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FUTURE TRIP DISTRIBUTION FOR AHMEDABAD WEST ZONE

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Abstract- **The Trip Distribution is the most complex and also important model in the urban transportation planning process. This paper gives a Flow of the framework to calibrate a doubly constrained gravity model of the trip distribution stage for the West Zone - Ahmedabad area based on a Household Information Survey (HIS) and Cordon Line Survey (CLS) which is carried out in 2016-2017. Samples are used for the calibration of gravity model. Calibration is carried out for different trip purposes like home, Service, Business etc. trips using Trans CAD software.**

Keywords- *Trip Distribution, Gravity Model, Future Trips, Calibration of Gravity Model*

I. INTRODUCTION

Transportation engineering is the application of scientific principles to the planning, design, operation and management of transportation system. The transportation System in the reference to society as a whole because it provides a service for the movements of goods and people from place to place. Population growth and Economic growth seems to have generated levels of demand exceeding the capacity of most transport facilities. Due to the continuing expansion of cities with the development of societies and technology the existing transportation systems are not sufficient to meet the increasing demands. To provide the free and safe flow of traffic from one place to another without encountering any congestion problem, it might be necessary to improve the existing transportation facilities or to construct new facilities. Transportation Planning Process plays an important role in construction of new transport facilities. The basic purpose of transportation planning and management is to match transportation supply with travel demand. For any city like Ahmedabad which already facing the problem of Traffic it is very much important to know about Future Traffic Conditions.

II. LITERATURE REVIEW

Study done by Abdel et al in Alexandria (2014) serves as a framework for calibrating a gravity model for the purpose of analyzing the travel behaviour for different purposes... The proposed model demonstrates the different patterns of trip distribution per purpose. It also shows a considerable shift toward non-compulsory trip purposes in the city of Alexandria. Also, the value for dispersion parameter ranges between 0.12-0.14.

Study done by Zala K in (2013) describe the calibration of a gravity model for various trip purposes like business, service and home and also for the same, the value for the deterrence functions ranges between 1 to 3 depending upon travel factors.

Study done by Guler in Turkey (2014) aims to calculate the transportation demand of the Marmaray corridor. The model was used to estimate freight and passenger transportation between Istanbul and other Turkish provinces. The estimated results were used to calculate the required train numbers on a daily basis through the Marmaray corridor and some suggestions were put forward to increase the capacity of this corridor.

Study done by Jin & Yang (2014) shows that LBSN (Location based social networking) has increased in popularity and sophistication, emerging as a new travel demand data source. Users of LBSN provide location sensitive data interactively via mobile devices, including smartphones and tablets. This data has the potential to provide origin-destination estimates. The proposed methodology is calibrated and comparatively evaluated against the OD matrix generated by gravity model based method as well as a reference matrix from the local metropolitan planning organization. The results of this method illustrate significant improvement in reducing the OD estimation errors caused by the sampling bias from the gravity model based method.

III. STUDY AREA

The study was carried out on West Zone of Ahmedabad, Gujarat. West Ahmedabad is separated from the other parts of the city by Sabarmati River. There are plenty of residential colonies located in this region. The place also boasts of housing some reputed colleges, which are world renowned. The region also flaunts good network of roads. Sardar Patel Stadium is housed here. This part of Ahmedabad is primarily a residential region with prominent educational institutes. Total area of West Ahmedabad is 59.68 sqkm.

