New Jersey's Link to the 21st Century:
Maximizing the Impact of Infrastructure Investment

Working Paper #3:

Available Data and Data Source Description
and
Review of Selected Related Papers

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1. INTRODUCTION

An improvement in the transportation system in a certain area will have an impact on accessibility, which in turn may affect land use, economic development and travel patterns in that region. How large is this impact on each of the above mentioned issues? This can be measured by observing the changes in certain indicators such as population, income level, employment rate, land use patterns, and transportation system characteristics of this region.

Since the main goal of this project is to assess the impact of planned transportation infrastructure investment projects on travel behavior and economic development in New Jersey (see Working Paper No.1), major efforts should be made on collecting land use, demographic, employment and other socioeconomic data. In this report, types and sources of available data for New Jersey are presented.

Working Paper No.1 (page 3) stated that the work to be carried out for the objective " *to describe, quantify and assess the nature and impact of current and proposed transportation infrastructure investments upon accessibility and economic development"*. In the light of this, mainly the following data has been identified:

1. Travel behavior
2. Land use
3. Demographics
4.Income, business establishment, employment data as an indication of economic development

The next section of this report briefly describes the current and proposed infrastructure investment projects relative to the characteristics mentioned in Working Paper No.1 (page3), along with other data requirements.

The third section of this report addresses data issues for this project. Data required is divided into two main categories:
-available data in the existing databases
-data that need to be collected for the purpose of this project.

The third section also describes the data available in the existing databases. During the course of this project we will also develop surveys/questionnaires in order to acquire data that is not available in the existing databases.

In the fourth section, a literature survey has been done to identify papers about the impact of transportation investment on economic growth, land use, accessibility and mobility. Numerous papers were found. Among them, some papers that are closely related to our project are selected and reviewed to find out about the data collected and used in these studies and the model(s) tested using the collected data.

2. DESCRIPTION OF SELECTED CURRENT AND PROPOSED PROJECTS IN NEW JERSEY

In order to evaluate, measure and model the impact of infrastructure investment on economic development, which is the goal of our project, first we need to characterize infrastructure investment projects in terms of money outlay, implementation time, type of project, capacity and location, as stated in the Working Paper No.1.

The list of some selected current and proposed infrastructure investment projects is given below:

1. The Route 35 Cooper's Bridge Replacement Project: The Route 35 Cooper's Bridge over the Navesink River, which connects the Borough of Red Bank with the Township of Middletown, is being replaced with a completely new bridge. Built in 1925, the original bridge has had no major reconstruction and has been determined to be structurally deficient and functionally obsolete. The new structure, designed by the NJDOT and currently under construction, will bridge this gap. Providing a safe, attractive transportation link in Monmouth county, the new Route 35 Cooper's Bridge will feature a design that meets the functional needs of steadily growing vehicular traffic. Equally important, the design meets the aesthetic needs of the distinctive and historic surrounding communities. With field construction underway since July 1998, the new bridge will be open for traffic by July 1, 2000. The cost of construction is $ 17.3 million.

2. The Route 29 Project: This project is designed to alleviate traffic congestion throughout the City of Trenton. Currently, commuters coming into the city on Route 29 from the interstate highways to the north and south use a local street, Lamberton Road. The improvements to Route 29 , the final section of the Trenton Complex that was started in the 1960's, will eliminate that bottleneck and connect the interstate loop around the city. The Route 29 project includes construction of a four-lane highway between the Amtrak Bridge and Route 129 in South Trenton. This project addresses the needs of local residents, commuters and area business and was designed to preserve Trenton's rich historic flavor while enhancing its economic future. The contractor's bid for the project was $ 71 million, although it is expected that environmental remediation work will raise the total cost to about $ 95 million.

