“TOLL TRAFFIC REVENUE AND EXPENSES AT NH-22 ZIRAKHPUR-PINJORE PARWANOO HIGHWAY ”

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Bachelor of Technology

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Under the Supervision of

Dr. Ashok Kumar Gupta

Mr. Ashish Kumar

By

Lakshya Siddhi (101626)

Adarsh Pandey (101623)

DEPARTMENT OF CIVIL ENGINEERING

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY,

WAKNAGHAT

CERTIFICATE

This is to certify that the work titled "TOLL TRAFFIC REVENUE AND EXPENSES AT NH-22 ZIRAKHPUR-PINJORE-PARWANOO HIGHWAY" submitted by Lakshya Siddhi, Adarsh Pandey in partial fulfilment for the award of degree of B.Tech Civil Engineering of Jaypee University of Information Technology, Waknaghat has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Dr. Ashok Kumar Gupta
(Professor and Head)

Date: 13/05/2014

Mr. Ashish Kumar
(Assistant Professor)

Department of Civil Engineering

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-Project Members

Lakshya Siddhi (101626)

Adarsh Pandey (101623)

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ABSTRACT

Through this project report we intend to bring about an economical analysis of JAYPEE Group in their operational project at the border of Punjab, Haryana , Himachal Pradesh , "HIMALYAN EXPRESSWAY". For this economical analysis we had to study the Traffic Characteristics. Using the studied data we made various estimations regarding Traffic forecast (future Traffic), Traffic growth rates, Revenue and Expenses. For the estimation of Traffic growth rate we had to study the Demand Elasticity for the State of Punjab. As per the Contract with the Government the actual Toll collection time was 20 years with the JAYPEE Group But 2.5 years out of these 20 years were wasted due to Delay in the process of construction. So the Revenue generated is only of 17 years.All the calculations made are approximate and not exact.

1 INTRODUCTION

The **Himalayan Expressway** is a 27.5 km expressway in connecting the city of Zirakpur, Chandigarh to Parwanoo, Solan . The road runs two kilometres in Punjab, 21 km in Haryana and 4.5 km in Himachal Pradesh catering to about 30,000 vehicles passing through the stretch every day and the commuters would need to pay Rs. 21 as toll for each trip on the stretch in the year 2012. The bypass, cutting through the Shivaliks , is part of the 27.5 km expressway project between the two towns on NH-5.

The four-lane Himalayan Expressway is huge relief to commuters, who often face long snarls at Kalka and Pinjore. Though the stretch will reduce the distance between Zirakpur and Parwanoo by only three kilometres, bypass will save time and fuel in a big way. Rough estimates suggest that tourists driving down from Delhi would now take seven hours to reach Shimla instead of eight.

Though people have to pay toll for using the expressway, they can cross this stretch in just 10-15 minutes. The small stretch has 32 structures including a rail over bridge, two flyovers and 11 bridges. Jaypee has constructed high retaining walls, concrete cladding up to 30 meters high to save the houses and rock fall protection measures.

For better monitoring of mishaps, the developer has adopted video incident detection system (VIDS). It claims that eight cameras had been installed on the hilly stretch so that they get instant input of any accident from these spots.
Moreover, the 14-lane toll plaza at Zirakpur became the first plaza fitted with radio frequency identification (RFID) technology. All toll gates have got RFID tag readers vehicles fitted with the RFID tags won't have to wait in queues as the boom barrier would automatically lift as soon as the vehicle approaches.

An RFID tag is like a band aid, which can be attached to the windscreen of a vehicle. "People can recharge easily and the toll charge would get automatically deducted.