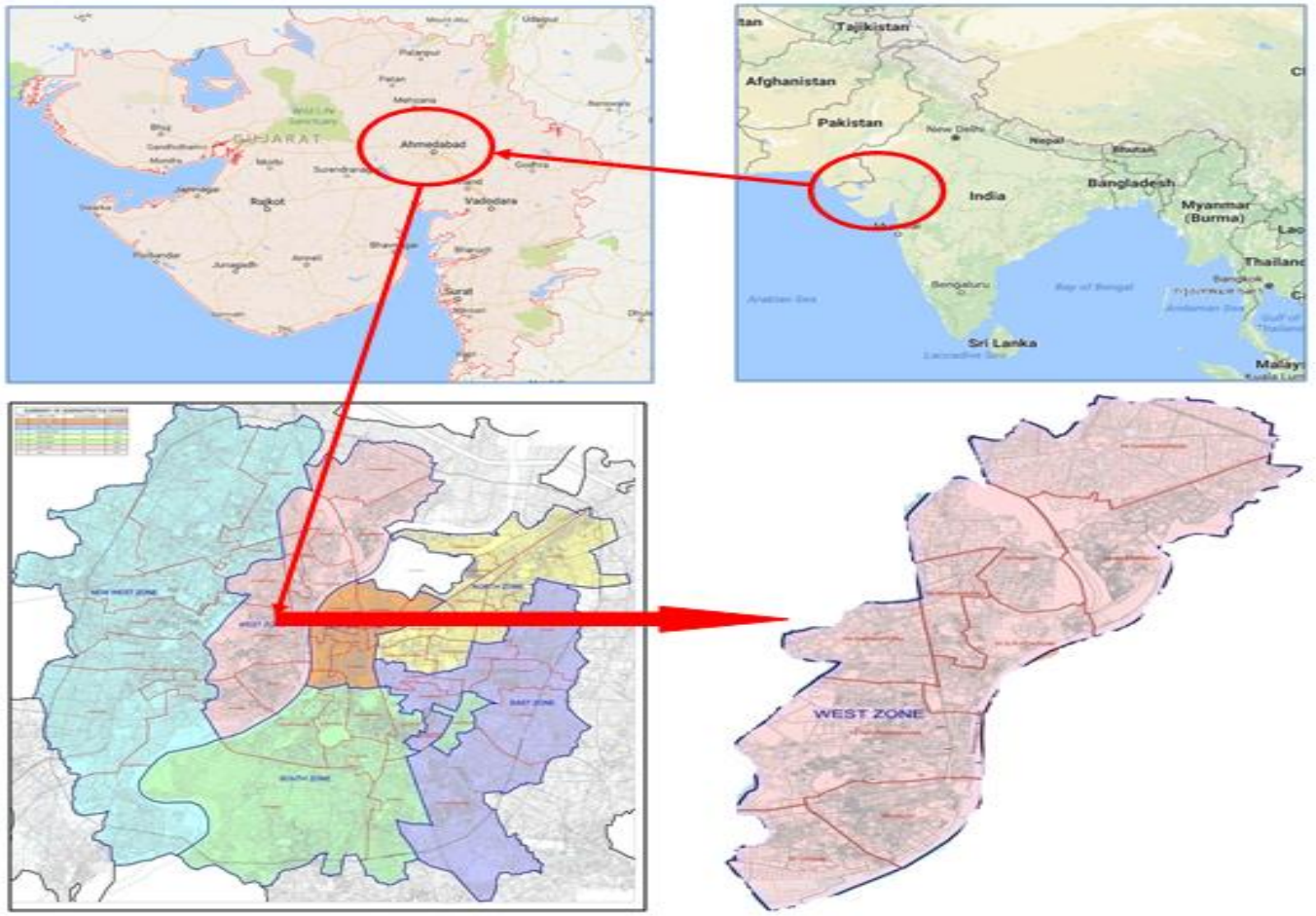
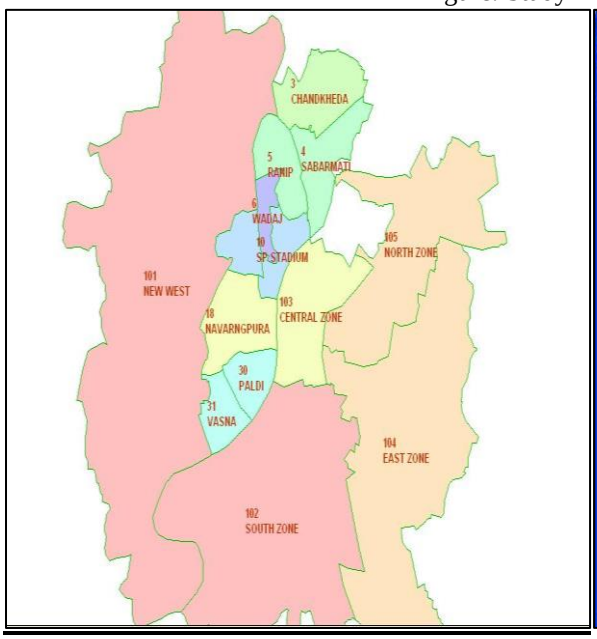