3. The Routes 4 and 17 Project: Built in 1932 as a state-of-the-art cloverleaf, the Routes 4 and 17 interchange in Paramus, Bergen County, is a main transportation connector for one of the most densely populated regions in the state. It offers access to Routes 208 and 46, I-287 and I-80, the Garden State Parkway, the New Jersey Turnpike and the George Washington Bridge gateways to New York City, New England and the rest of New Jersey. The interchange also supports bus routes that serve nearly 20,000 regular passengers. Designed to carry 9,000 vehicles during rush hour, the interchange now carries more than 17,000 rush hour vehicles, making it one of the most congested in the state. Beginning in January 1999, this interchange will be totally reconfigured. The project will cost $120 million, funded solely by the Federal Highway Administration.

4. Train Preemption for Traffic Signals: The bidding for this planned project will take place on November 18, 1999. This project will focus on safety and traffic control issues in Bergen, Hudson, Passaic and Union counties. The work is expected to be completed by February 1, 2001. The approximate dollar value of the current cost estimate for the work on the project is $ 1.5 million.

5. The Route I-280 Project: The bidding for this planned project will take place on October 26, 1999. This project includes the construction of noise barriers along Westbound I-280, from Mount Pleasant Street to west of Tulip Avenue in Essex county. The work is expected to be

completed by January 31, 2001. The approximate dollar value of the current cost estimate for the work on the project is $ 3 million.

6. The Routes 9 and 50 Project: The bidding for this planned project will take place on November 16, 1999. This project includes intersection improvements in Cape May county. The work is expected to be completed by June 24, 2000. The approximate dollar value of the current cost estimate for the work on the project is $ 1.5 million.

7. The Route 23 Project: The bidding for this planned project will take place on October 28, 1999. This project includes widening and intersection realignment works in Essex county, from south of Fairview Avenue to north of Commerce Road. The work is expected to be completed by December 13, 2000. The approximate dollar value of the current cost estimate for the work on the project is $ 1.5 million.

8. The Routes 1,9 and 46 Project: The bidding for this planned project will take place on October 28, 1999. This project includes grading, paving and structures from Jones Road to Fletcher Avenue in Bergen county. The work is expected to be completed by June 30, 2001. The approximate dollar value of the current cost estimate for the work on the project is $ 5 million.

9. The Routes 9 and 34 Project: The bidding for this planned project will take place on October 28, 1999. This project includes widening and minor realignment works from south of Perrine to north of Poor Farm Road in Middlesex county. The work is expected to be completed by November 15, 2000. The approximate dollar value of the current cost estimate for the work on the project is $ 3 million.

In the Table 1, a summary of projects described above is presented.

TABLE 1 Description Of Current And Proposed Projects In New Jersey

Project Title	County/City	Municipality	Type Of Work	Construction Cost	Completion Date	Expected Impact
The Route 35 Project	Monmouth	Middletown	Bridge replacement	$ 17.3 million	July 1, 2000	Meet aesthetic and functional needs
The Route 29 Project	Trenton	-	4-lane highway construction	$ 95 million	September 1, 2001	Alleviate traffic congestion
The Routes 4 & 17 Project	Bergen	-	Interchange reconfiguration	$ 120 million	-	Alleviate traffic congestion
Train Preemption for Traffic Signals	Bergen, Hudson, Passaic, Union	Hillside, North Bergen, West Milford	Safety and traffic control	$ 1.5 million	February 1, 2001	Improve safety
The Route I-280 Project	Essex	West Orange	Noise barrier construction	$ 3 million	January 31, 2001	Environmental improvement (alleviate noise)
The Routes 9 and 50 Project	Cape May	Upper	Intersection improvements	$ 1.5 million	June 24, 2000	Alleviate traffic congestion
The Route 23 Project	Essex	Cedar Grove	Widening and intersection realignment	$ 1.5 million	December 13, 2000	Alleviate traffic congestion
The Routes 1,9 and 46 Project	Bergen	Fort Lee	Grading, paving , structures	$ 5 million	June 30, 2001	Meet functional needs
The Routes 9 and 34 Project	Middlesex	Old Bridge	Widening and minor realignment	$ 3 million	November 15, 2000	Alleviate traffic congestion

Source: NJDOT Project Status and Construction Updates

3. DATA AVAILABLE IN EXISTING DATABASES

Available data is described in Table 2 along with their sources.