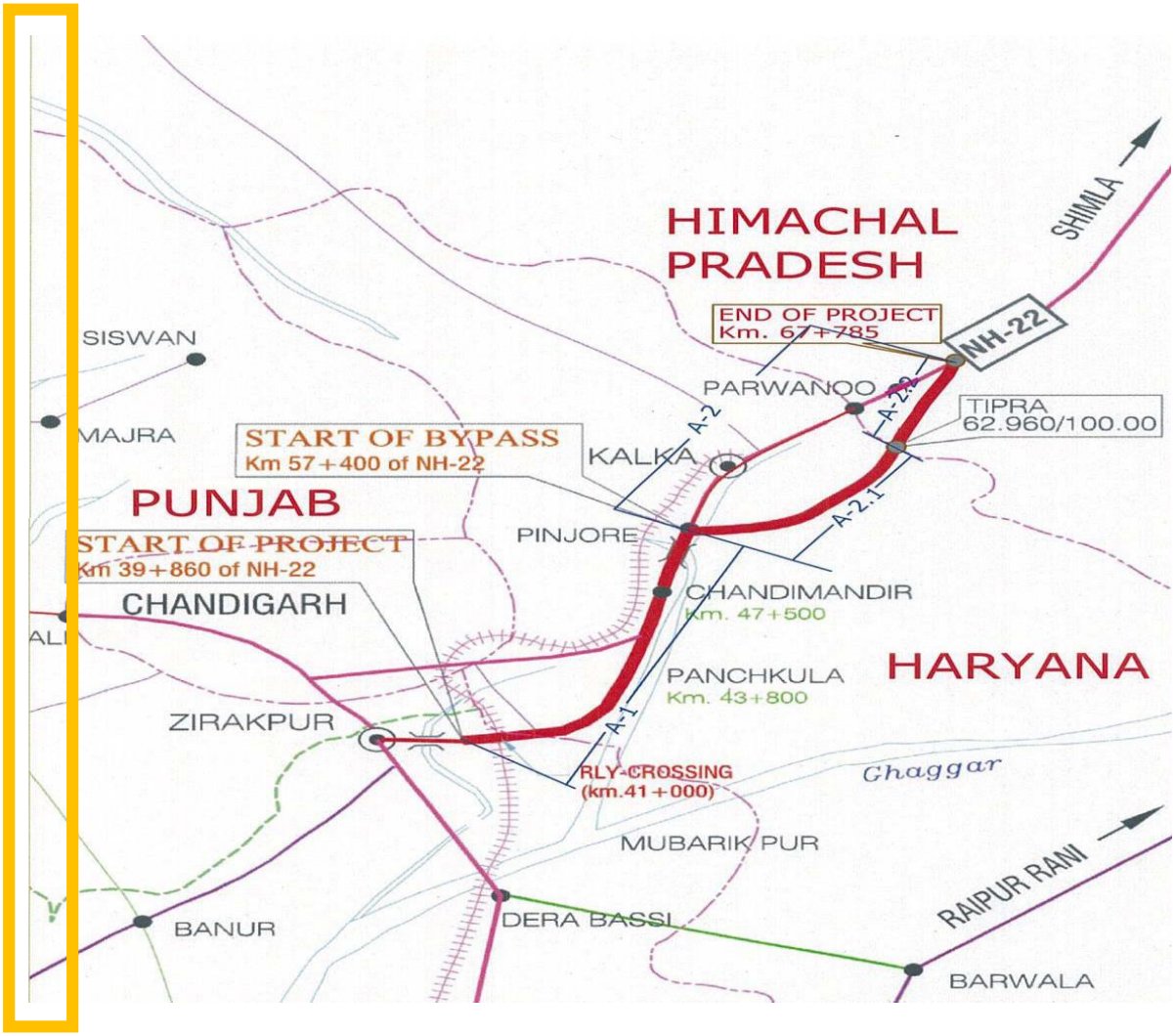
Himalayan Expressway	
Route information	
Length:	27.5 km (17.1 mi)
Major junctions	
South end:	Zirakpur, Chandigarh
North end:	Parwanoo , Solan district.
Location	
States:	Punjab, Haryana & Himachal Pradesh
Major cities:	Zirakpur, Parwanoo
Highway system	
Indian Road Network	
National · Expressways · State	

Nearby cities: Baddi, Shimla, Bilaspur

Coordinates: 30°49'0"N 76°56'21"

ZIRAKHPUR-PINJORE-PARWANOO HIGHWAY

LAYOUT



Source : jaypee head office

2 TRAFFIC SURVEYS AND METHODOLOGY

2.1 INTRODUCTION

The project road is divided into two homogeneous sections based on the major traffic generating points , location of intersection etc as listed below:

- Zirakpur – Pinjore (start of bypass)
- Pinjore (start of bypass) – Parwanoo (end of bypass)

Traffic surveys were conducted in the first section and traffic on the proposed bypass has been estimated from the information of present and previous studies on the project road.

TABLE 2.1: SURVEY

S.NO	SECTION	LOCATION	DURATION	PERIOD
1	Zirakpur – pinjore	53.0 Km on NH-22 near Surajpur	3 days	10/04/06 - 12/04/06

2.2 SURVEY METHODOLOGY

The main objective of classified traffic volume count was to assess the traffic characteristics on project road section in terms of hourly traffic variation, peak hour traffic, average daily traffic composition and directional distribution. The survey was carried out by manual vehicle counting and classifying the vehicles passing the survey station in both directions at 15 minutes interval. The counts were made separately for motorized vehicles and non-motorized vehicles. In addition, toll exempted vehicles i.e. government, military, ambulance, fire vehicles etc. were classified separately as per vehicle classification system shown in following table:

TABLE 2.2: Vehicle classification system

Two Wheeler	**Motorized**
Auto Rikshaw/Car	**Motorized**
Mini Bus	**Motorized**
Multi Axle Vehicle	**Motorized**
Agricultural Tractor without Trailer	**Motorized**
Agricultural Tractor with Trailer	**Motorized**
Standard Bus	**Motorized**
Light Truck (LCV)	**Motorized**
Medium Truck (HCV)	**Motorized**
Animal Drawn	**Non- Motorized**
Cycle	**Non- Motorized**
Cycle Rikshaw	**Non- Motorized**

3 TRAFFIC CHARACTERISTICS

Traffic volume count data collected has been analyzed to arrive at average daily traffic (ADT). Daily variation of traffic, peak hour traffic, traffic composition and directional distribution. The Various vehicle having different size and characteristics were converted into equivalent . Passenger car units (PCUs). The PCU conversion factor s adopted for the present study are

Taken from "IRC 64-1990: Guideline for capacity for roads in a rural areas".

TABLE 3.1: PCU factor values

Vehicle type	PCU factor
Two Wheeler	0.5
Auto Rikshaw/Car	1
Mini Bus	1.5
Multi Axle Vehicle	4.5
Agricultural Tractor without Trailer	1.5
Agricultural Tractor with Trailer	4.5
Standard Bus	3
Light Truck (LCV)	1.5
Medium Truck(HCV)	3
Animal Drawn	6
Cycle	0.5
Cycle Rikshaw	1.5

3.1 AVERAGE DAILY TRAFFIC (ADT)

It was observed that an average daily traffic of 25,290 vehicle (32,279 PCUs) was observed in Zirakpur-Pinjore section. The directional split of ADT showed that the flow in the both the direction is evenly distributed at 50:50 on NH-22.