Figure: Study Area Ahmedabad West Zone



Dataview1 - New Layer

ID	Area	[Sr No]	[Zone No]	Population	[Male Population]	[Female Population]	[No of HH]	[Zone Name]
1	0.04	1	3	149461	81477	67984	31532	CHANDKHEDA
2	0.03	2	4	111873	61124	50749	23617	SABARMATI
3	0.03	3	5	118599	68160	50439	25021	RANIP
4	0.01	4	6	100151	58091	42060	21129	WADAJ
5	0.02	5	9	128368	71021	57347	27082	NARANPURA
6	0.02	6	10	79371	46633	32738	16745	SP STADIUM
7	0.04	7	18	139986	79891	60095	29553	NAVARNGPURA
8	0.02	8	30	100668	57401	43267	21338	PALDI
9	0.02	9	31	183281	101269	82012	38667	VASNA
10	0.06	10	103	505668	290400	215268	106681	CENTRAL ZONE
11	0.14	11	105	600676	350271	250271	126725	NORTH ZONE
12	0.27	12	104	837050	495230	341820	176593	EAST ZONE
13	0.30	13	102	1046032	597619	448413	220682	SOUTH ZONE
14	0.53	14	101	1491166	834699	656467	314592	NEW WEST

Figure: Study Area Details Ahmedabad West Zone

IV. DATA COLLECTION AND ANALYSIS

Data Collected in the 2 phases one as the House Hold Interview Survey (HIS) and Second Phase is Cordon Line Survey (CLS). 1578 House Hold Surveyed During HIS and 1450 Survey Conducted at the Different Entries of Ahmedabad West Zone.

