effect on the unit cost parameter have not been considered.

Based on above considerations, data from ten BOT (Annuity) projects under NHDP-I and NHDP-II; 23 projects under BOT (Toll) (includes 5 projects under NHDP-I, 11 projects under NHDP-II and 7 projects under NHDP-III); and 134 projects under IRCC/EPC (117 projects from NHDP-I and 17 projects from NHDP-II) have been analysed. The details of individual projects are available at Appendix VIII. The summary of data analysis is given in Table 6.4 given below.

Table 6.4 – Unit Cost per Km of four laning in different modes of project execution

Project Mode		BOT (Annuity)	BOT (Toll)	IRCC/EPC
NHDP Phase				
NHDP-I (1997 onwards)	No. of Projects	8	5	117
	Length (in km)	475.58	329.02	4281.57
	Const. Cost (in Rs. cr)	2353.70	1581.35	18845.36
	Cost per km (in Rs. cr)	5.02	4.81	4.40
NHDP-II (Dec 2003 onwards)	No. of Projects	2	11	17
	Length (in km)	161.74	609.10	960
	Const. Cost (in Rs. cr)	988.00	3707.39	5405.70
	Cost per km (in Rs. cr)	6.11	6.09	5.63
NHDP-III (Mar 2005 onwards)	No. of Projects	-	7	-
	Length (in km)	-	390.00	-
	Const. Cost (in Rs. cr)	-	1956.00	-
	Cost per km (in Rs. cr)	-	5.02	-
NHDP ALL	No. of Projects	10	23	134
	Length (in km)	637.32	1328.12	5241.57
	Const. Cost (in Rs. cr)	3341.70	7244.74	24251.06
	Cost per km (in Rs. cr)	5.29	5.45	4.63

Source: NHAI

The cost of construction per km of four lane highways is lowest for IRCC/EPC contracts at Rs. 4.63 cr per km; in case of BOT (Annuity) and BOT (Toll) the figures are Rs. 5.29 cr per km and Rs. 5.45 cr per km respectively. However, the key difference is that cost of maintenance is not included in IRCC/EPC contracts, whereas BOT (Toll) and BOT (Annuity) have the operations and maintenance cost built in the project cost. It is estimated that over the 15 year concession period the maintenance cost comes to about 20 per cent of construction cost. If we include the same in the average cost of IRCC contracts then the cost per km would come to Rs.5.56 cr per km. keeping this as the base figure, we find that annuity contracts cost nearly 5 per cent less than the IRCC contracts. In case of Toll projects the difference in cost comes to about two per cent, such projects being two per cent cheaper.

It is also seen in IRCC contracts that final costs are invariably higher than the awarded costs, the average variation being 23.17 per cent upside from contracted cost. This figure coincides with the UK government's finding that contractors generally charge 20 per cent more than the original contract prices<sup>69</sup>.

In BOT (Toll) projects one peculiar feature is observed that even though NHDP-II and NHDP-III projects were awarded and started in the same period; late 2005 to early 2006; NHDP-III being slightly late, the cost per km for NHDP-II is much higher at Rs. 6.09 cr per km *vis-à-vis* Rs. 5.02 cr per km for NHDP-III. It appears that these projects seem to have been over engineered to provide better facilities to road users thereby leading to substantial increase in costs. All projects in NHDP-II irrespective of mode of delivery have cost the government much higher compared to NHDP-III even though both were started at same time. It clearly implies that project formulation and appraisal for this phase has not been very sound.

In fact if we exclude the projects under NHDP-II from list of BOT (Toll) projects and consider only 12 projects under NHDP-I and NHDP-II then the average cost of per km of four laning comes to Rs. 4.92 cr only for BOT (Toll) projects, which is the cheapest option.