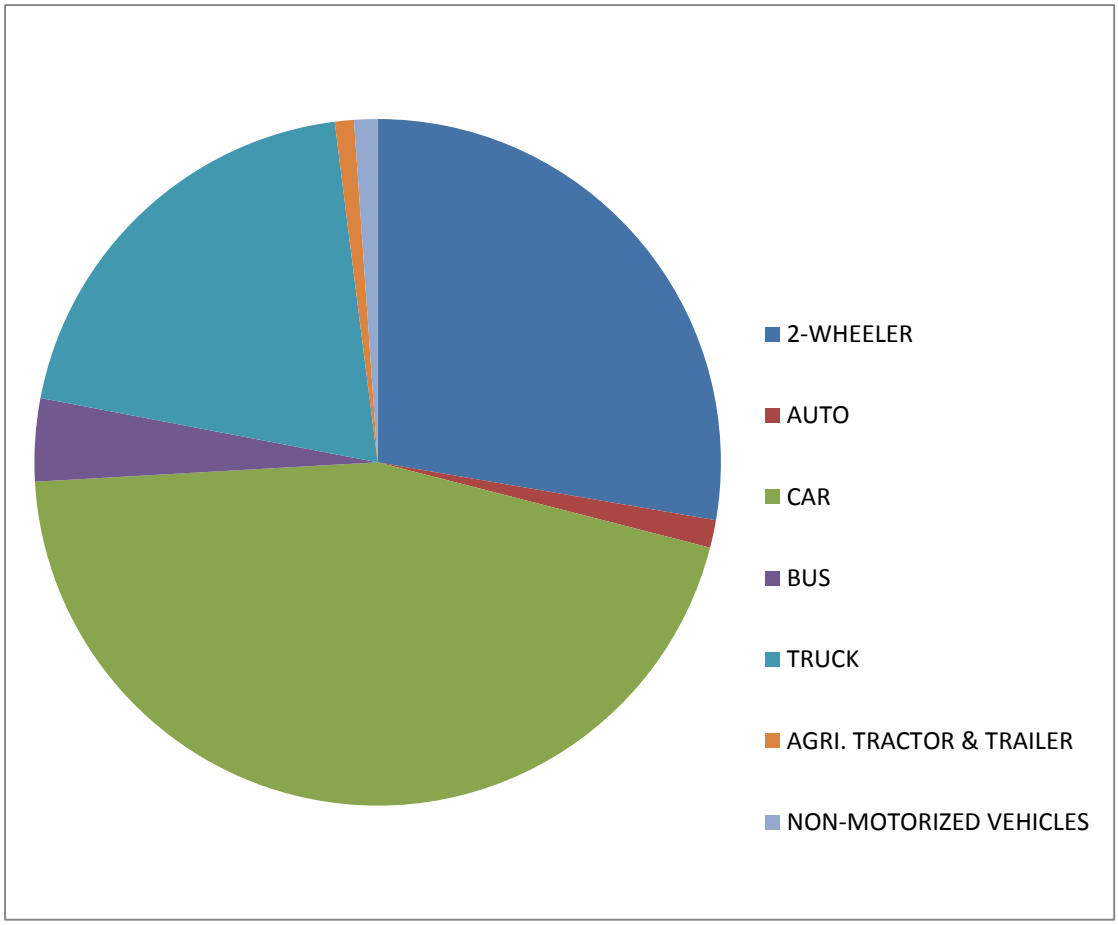
TABLE 3.2: ADT of various vehicle types

SECTION	MOTORIZED VEHICLES						NON-MOTORIZED VEHICLES	TOTAL VEHICLES	TOTAL PCU's
	2-WHEELER	AUTO	CAR	BUS	TRUCK	AGRI. TRACTOR & TRAILER			
Zirakpur-pinjore	3491	165	5736	488	2534	114	137	12666	16141
Pinjore-Zirakpur	3503	167	5680	498	2521	122	142	12623	16138
Both directions	6994	322	11416	986	5055	236	279	25290	32279

3.2 TRAFFIC COMPOSITION AT NH-22

TABLE 3.3: Traffic composition

LOCATION	MOTORIZED VEHICLES						NON-MOTORIZED VEHICLES	TOTAL VEHICLES
	2-WHEELER	AUTO	CAR	BUS	TRUCK	AGRI. TRACTOR & TRAILER		
Surajpur (53Km on NH-22)	27.7	1.3	45.1	3.9	20	0.9	1.1	100



3.3 **PEAK HOUR TRAFFIC**

The observed peak hour traffic volume in the vehicles and PCUs are presented in Table. The peak hour traffic was observed between 18.00 hours and 19.00 hours on NH-22. It was observed to be 1804 vehicles (2111PCUs),which is 7.13% of ADT. Figure shows the hourly traffic variation of traffic for the project road section

Peak Hour Traffic on NH-22 (%)

TABLE 3.4: Peak Hour Traffic

Location	Peak Hour Traffic		Peak Hour Trafic ADT (%)		Peak Hour Traffic
	Vehicles	PCUs	Vehicles	PCUs	
Surajpur(53 Km on NH-22)	1804	2111	7.13	6.54	18.00 - 19.00

3.4 **TOLL EXEMPTED VEHICLES**

Toll exempted vehicles which include government, military, ambulance, fire vehicles etc. were counted separately to estimate their amount in total traffic volume. These vehicles are to be deducted from the total toll able traffic for estimation of toll revenue .The estimated percentage of toll exempted vehicles in total toll able traffic are presented in table. The total toll exempted vehicles were observed to be very low and were found to be 1.0% only.

Table 3.5: Toll Exempted Vehicles in Zirakpur-Pinjore Section (%)

Car/Jeep/Van	Buses	LCV	2/3-Axle	MAV	Total
0.8	2.5	0.6	1.2	0.0	1.0

3.5 **Annual Average Daily Traffic (AADT)**

To estimate seasonal variation of a traffic over an year, past traffic data was collected for DPR Study. Section wise seasonality factors were determined from the analysis of the past traffic Data collected from PWD of Punjab. PWD usually conducts traffic count in two seasons in a year. Seasonality factor for current study was taken as the proportion of the average daily traffic (average of traffic in both season) .

TABLE 3.6: SEASONALITY FACTOR

Two-Wheeler	Car/Jeep	Buses	Trucks	Slow Vehicles
0.99	1.01	0.99	0.99	0.96

TABLE 3.7: AADT

SECTION	MOTORIZED VEHICLES						NON-MOTORIZED	TOTAL VEHICLES	TOTAL PCU's
	2-WHEELER	AUTO	CAR	BUS	TRUCK	AGRI. TRACTOR			
Zirakpur-pinjore	3456	167	5794	483	2509	110	132	12650	16079
Pinjore-Zirakpur	3468	158	5736	493	2496	117	137	12606	16073
Both directions	6924	325	11530	976	5005	227	269	25256	32153

4 TRAVEL CHARACTERISTICS

In absence of Origin-Destination surveys in the present scope of work, travel characteristics along NH-22 were taken from earlier DPR study. Origin-Destination survey was conducted in 2006 at chandimandir on Zirakpur-Pinjore section. The survey was conducted for 24 hours on a normal working day simultaneously along with traffic volume count. Roadside interview method was adopted for the survey.

Origin-Destination matrices developed from the survey data were analysed to find out the travel pattern of vehicles on project road sections. The region-wise distribution of trips observed was presented in Table.

Table 4.1: Region-wise Distribution of Trips at Chandimandir in 2006

S.NO.	Area/resion	Trips(%)
1	Chandigarh	22.3
2	Punjab	7.1
3	Haryana	43.5
4	Himachal Pradesh	23.6
5	Jammu & Kashmir	0
6	Delhi	2.8
7	Rajasthan	0.1
8	Uttar Pradesh	0.3
9	South, Central and eastern India	0.3
	Total	100

As observed from the table, on National Highway 22 at Chandimandir about 22.3% of total trips are generating/destining from Chandigarh, 43.5% trips are from Haryana and 23.6% are from Himachal Pradesh . About 7% of trips are from Punjab state.