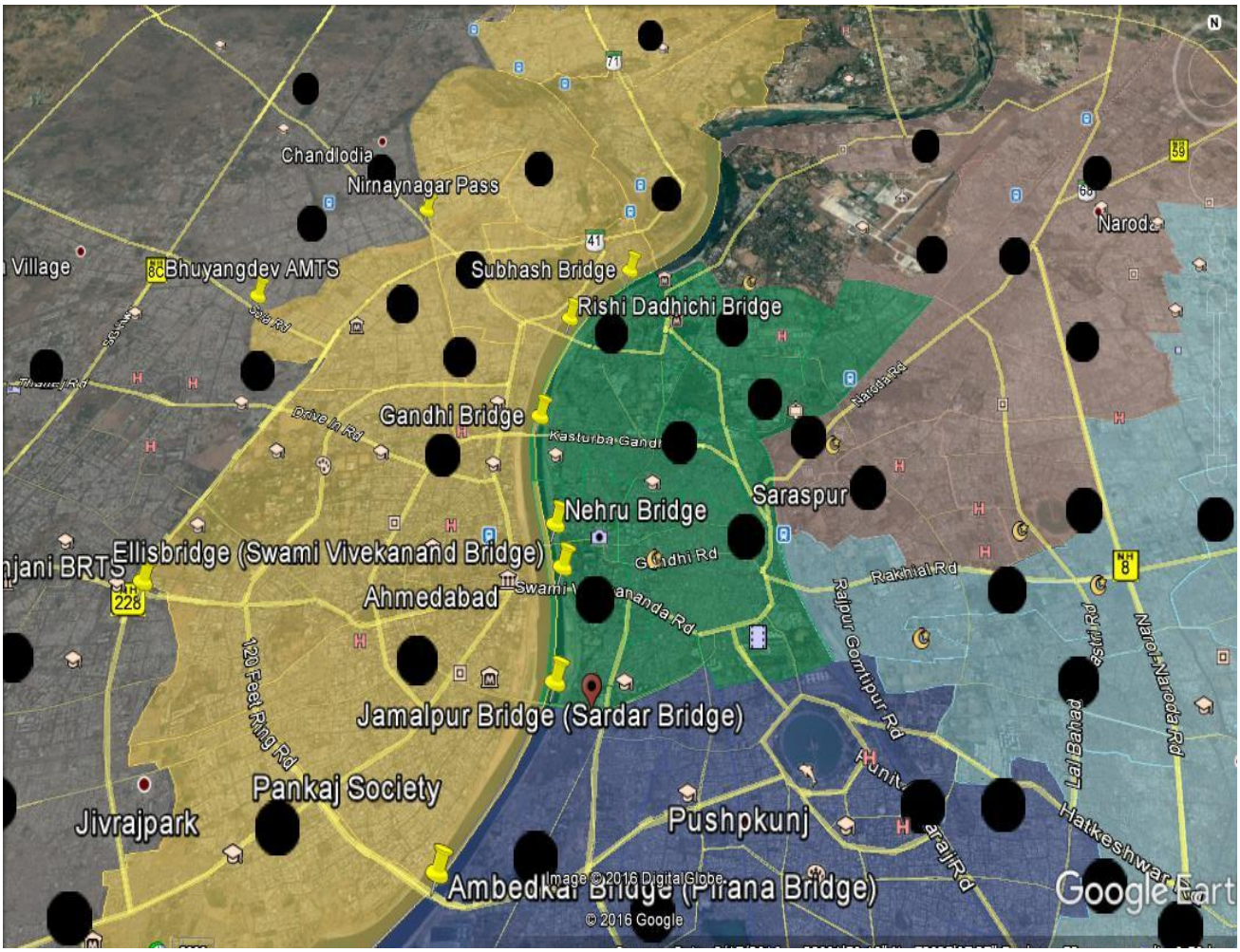


Figure: Survey Points and LLocations

Using Home Interview Survey will only Give Internal to Internal and Internal to External Trips but there is the another big amount of Trip Originate from other Zone rather than West Zone i.e. New West Zone, Central Zone, South Zone, East Zone and North Zone. It observed that Boundary Sharing Zone like Central Zone, New West Zone and South Zone Contributed higher External to Internal Trip for West Zone.

There are 7 entrance points by which All traffic can flow inwards West Zone from South Zone, Central Zone, North Zone and East Zone. As the West Zone has natural Cordon Line as the Sabarmati River from North, East, Central and South Zone and from New West Zone Separated form Road Network.
There are only and only 7 entrances to West Zone from the North, East, South and Central Zone and they all are:
1) Ambedkar Bridge (Chandranagar Bridge), **2) Sardar Bridge** (Jamalpur Bridge), **3) Ellis Bridge** (Swami Vivekanand Bridge), **4) Nehru Bridge**, **5) Gandhi Bridge**, **6) Rishi Dadhichi Bridge, 7) Subhash Bridge.**

There are 3 entrances are Selected as they have maximum traffic share from New West Zone and they are:
1) Nirnayanagar Under Pass (Easy Access to Ranip, Chandkheda and Sabarmati) **2) Bhuyangdev BRTS-AMTS** (Easy Access to Vadaj, Naranpura and S.P. Stadium) **3) Shivranjani BRTS** (Easy Access to Vasna, Paldi, Navarangpura and S.P.Stadium)

Primary O-D Matrix where generated in the SPSS Statistical 17.0 after that same will be prepared in TransCAD. Expanded Matrix and Future OD Matrix where found with help of Current OD Matrix and Expand Factors with help of current and future Population. After Preparing all 3 OD Matrix Prepare Desire Line Diagram in TransCAD for Current and Future.

TransCAD

File Edit Map Dataview Selection Matrix Layout Tools Procedures Networks/Paths Route Systems Planning Transit Routing/Logistics Statistics Window Help