TABLE 2 Description of the Available Relevant Data for New Jersey

Population	1990 & 1998	http://www.wnjpin.state.nj.us/OneStopCareerCenter/Labor MarketInformation/lmi02/density98.htm	html	By municips
Population by age, race sex and hispanic origin	1990-1997	http://www.wnjpin.state.nj.us/OneStopCareer Center/LaborMarketInformation/Imi02/njarsh97.htm	html	N
Subcounty population estimates	1990-1998	http://www.wnjpin.state.nj.us/OneStopCareerCenter/ LaborMarketInformation/Imi02/mcdp9098.htm	html	Y
Income and poverty	1995	http://www.census.gov/hhes/www/saipe/estimatecty/ cty34000.htm	excel	N
Number of families below poverty level	1989-1997	http://www.wnjpin.state.nj.us/OneStopCareer Center/LaborMarketInformation/Imi19/table13.htm	excel	N
Median household,family,nonfamily income	1989	http://www.wnjpin.state.nj.us/OneStopCareerCenter/Labor MarketInformation/lmi01/index.html	html	By municips
Median family income	1990-1997	http://www.wnjpin.state.nj.us/OneStopCareer Center/LaborMarketInformation/Imi19/tables4.htm	excel	N
Employment and population	1996-2006	Division of Labor Market and Demographic Research	word	N
Employment by type	1990 & 1996	http://www.nymtc.org	excel	By municips
Employment by type	1995-2020	http://www.nymtc.org	excel	Y
Economic	1992	http://www.census.gov/epcd/www/92profiles/EC92NJ.htm	notepad	Y
Land use by type, location, magnitude and density	1987-1992	http://urban.rutgers.edu/geogrowth http://www.wnjpin.state.nj.us/OneStopCareerCenter/	html	Y
Number of residential housing units	1980-1998	http://www.wnjpin.state.nj.us/OneStopCareerCenter/	html	By municips
Number of housing units by structure size	1990 & 1996	http://www.nymtc.org	excel	By municips
Floorspace area	1996	http://www.nymtc.org	excel	By municips
Transportation(trips,modes, accidents, automobile usage etc.)	1990-1996	Several databases (DOT, AAMA, APTA,Princeton Univ.)		Y
Traffic data as a measure of accessibility (travel times, volumes, distances, trip attractions, comfort, veh.oper.costs)	1993-1997*	http://www.state.nj.us/transportation/count	notepad	Y

*Only traffic volume data is available. Travel time and distance data is available in calibrated Transplan Model.

Explanation of each type of data is given in the following subsections.

3.1. Population and Demographic Data`

Population

New Jersey population data is available in the US Census Bureau database. This database contains the following fields:

-State/county code and area name

-Population estimate for the year 1998

-Population estimate for the year 1997

-Numeric and percent population changes from 1997 to 1998

An example of data is shown in Table 3a below.

TABLE 3A Example Population Data

State/county code	Area name	Estimate (7/1/98)	Estimate (7/1/97)	Numeric population change (1997-1998)	Percent population change (1997-1998)
34	New Jersey	8,115,011	8,058,384	56,627	0.7
34001	Atlantic County, NJ	238,047	236,331	1,716	0.7
34003	Bergen County, NJ	858,529	852,448	6,081	0.7
34005	Burlington County, NJ	420,323	418,459	1,864	0.4
34007	Camden County, NJ	505,204	504,814	390	0.1

Source: US Census Bureau Database

In addition, there is another data source for population, that can be found in the US Bureau of the Census, Population Estimates Branch database. This population data is given on the basis of two categories; for persons who are American Indian and Alaska native and for persons who are Asian and Pacific islander. Database includes many tables for population data for the years 1990 through 1997, for varying 'age's. This database contains the following fields:

-Year
-Age
-Race
-Sex (M, F)
-Origin

An example of data is shown in Table 3b below:

TABLE 3B Example Population Data

Year	Age	Race							
		White		Black		American Indian and Alaska native		Asian and Pacific Islander	
		M	F	M	F	M	F	M	F
1990	0	40406	38639	9348	9184	107	90	2587	2512
1990	1	38368	36592	9105	8886	118	91	2485	2285
1990	2	37517	35692	8759	8555	96	87	2452	2308

Source: US Bureau of the Census, Population Estimates Branch Database

In addition two these two population data described above, there is another data source for population, that can be found in the Workforce New Jersey Public Information Network

database. Database includes data for the years 1990 and 1998. This database contains the following fields:

-County and municipality names
-Area (Square mileage)
-Total resident population for 1990 and 1998
-Persons per square mile for 1990 and 1998

An example of data is shown in Table 3c below:

TABLE 3C Example Population Data

County/Municipality	Area (Square Mileage)	Total Resident Population				Persons per Square Mile			
		Census 4/1/90	Estimates 7/1/98	Rank		Census 4/1/90	Estimates 7/1/98	Rank	
				1990	1998			1990	1998
Atlantic County	561.16	224,327	238,047	15	15	399.8	424.2	15	15
Absecon city	5.72	7,298	7,817	286	279	1,275.90	1,366.60	336	336
Atlantic City city	11.35	37,986	38,063	39	44	3,346.80	3,353.60	184	187
Brigantine city	6.43	11,354	11,599	196	203	1,765.80	1,803.90	302	304
Buena borough	7.61	4,441	4,596	388	387	583.6	603.9	415	421
Buena Vista township	41.44	7,655	8,118	273	268	184.7	195.9	492	497

Source: Workforce New Jersey Public Information Network Database

Subcounty Population Estimates

This data is available in the US Bureau of the Census, Population Division database. In this database, estimates of resident population by municipalities in each county of New Jersey are provided for the years between 1990 – 1998. This database contains the following fields:

-Municipality
-Population estimates as of July 1 of the years between 1990 and 1998.

A sample table from this database is shown in Table 4 below:

TABLE 4 Example for New Jersey Subcounty Population Estimates

Municipality	Census on April 1,	Estimates as of July 1,							
	1990	1991	1992	1993	1994	1995	1996	1997	1998

Atlantic County	224327	227336	229005	230538	231618	233054	234839	236331	238047
Absecon City	7298	7429	7487	7553	7607	7648	7690	7779	7817
Atlantic City City	37986	38171	38165	38217	38141	38215	38282	38165	38065
Brigantine City	11354	11414	11431	11478	11505	11502	11531	11571	11599
Buena Borough	4441	4497	4544	4565	4572	4573	4595	4600	4596

Source: US Bureau of the Census, Population Division Database

Population Projections

This data is available in the report titled " New Jersey Employment & Population in the 21st Century, 1996 Base Year: Projections 2006" (Reference, New Jersey Department of Labor, 1998). This report represents the latest projections of population for the State of New Jersey. The projections reflect past trends and known future events which will have an impact on the state's employment and demographic profile. The projections are neither predictions nor forecasts. Data is represented both in graphics form and in table form.

As an example, some portions of the population data in table format is shown in Table 5 below:

TABLE 5 Projections of Population by Age, Race, Sex and Hispanic Origin,NJ,1996-2006 (Example)

	1996		2006		Change 1996-2006	
	Number	Percent	Number	Percent	Number	Percent
Total population	7987900	100	8436600	100	448700	5.6
By age:						
Under 15 years	1678000	21	1718400	20.4	40400	2.4
15 to 64 years	5210300	65.2	5569400	66	359100	6.9
By sex:						
Male	3875900	48.5	4107500	48.7	231600	6
Female	4112100	51.5	4329100	51.3	217000	5.3
By race						
White	6414900	80.3	6451900	76.5	37000	0.6
Black	1157200	14.5	1296700	15.4	139500	12.1
Other	415800	5.2	688000	8.2	272200	65.5
Hispanic	920100	11.5	1241300	14.7	321200	34.9