Travel pattern of vehicles are further analysed to assess the amount of traffic using the different sections of the project road. This information has been used in estimation of tollable traffic , local traffic and for deciding the toll plaza location. The OD data also used for estimation of traffic on proposed bypass from Pinjore to Parwanoo.

5 TRAFFIC FORECAST

Past growth economy for the state of Punjab was analysed ,its past performance and its perspective growth. Traffic growth rates were estimated based on the available data about the economic indicators for the state in year 2000.

The perspective growth rates for NSDP and main economic sectors of agriculture and industry had been studied again in year 2006 based on the recent information for the state to update the traffic growth rates.

ECONOMIC INDICATORS:

Example:

-NSDP (**Net State Domestic Product)**

-AGRICULTURE AND INDUSTRY SECTOR

5.1 Traffic Growth Estimation by Transport Demand elasticity Method:

The exercise of traffic growth rate estimation has been carried out by us using the elasticity approach. The elasticity method relates traffic growth to changes in the related economic parameters. According to IRC-108-1996, elasticity based econometric model for highway projects could be derived in the following form:

$$\text{Log e (P)} = A0 + A1 \text{ Log e (EI)}$$

Where:

- P = Traffic volume (of any vehicle type)
- EI = Economic Indicator

  (GDP/NSDP/Population/PCI)
- A0 = Regression constant;
- A1 = Regression co-efficient (Elasticity Index)

TABLE 5.1: ELASTICITY VALUES FOR THE STATE OF PUNJAB

Mode	Variable	Elasticity	R square	CAAGR (Vehicle Registration)
Two Wheelers	Per Capita Income	2.86	0.80	11.10%
Cars	Per Capita Income	1.48	0.97	10.91%
Buses	Per Capita Income	1.45	0.75	11.62%
Goods	NSDP	1.23	0.97	11.22%
Auto Rickshaw	Per Capita Income	0.84	0.7	8.27%

TABLE 5.2: ELASTICITY VALUES FOR FUTURE YEARS FOR THE STATE OF PUNJAB

PERIOD	DEMAND ELASTICITY			
	CAR	BUS	TRUCK	2-WHEELER
PAST	2.38	4.2	1	1.8
UPTO 2010	1.2	1.54	1	1.8
2011-2015	1.1	1.4	1	1.7
2016-2020	1	1.4	1	1.5
2021-2025	1	1.3	1	1.5
2026-2030	1	1.2	1	1.4

Goods Vehicles:

Growth Rate for Goods Vehicles = Elasticity Value * NSDP Growth Rate

The growth rates for passenger vehicles have been computed by multiplying the growth rate in state economy with transport demand elasticity by vehicle type in case of freight vehicles growth rates have been computed by multiplying the combined growth rate of agriculture and industrial sectors with transport demand elasticity for freight vehicles.

The slow moving vehicles essentially cater to short haul traffic, meeting localized demand for transportation of passengers and goods from rural areas in up country to the nearest market town and urban centres. These are gradually being replaced by motorized vehicles. The slow moving traffic is not expected to have high growth rates on highways. As such, slow moving traffic of animal drawn vehicles and cycle rickshaws is likely to be phased out from the project road by a negative growth rate of 2 percent per annum. However, the cycles and agricultural tractors are likely to increase by 2 percent per annum. This would be on account of both recreational (including social) and work trips.

5.2 TRAFFIC ESTIMATION USING GROWTH RATES

TABLE 5.3: Future estimation of AADT of Cars along with respective growth rates

	AADT	
Year	Cars	growth rate (%)
2006	10753	9.5
2007	11774.54	9.5
2008	12893.12	9.5
2009	14117.96	9.5
2010	15459.17	9.1
2011	16865.95	9.1
2012	18400.75	9.1
2013	20075.22	9.1
2014	21902.07	9.1
2015	23895.16	8.4
2016	25902.35	8.4
2017	28078.15	8.4
2018	30436.71	8.4
2019	32993.39	8.4
2020	35764.84	7.2
2021	38339.91	7.2
2022	41100.38	7.2
2023	44059.61	7.2
2024	47231.9	7.2
2025	50632.6	6.6
2026	53974.35	6.6
2027	57536.66	6.6
2028	61334.08	6.6