Matrix 1

OD_Current.mtx - OD_Current (Matrix 1)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	371.00	134.00	69.00	40.00	32.00	25.00	16.00	30.00	35.00	28.00	13.00	13.00	31.00	44.00
2	129.00	205.00	52.00	40.00	45.00	44.00	41.00	29.00	30.00	57.00	4.00	14.00	29.00	61.00
3	67.00	53.00	160.00	84.00	72.00	43.00	37.00	38.00	24.00	47.00	2.00	8.00	25.00	51.00
4	40.00	41.00	87.00	151.00	70.00	38.00	47.00	35.00	39.00	41.00	4.00	13.00	37.00	56.00
5	32.00	47.00	69.00	74.00	121.00	111.00	69.00	38.00	32.00	29.00	9.00	13.00	30.00	36.00
6	26.00	45.00	42.00	36.00	110.00	135.00	67.00	62.00	39.00	44.00	15.00	28.00	31.00	33.00
7	17.00	41.00	37.00	47.00	70.00	67.00	146.00	113.00	81.00	52.00	8.00	22.00	48.00	35.00
8	30.00	30.00	38.00	35.00	38.00	59.00	114.00	215.00	112.00	59.00	18.00	35.00	49.00	22.00
9	34.00	32.00	24.00	39.00	32.00	40.00	81.00	109.00	140.00	71.00	10.00	27.00	62.00	16.00
10	61.00	96.00	90.00	75.00	89.00	74.00	123.00	117.00	115.00	2.00	0.00	0.00	0.00	59.00
11	32.00	18.00	15.00	26.00	31.00	29.00	41.00	46.00	38.00	0.00	0.00	0.00	0.00	17.00
12	25.00	28.00	20.00	29.00	39.00	39.00	46.00	66.00	51.00	0.00	0.00	0.00	0.00	20.00
13	54.00	47.00	37.00	56.00	48.00	50.00	92.00	84.00	108.00	2.00	0.00	0.00	1.00	14.00
14	64.00	77.00	74.00	83.00	65.00	47.00	74.00	67.00	48.00	19.00	19.00	29.00	28.00	0.00