Source: New Jersey Department of Labor Database

3.2. Income and Poverty Data

This data is available in the US Bureau of the Census, Small Area Income and Poverty Estimates Program database. This database contains the following fields:

-Estimates for the number of people (for different age groups) in poverty
-Estimates for the percentage of people (for different age groups) in poverty
-Estimate for median household income

A sample table from this database is shown in Table 6a below:

TABLE 6A Example Poverty Data for the Whole Population

Statistic	Number		Percent	
	Estimate	90%Confidence interval	Estimate	90%Confidence interval
People of all ages in poverty	699733	653733 to 745733	8.7	8.2 to 9.3
People under age 18 in poverty	255284	231239 to 279328	12.6	11.4 to 13.8
Related children age 5-17 in families in poverty	178604	162331 to 194877	12.6	11.4 to 13.7
People under age 5 in poverty	63216	45373 to 81060	10.8	7.7 to 13.8
Median household income	44,345 $	42,711 to 45,979		-

Source:US Bureau of the Census, Small Area Income and Poverty Estimates Program Database

In addition, there is huge amount of data for number of families below poverty level; this data is available in U.S. Department of Commerce, Bureau of the Census database. This database contains the following fields on a two-year basis from 1989 through 1997:

-Number of families below poverty level (grouped by family type, race)
-Rate of families below poverty level (grouped by family type, race)

An example of this data is given in Table 6b below:

TABLE 6B Example Poverty Data

Two-year moving average:	1989-1990		1990-1991		1991-1992		1992-1993	
	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)
All families in poverty	143 000	7.1	155 000	7.6	165 000	8.1	182000	8.8
Family type:								
Married Couple family	46 000	2.9	50 000	3.1	56 000	3.5	56000	3.5
Female householder (no spouse)	89 00	25.9	97 000	28.1	97 000	27.9	115000	30.8
Race:								
White family	83 000	4.9	93 000	5.5	105 000	6.1	113000	6.5
Black family	57000	22.1	57 000	22.2	53 000	21.9	60000	25.3

Source: Families U.S. Department of Commerce, Bureau of the Census Database

In addition, data is available for median family income in U.S. Department of Commerce, Bureau of the Census database. This database contains the following fields on a two-year basis from 1990 through 1997:

-Number of families (grouped by race, labor force members in the family, family type, education)

-Median income (grouped by race, labor force members in the family, family type, education)

An example of this data is given in Table 6c below:

TABLE 6C Example New Jersey Income Data (in Dollars)

Two-year moving average:	1990-1991		1991-1992		1992-1993		1993-1994	
	Number of Families	Median Income	Number of Families	Median Income	Number of families	Median Income	Number of families	Median Income
All families	2030	58,423	2036	57,231	2051	54,886	2069	54,803
Race:								
White family	1702	61,136	1715	60,147	1726	57,844	1743	57,320
Black family	258	38,207	243	36,550	237	31,981	235	32,278
Labor force members:								
Families with no labor force member	280	20,301	281	20,474	313	19,832	318	19,793
Families with 1 labor force member	581	44,305	611	44,364	610	43,323	592	43,682
Demographics:								
Married-couple families	1600	65,586	1597	64,305	1589	63,840	1600	63,833
Married-couple families (spouse in labor force)	997	74,140	1005	73,155	1015	73,282	1049	73,454

Source: U.S. Department of Commerce, Bureau of the Census Database

In addition, 1989 data is available for median household, family and nonfamily income at municipality level in the Workforce New Jersey Public Information Network database. In this database, different tables are available for different counties. This database contains the following fields for each county:

-Municipality names
-Median household income
-Median family income
-Median nonfamily income
-Per capita income
-Per capita income rank

An example data for Bergen county is given in Table 6d below.