TABLE 5.4: Future estimation of AADT of Bus along with respective growth rates

	AADT	
Year	Bus	growth rate (%)
2006	976	6.2
2007	1036.512	6.2
2008	1100.776	6.2
2009	1169.024	6.2
2010	1241.503	6.5
2011	1322.201	6.5
2012	1408.144	6.5
2013	1499.673	6.5
2014	1597.152	6.5
2015	1700.967	6
2016	1803.025	6
2017	1911.207	6
2018	2025.879	6
2019	2147.432	6
2020	2276.278	5.5
2021	2412.854	5.5
2022	2557.626	5.5
2023	2711.083	5.5
2024	2873.748	5.5
2025	3046.173	5.5
2026	3228.943	5.5
2027	3422.68	5.5
2028	3628.041	5.5

TABLE 5.5: Future estimation of AADT of Truck along with respective growth rates

	AADT	
Year	Truck	growth rate (%)
2006	3160	5.8
2007	3343.28	5.8
2008	3537.19	5.8
2009	3742.347	5.8
2010	3959.403	6
2011	4196.968	6
2012	4440.392	6
2013	4697.934	6
2014	4970.415	6
2015	5258.699	5.3
2016	5537.41	5.3
2017	5886.398	5.3
2018	6227.809	5.3
2019	6589.022	5.3
2020	4189.049	4.5
2021	4377.556	4.5
2022	4574.546	4.5
2023	4780.401	4.5
2024	4995.519	4.5
2025	5220.317	4.2
2026	5439.57	4.2
2027	5668.032	4.2
2028	5906.09	4.2

TABLE 5.6: Future estimation of AADT of LCVs along with respective growth rates

	AADT	
Year	LCVs	growth rate (%)
2006	1557	5.7
2007	1645.749	5.7
2008	1739.556693	5.7
2009	1838.711425	6.6
2010	1960.066379	6.6
2011	2089.43076	6.6
2012	2227.33319	5.9
2013	2358.745848	5.9
2014	2497.911853	5.9
2015	2645.288652	5.9
2016	2801.360683	5.2
2017	2947.031438	5.2
2018	3100.277073	5.2
2019	3261.491481	5.2
2020	3431.089038	5.2
2021	3609.505668	4.5
2022	3771.933423	4.5
2023	3941.67	4.5
2024	4119.04515	4.5
2025	4304.403	4.5
2026	4485.118	4.2
2027	4673.492956	4.2
2028	4869.77966	4.2

TABLE 5.7: Future estimation of AADT of MAVs

	AADT	
Year	**MAVs**	**growth rate (%)**
2006	**358**	**5.8**
2007	**378.764**	**5.8**
2008	**400.732312**	**5.8**
2009	**423.9747861**	**6.4**
2010	**451.1091724**	**7**
2011	**482.6868145**	**6**
2012	**511.6480233**	**6**
2013	**542.3469047**	**6**
2014	**574.887719**	**5.8**
2015	**608.2312067**	**6**
2016	**644.7250791**	**5.2**
2017	**678.2507833**	**5.2**
2018	**713.519824**	**5.2**
2019	**750.6228548**	**5.2**
2020	**789.6552433**	**5.2**
2021	**830.7173159**	**4.5**
2022	**868.0995951**	**4.5**
2023	**907.1640769**	**4.5**
2024	**947.9864604**	**4.5**
2025	**990.6458511**	**4.5**
2026	**1035.224914**	**4.2**
2027	**1078.704361**	**4.2**
2028	**1124.009944**	**4.5**

5.3 TOLL TRAFFIC PER YEAR

TABLE 5.8: **Car Traffic Estimation**

		AADT	
S. No.	Year	Car	Total no of vehicles per year
1	2009	14117.96	
2	2010	15459.17	
3	2011	16865.95	
4	2012	18400.75	7021864.525
5	2013	20075.22	7660906.525
6	2014	21902.35	8358045.575
7	2015	23895.16	9088045.575
8	2016	25902.35	9851441.25
9	2017	28078.15	10678961.95
10	2018	30436.71	11575993.25
11	2019	32993.39	12548376.98
12	2020	35764.84	13524116.88
13	2021	38339.91	15037912.4
14	2022	41100.38	15541698.18
15	2023	44059.61	16660700.58
16	2024	47231.9	17860271.25
17	2025	50632.6	19090768.38
18	2026	53974.35	20350759.33
19	2027	57536.66	21693910.05
20	2028	61334.08	23037065

TABLE 5.9: Truck/Bus Traffic Estimation

S.no	Year	Truck/Bus	Total no of vehicles per year
1	2009	4898.211	
2	2010	5182.307	
3	2011	5492.912	
4	2012	5814.447	2184320.6
5	2013	6154.433	2312044.503
6	2014	6514.304	2447238.313
7	2015	6895.221	2583449.743
8	2016	7260.668	2730502.22
9	2017	7700.988	2890719.7
10	2018	8138.572	3054982.11
11	2019	8601.056	2720851.803
12	2020	6307.721	2357213.435
13	2021	6608.517	2469638.363
14	2022	6923.748	2589284.268
15	2023	7264.111	2712761.578
16	2024	7600.336	2840343.313
17	2025	7963.189	2973108.048
18	2026	8327.814	3109282.978
19	2027	8709.353	3251776.605
20	2028	9108.601	3388270