Figure: Current OD Matrix

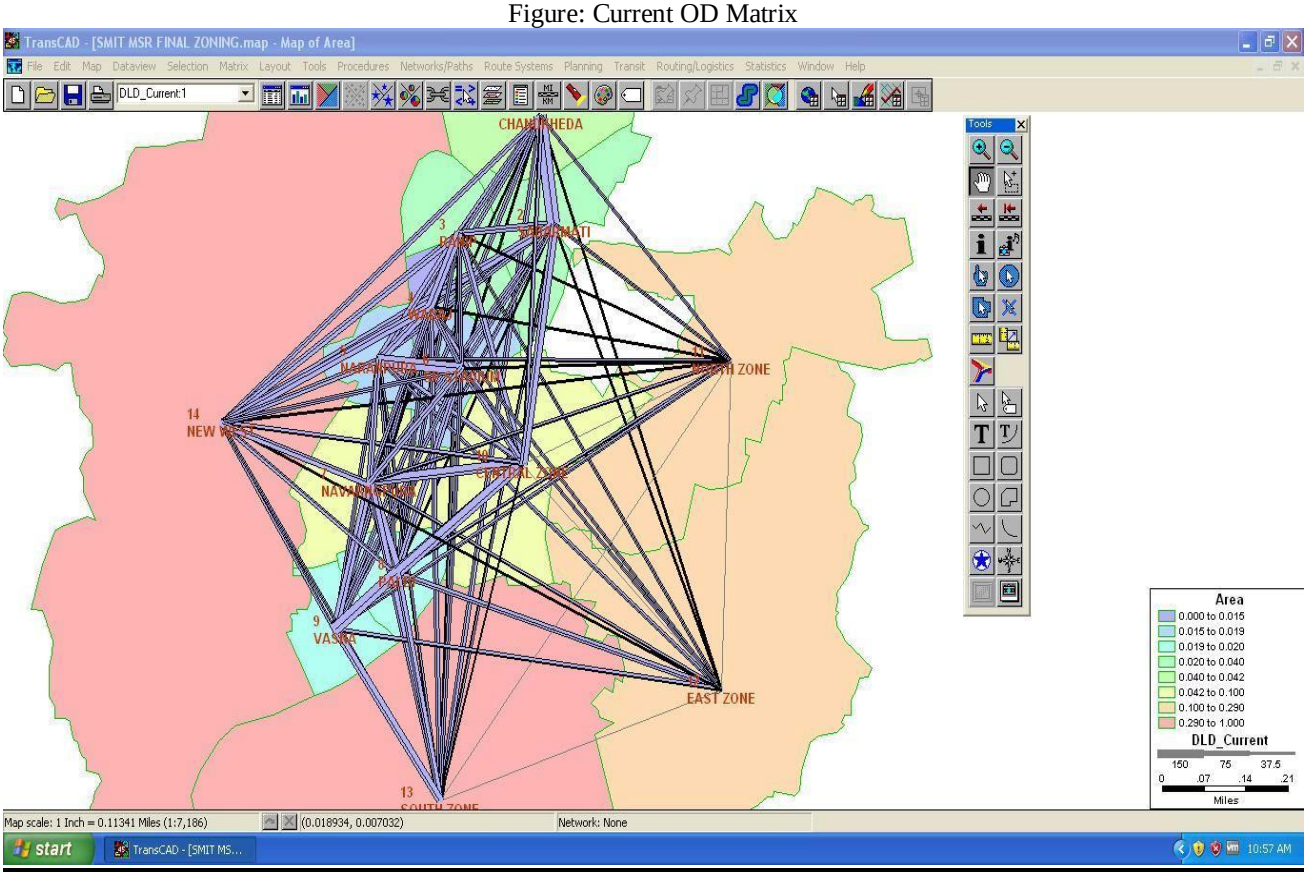


Figure: Current DLD for West Zone Ahmedabad

TransCAD

File Edit Map Dataview Selection Matrix Layout Tools Procedures Networks/Paths Route Systems Planning Transit Routing/Logistics Statistics Window Help

Matrix1 - OD Matrix_Future (Matrix 1)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	110558.00	39932.00	20562.00	11920.00	9536.00	7450.00	4768.00	8940.00	10430.00	8344.00	3874.00	3874.00	9238.00	13112.00
2	38442.00	61090.00	15496.00	11920.00	13410.00	13112.00	12218.00	8642.00	8940.00	16989.00	1192.00	4172.00	8642.00	18178.00
3	19966.00	15794.00	47680.00	25032.00	21456.00	12814.00	11026.00	11324.00	7152.00	14006.00	596.00	2384.00	7450.00	15198.00
4	11920.00	12218.00	25926.00	44998.00	20860.00	11324.00	14006.00	10430.00	11622.00	12218.00	1192.00	3874.00	11026.00	16688.00
5	9536.00	14006.00	20562.00	22052.00	36058.00	33078.00	20562.00	11324.00	9536.00	8642.00	2682.00	3874.00	8940.00	10728.00
6	7748.00	13410.00	12516.00	10728.00	32780.00	40230.00	19966.00	18476.00	11622.00	13112.00	4470.00	8344.00	9238.00	9834.00
7	5066.00	12218.00	11026.00	14006.00	20860.00	19966.00	43508.00	33674.00	24138.00	15496.00	2384.00	6556.00	14304.00	10430.00
8	8640.00	8940.00	11324.00	10430.00	11324.00	17582.00	33972.00	64070.00	33376.00	17582.00	5364.00	10430.00	14602.00	6556.00
9	10132.00	9536.00	7152.00	11622.00	9536.00	11920.00	24138.00	32482.00	41720.00	21158.00	2980.00	8046.00	18476.00	4768.00
10	18178.00	28608.00	26820.00	22350.00	26522.00	22052.00	36654.00	34866.00	34270.00	596.00	0.00	0.00	0.00	17582.00
11	9536.00	5364.00	4470.00	7748.00	9238.00	8642.00	12218.00	13708.00	11324.00	0.00	0.00	0.00	0.00	5066.00
12	7450.00	8344.00	5960.00	8642.00	11622.00	11622.00	13708.00	19668.00	15198.00	0.00	0.00	0.00	0.00	5960.00
13	16092.00	14006.00	11026.00	16688.00	14304.00	14900.00	27416.00	25032.00	32184.00	596.00	0.00	0.00	298.00	4172.00
14	19072.00	22946.00	22052.00	24734.00	19370.00	14006.00	22052.00	19966.00	14304.00	5662.00	5662.00	8642.00	8344.00	0.00