### **Contractual Disputes/ Renegotiations**

NHAI has so far awarded 406 contracts which include 309 EPC/IRCC, 72 BOT (Toll) and 25 BOT (Annuity). In 123 of these contract packages [119 EPC/IRCC and 4 BOT (Annuity)] more than 1250 disputes have been raised by either party, involving an amount of Rs. 8,509 crore. It is also seen that except in case of four BOT (Annuity) projects the disputes relate to only EPC/IRCC awarded by NHAI. There are no disputes pending for any of the BOT (Toll) projects. All the earlier disputes in BOT (Toll) originated over handing over possession of land, which has since been taken care of by amendment to MCA providing for handing over at least 80 per cent of the project land to the concessionaire at the time of signing the agreement/contract.

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<sup>69</sup> Tsukada, Shunso (2005), "Global Experiences of Public Private Partnership for Highway Development", ADB

The common issues for disputes include compensation for subsequent legislation; price adjustment/escalation; delay in hand over of encumbrance free site, utility shifting, rehabilitation and resettlement resulting in idling of plant and machinery; variations in BOQ<sup>70</sup> beyond permissible limit; rates for non BOQ items; and different interpretation of technical items. The largest identifiable chunk of cases relate to non-BOQ items and BOQ variations beyond permissible limits.

In addition to pending disputes, 114 awards in respect of 490 disputes amounting to Rs 657 crore have been published by Arbitral Tribunals, out of which only 17 awards covering 68 disputes in 11 contract packages for an amount of Rs 31 crore have been accepted by both the parties. NHAI has challenged 70 awards containing 300 disputes amounting to Rs 470 crore. The contractors have challenged 15 awards containing 80 disputes amounting to Rs 124 crore. No decision has been taken to file appeal in 12 awards in respect of 42 disputes amounting to Rs 35 crore. The information in tabular form is given in Table 6.5.

**Table 6.5 – Action taken by NHAI on Awards published by Arbitral Tribunal**

Action Taken after Award publication	No. of Awards	No. of disputes	Amount Involved (in crore)
Agreement between both parties	17	68	31
Appeal by NHAI	70	300	467
Appeal by contractor	15	80	124
Decision to file appeal pending	12	42	35
<b>Total</b>	<b>114</b>	<b>490</b>	<b>657</b>

Source: NHAI

The EPC/IRCC contracts of NHAI generally have a provision for Dispute Resolution Board (DRB) or Dispute Review Expert (DRE). It is the first level for resolution of disputes to be followed at Arbitration Tribunal and thereafter in High Courts. The existing position in regard to appellant wise break up both in case of published awards and cases pending in Arbitration Tribunal can be seen in Table 6.6 below:

<sup>70</sup> BOQ refers to Bill Of Quantity



**Table 6.6 – Appellant wise break-up of disputes**

<b>Category I- Published Awards</b>								
<b>Appellant</b>	<b>Both DRB and AT</b>		<b>Only DRB</b>		<b>Only AT</b>		<b>Total</b>	
	<b>Package</b>	<b>Dispute</b>	<b>Package</b>	<b>Dispute</b>	<b>Package</b>	<b>Dispute</b>	<b>Package</b>	<b>Dispute</b>
NHAI	37	148	7	36	37	205	81	389
Contractor	11	60	26	142	3	5	40	207
Both	3	12	15	92	8	60	26	164
<b>Total</b>	<b>51</b>	<b>120</b>	<b>48</b>	<b>270</b>	<b>48</b>	<b>270</b>	<b>147</b>	<b>760</b>
<b>Category II- Cases pending with Arbitration Tribunal</b>								
	<b>Package</b>				<b>Dispute</b>			
NHAI	62				514			
Contractor	55				489			
Both	25				236			
<b>Total</b>	<b>142</b>				<b>1239</b>			

Source: NHAI Dec 2009

The above analysis clearly shows that NHAI is the dominant litigant both at DRB and Arbitral Tribunals. Large number of cases has been filed in Arbitral tribunals as there was no provision in large number of packages for DRB. The contractors in such cases had to go to courts/Appellate Tribunals. In several cases the contractor raised the disputes at Appellate Tribunal only due to NHAI's non-implementation of even the DRB recommendation which has assumed finality. The contracts also provide for referring such failures of compliance with recommendations of DRB which have become final and binding.