TABLE 5.10: LCVs Traffic Estimation

S. No.	Year	LCV	Total no of vehicles per year
1	2009	1838.711	
2	2010	1960.066	
3	2011	2089.431	
4	2012	2227.333	836962.7025
5	2013	2358.764	886182.5875
6	2014	2497.031	938473.4
7	2015	2645.289	994013.625
8	2016	2801.361	1049081.54
9	2017	2947.031	1103633.71
10	2018	3100.277	1161022.66
11	2019	3261.491	1221395.85
12	2020	3431.089	1284908.588
13	2021	3609.506	1347112.618
14	2022	3771.933	1407732.548
15	2023	3941.67	1471080.67
16	2024	4119.046	1537279.443
17	2025	4304.403	1604100.358
18	2026	4485.188	1671472.423
19	2027	4673.565	1741660.463
20	2028	4869.78	1812198

TABLE 5.11: Multi axle vehicle Traffic Estimation

S. No.	Year	Multi axle vehicle(>2 axles)	Total no of vehicles per year
1	2009	423.974	
2	2010	451.109	
3	2011	482.686	
4	2012	511.648	192353.905
5	2013	542.346	203895.0225
6	2014	574.887	215919.035
7	2015	608.231	228664.47
8	2016	644.725	241442.9375
9	2017	678.25	253997.8425
10	2018	713.519	267205.7325
11	2019	750.622	281100.5525
12	2020	789.655	295717.89
13	2021	830.717	310033.92
14	2022	868.099	323985.4975
15	2023	907.164	338564.875
16	2024	947.986	353800.1575
17	2025	990.645	369721.275
18	2026	1035.225	385792.0425
19	2027	1078.704	401995.305
20	2028	1124.01	418213

6 REVENUE & EXPENSES

6.1 REVENUE BEING GENERATED BY THE TOLL

TABLE 6.1: Revenue collected from Cars

		AADT	Total no of vehicles per year		REVENUE (Rs.)
S. No.	Year	Car		Toll rate	
1	2009	14117.96			
2	2010	15459.17			
3	2011	16865.95			
4	2012	18400.75	7021864.525	21	147459155
5	2013	20075.22	7660906.525	23.5	180031303.3
6	2014	21902.35	8358045.575	26	217309185
7	2015	23895.16	9088045.575	28.5	259009298.9
8	2016	25902.35	9851441.25	31	305394678.8
9	2017	28078.15	10678961.95	33.5	357745225.3
10	2018	30436.71	11575993.25	36	416735757
11	2019	32993.39	12548376.98	38.5	483112513.5
12	2020	35764.84	13524116.88	41	554488791.9
13	2021	38339.91	15037912.4	43.5	654149189.4
14	2022	41100.38	15541698.18	46	714918116.1
15	2023	44059.61	16660700.58	48.5	808043977.9
16	2024	47231.9	17860271.25	51	910873833.8
17	2025	50632.6	19090768.38	53.5	1021356108
18	2026	53974.35	20350759.33	56	1139642522
19	2027	57536.66	21693910.05	58.5	1269093738
20	2028	61334.08	23037065	61	1405260965
				TOTAL=	10844624359

TABLE 6.2: Revenue collected from Truck/Bus

S. no	Year	Truck/bus	Total no of vehicles per year	Toll rate	Revenue(Rs.)
1	2009	4898.211			
2	2010	5182.307			
3	2011	5492.912			
4	2012	5814.447	2184320.6	82	179114289
5	2013	6154.433	2312044.503	87	201147872
6	2014	6514.304	2447238.313	92	225145925
7	2015	6895.221	2583449.743	97	250594625
8	2016	7260.668	2730502.22	102	278511226
9	2017	7700.988	2890719.7	107	309307008
10	2018	8138.572	3054982.11	112	342157996
11	2019	8601.056	2720851.803	117	318339661
12	2020	6307.721	2357213.435	122	287580039
13	2021	6608.517	2469638.363	127	313644072
14	2022	6923.748	2589284.268	132	341785523
15	2023	7264.111	2712761.578	137	371648336
16	2024	7600.336	2840343.313	142	403328750
17	2025	7963.189	2973108.048	147	437046883
18	2026	8327.814	3109282.978	152	472611013
19	2027	8709.353	3251776.605	157	510528927
20	2028	9108.601	3388270	162	548899740
				TOTAL=	5791391886