Figure: Screen Shot of OD Matrix Future in TransCAD

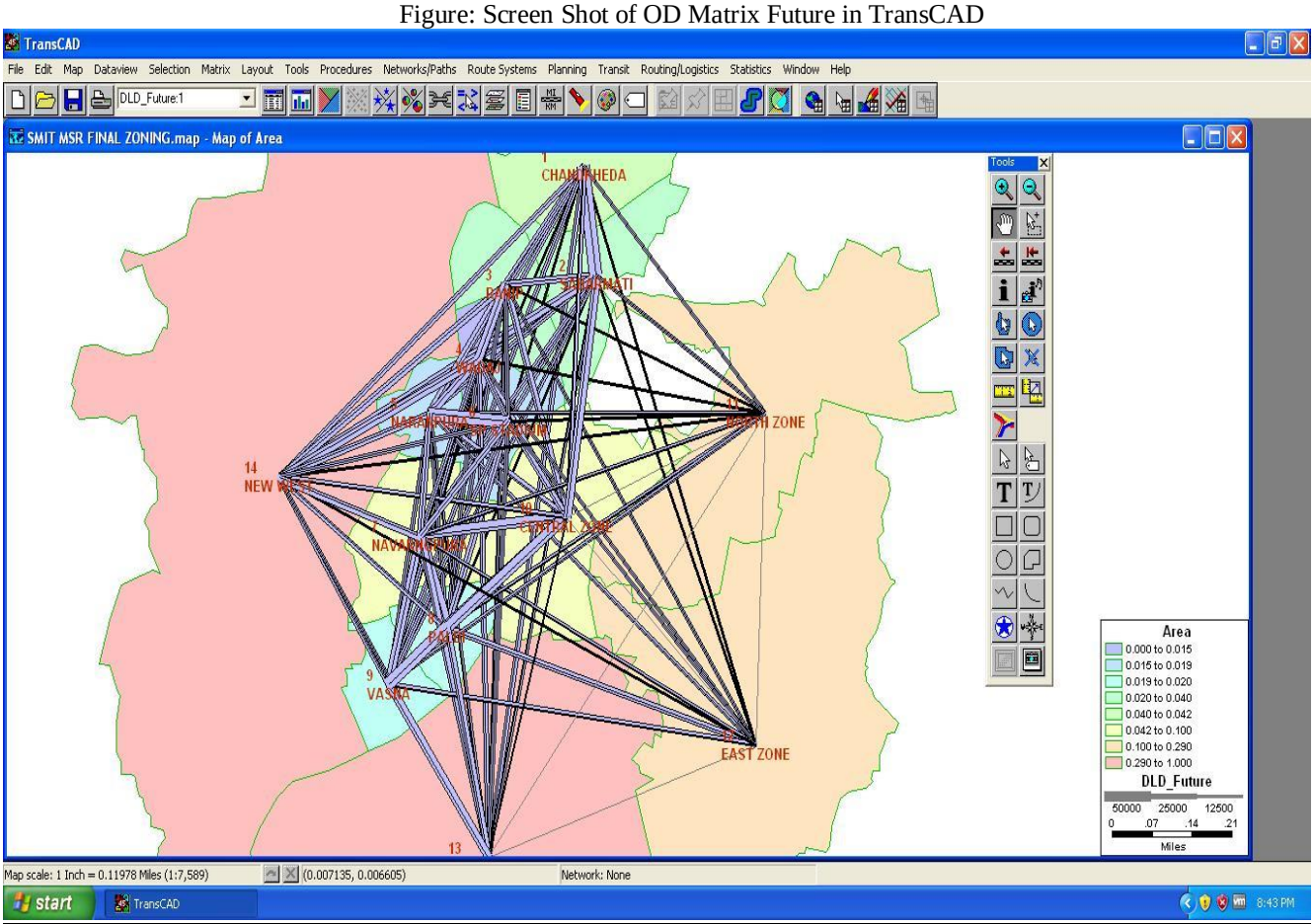


Figure: Screen Shot of DLD Future in TransCAD

After all Model is Calibrated in TransCAD and Trans CAD software is used for calibration of gravity model using Travel Time, Travel Cost and Travel Distance attributes for number of iterations. The calibrated exponent values for educational trips, work trips and shopping trips are as shown in Table.

Table 1: Observed Values - Inverse power function

Purpose	Using Travel Time	Using Travel Cost	Using Distance
Business	2.5577	1.5893	1.6306
Service	2.4033	1.4890	1.5185
Home	3.4096	2.0226	2.0744

V. CONCLUSION

Followings are the major conclusion of the study

1. The population growth rate in the last decade (2001-2011) is 1.48%.
2. The trip rate observed is 5.5 trips/HH/day.
3. The proportion of purpose based trip types is 54.4% Work, 41.6% Educational trips, 0.62% Social trips, 2% Shopping trips, 1.42% Recreational trips.
4. The derived final O-D Matrix can be used for transportation corridor planning.
5. The exponent in inverse power function c for work, Business trips are 2.55, 1.58, 1.63 for Travel Time, Cost and Distance

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