NHAI officials have been routinely filing appeals against the awards of DRB/DRE due to psychological fear of vigilance and other investigating authorities looking at bona-fides of the decisions taken, rather than the merits of the case thereby preferring safer option of appeal. Another reason for routine appeals is short 28 days time available for referring the DRB recommendation to arbitration; at times it is not possible to examine the award in such a short time due to which officials adopt appeal route.

In case of arbitral award NHAI has made a cost benefit analysis by dividing the awards in three categories namely up to Rs. 10 crore subject to five per cent of contract price (category A), Rs. 10 to 100 crore (category B), and more than Rs. 100 crore. The details of the analysis are placed at Appendix IX. It appears that not much benefit has been obtained in cases where the award of DRB is unanimous particularly in category A cases.

Our findings on cost parameters do not correspond to the risk framework of PPP projects. As IRCC contracts are the least risky of the three, it is easier for the contractor to arrange the funds at lower cost, these projects should therefore have been the cheapest over the lifecycle of the concession period (say 15 years). The final payment in IRCC contracts is made by the government; the overall cost of these projects should be much lower as governments can raise funds at cheapest rates. The cost to economy would also be the least, as EPC contract in combination with long term operation and maintenance contract could be the least costly alternative. In fact this is the model followed by most of developed countries which have the resources for public funding of highways. BOT (Annuity) and BOT (Toll) seem to be moving in tandem with degree of risk; with BOT (Toll) proving to be costlier of the two, as it involves traffic risk also.

The findings of the study can be summarised in the following manner:

BOT (Annuity) projects incur the least amount of delay in completion of the projects. Thirty per cent of projects get completed on or before time and the balance suffer an average delay of just 4.3 months. Cost wise at Rs. 5.29 cr per km it is cheaper than BOT (Toll) and IRCC contracts. A fairly robust concession agreement has led to very few contractual disputes.

BOT (Toll) is almost on par with BOT (annuity) as regards timely completion of the projects is concerned; the delayed projects face an average delay of 6.7 months. Cost wise it is slightly costlier than BOT (Annuity) but cheaper than IRCC (lifecycle cost). The biggest advantage of BOT (toll) is freedom from contractual disputes for NHAI. Contractual disputes have been the bane of BOT (Toll) projects all over the world, but our institutional framework including MCA has met with great success in this regard.

The cost per km at Rs. 5.45 crore seems to be on the higher side due to distortions caused by NHDP-II.

IRCC contracts with per km construction cost of Rs. 4.63 cr and lifecycle cost (including operations and maintenance over concession period) of about Rs. 5.56 cr are the costliest of the three modes; a very unexpected finding. These projects further suffer from the problem of steep cost escalation. The completed projects have faced an average escalation of 23.17 per cent over contract price. The per km price reflected here may also not be the final price, as more than Rs. 8000 cr is locked up in contractual disputes at various levels and NHAI would have to pay a large amount. The projects under IRCC/EPC also suffer from serious project delays; 78 per cent of all completed projects have been delayed with average delay of 18.4 months. Compared to average BOT (Annuity) project, the average IRCC projects get delayed by more than a year.

The government decision to opt for PPP model for highway development seems to be well supported by the findings. Quite unexpectedly and contrary to global trends, both Toll and Annuity models have turned out to be cheaper than IRCC/EPC contracts. Projects under PPP mode are also completed nearly a year earlier than IRCC/EPC contracts. The opportunity cost to economy in terms of non-availability of good quality infrastructure would be very high in case of IRCC/EPC mode due to loss of growth and losses due to higher fuel consumption and maintenance of vehicles.