TABLE 6.3: Revenue collected from LCVs

s. no.	year	LCV	total no of vehicles per year	toll rate	REVENUE(Rs.)
1	2009	1838.711			
2	2010	1960.066			
3	2011	2089.431			
4	2012	2227.333	836962.7025	39	32641545.4
5	2013	2358.764	886182.5875	42.5	37662760
6	2014	2497.031	938473.4	46	43169776.4
7	2015	2645.289	994013.625	49.5	49203674.4
8	2016	2801.361	1049081.54	53	55601321.6
9	2017	2947.031	1103633.71	56.5	62355304.6
10	2018	3100.277	1161022.66	60	69661359.6
11	2019	3261.491	1221395.85	63.5	77558636.5
12	2020	3431.089	1284908.588	67	86088875.4
13	2021	3609.506	1347112.618	70.5	94971439.5
14	2022	3771.933	1407732.548	74	104172209
15	2023	3941.67	1471080.67	77.5	114008752
16	2024	4119.046	1537279.443	81	124519635
17	2025	4304.403	1604100.358	84.5	135546480
18	2026	4485.188	1671472.423	88	147089573
19	2027	4673.565	1741660.463	91.5	159361932
20	2028	4869.78	1812198	95	172158810
				TOTAL=	1565772084

TABLE 6.4: Revenue collected from MAVs

S.No.	Year	Multi axle vehicle(>2 axles)	Total no of vehicles per year	Toll rate	Revenue(Rs.)
1	2009	423.974			
2	2010	451.109			
3	2011	482.686			
4	2012	511.648	192353.905	132	25390715.5
5	2013	542.346	203895.0225	140	28545303.2
6	2014	574.887	215919.035	148	31956017.2
7	2015	608.231	228664.47	156	35671657.3
8	2016	644.725	241442.9375	164	39596641.8
9	2017	678.25	253997.8425	172	43687628.9
10	2018	713.519	267205.7325	180	48097031.9
11	2019	750.622	281100.5525	188	52846903.9
12	2020	789.655	295717.89	196	57960706.4
13	2021	830.717	310033.92	204	63246919.7
14	2022	868.099	323985.4975	212	68684925.5
15	2023	907.164	338564.875	220	74484272.5
16	2024	947.986	353800.1575	228	80666435.9
17	2025	990.645	369721.275	236	87254220.9
18	2026	1035.225	385792.0425	244	94133258.4
19	2027	1078.704	401995.305	252	101302817
20	2028	1124.01	418213	260	108735380
				TOTAL=	1042260836

6.2 EXPENSES

TABLE 6.5: SALARY

S.NO	PARTICULARS		TOTAL STAFF	COST/YEAR
1	Supervisor		3	
2	Accounts		2	
3	Toll Collector		27	
4	Helpers at Tollbooth		28	
5	Peon		4	
6	Security		24	
			TOTAL=	3.6crore(approx.)

TABLE 6.6: ELECTRICITY

S..NO	PARTICULARS		CONSUMPTION PER MONTH	COST/YEAR
			(KWHR)	
1	Toll Plaza		2436.2	
2	Tolling system		26438.7	
3	Toll Plaza Building		8930	
4	Lighting at Toll Plaza area			
5	Highmast Light		7200	
6	Sodium Vapour lamps		5410	
			TOTAL=	1.2 Cr (approx.)

TABLE 6.7: OTHERS

S.NO	PARTICULARS		UNIT	COST/YEAR
1	Spare Parts			
(A)	Electronics items		@ 15% of equipment cost per year	
(B)	Others		@ 7% of equipment cost per year	
2	Telephone & Communication		Lumpsum	
3	Stationary		Lumpsum	
4	Miscellaneous items		Lumpsum	
			TOTAL=	80-90 lakh (approx.)

Other than these expenses the road has to be repaired and resurfaced with bituminous concrete material of about 80mm thick layer.

This procedure costs about **5 crore per year** and is done in every 5 years and costs upto **25-30 crore .**

JAYPEE GROUP has put in 1304 crore (approx.) up till date.

7 CONCLUSIONS

JAYPEE GROUP has spent nearly 1304 crore rs up till date. After all the calculations done we estimated that Jaypee Group will be spending 1500 crore rs by the end of 2028 (end of project handling duration).

Till date jaypee Group is going through a loss of 2.5 crore per month as said by a Jaypee official. But by the end of the project time (year 2028) the company will earn 1930 crore with a net profit of nearly 430 crore.

Source: jaypee head office

Source : jaypee head office

REFERENCES

www.blog.minitab.com

www.indiastat.com

JAYPEE HEAD OFFICE ,NOIDA

BUDH INTERNATIONAL CURCUIT , GREATER NOIDA

HIMALYAN EXPRESSWAY TOLL OFFICE