TABLE 6D Example New Jersey Income Data For Bergen County (in Dollars)

Municipality	Median Household Income	Median Family Income	Median Nonfamily Income	Per Capita Income	Per Capita Income Rank
BERGEN County	49249	57640	25685	24080	3
Allendale Borough	78361	84937	34667	34602	35
Alpine Borough	106331	115426	45625	56298	5
Bergenfield Borough	45713	51311	21956	18713	274

Source: Workforce New Jersey Public Information Network Database

3.3. Employment Data

This data is available in the report titled "New Jersey Employment & Population in the 21st Century, 1996 Base Year: Projections 2006" (Reference, New Jersey Department of Labor, 1998). This report represents the latest projections of employment by industry, employment by occupation and labor force for the State of New Jersey. The projections reflect past trends and known future events which will have an impact on the state's employment and demographic profile. The projections are neither predictions nor forecasts. Data is represented both in graphics form and in table form. This report contains the following data:

-Annual average employment growth

-Employment changes by industry sectors, by major occupational categories

-Annual average job openings, by major occupational categories

-Labor force growth by race, sex and hispanic origin

-Projections for the top 25 high, moderate and low wage occupations.

As an example, some portions of the data in table format is shown in Table 7a below:

TABLE 7A Employment Projections by Major Industry Category,NJ,1996-2006 (Example)

Industry	1996		2006		Change 1996-2006	
	Number	Percent	Number	Percent	Number	Percent
Total nonfarm employment	3639900	100	4046900	100	406900	11.2
Goods producing	610500	16.8	573300	14.2	-37200	-6.1
Mining	1900	-	2000	-	100	5.1
Construction	123400	3.4	134200	3.3	10800	8.8
Service producing	3029400	83.2	3473500	85.8	444100	14.7
Transportation,Communication and utilities	249000	6.8	278700	6.9	29600	11.9

Source: New Jersey Department of Labor Database

In addition, employment by type data is available for 14 of the 20 New Jersey counties between years 1995 and 2020. This data is available in New York Metropolitan Transportation Council (NYMTC) database. It contains data for the following industries for each of the 14 counties:

- Mining

-Construction

-Manufacturing

-Transportation, Communications and Public Utilities

-Wholesale Trade

-Retail Trade

-Finance, Insurance, Real Estate (FIRE)

-Services

-Government

An example data for Essex county is given below. Only the data for the years between 1995 and 2002 is shown in Table 7b below.

TABLE 7B Example Employment By Type Data For Essex County

Industry	1995	1996	1997	1998	1999	2000	2001	2002
Total	412.8	416.6	420.5	423.8	426.7	429.8	431.9	433.4
Proprietors	49.7	50.4	51.3	52.0	52.7	53.4	53.9	54.2
Total Payroll	363.1	366.1	369.2	371.7	374.0	376.4	378.1	379.2
Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manuf	45.9	44.6	43.7	42.8	41.9	41.4	40.2	38.7
Const	10.4	10.6	10.9	11.0	11.1	11.2	11.3	11.4
TPU	35.1	35.2	35.3	35.3	35.3	35.3	35.3	35.3
Whol.Tr	21.4	21.6	22.0	22.4	22.8	23.0	23.3	23.6
Retl.Tr	43.5	44.2	44.4	44.6	44.7	44.9	45.0	45.0
FIRE	31.8	32.0	32.2	32.4	32.6	32.8	33.0	33.2
Services	121.5	125.2	128.6	131.7	134.6	137.2	139.8	142.2
Gov't	53.4	52.8	52.1	51.5	51.0	50.5	50.1	49.8

Source: http://www.nymtc.org

In addition, employment data is available according to industries for 1990 and 1996 at municipality level. This data is available in NYMTC database. It contains the following fields for 15 counties in New Jersey:

-Municipality names
-Total employment
-Agricultural/ other
-Mining
-Construction
-Manufacturing
-Transportation
-Communications and Public Utilities
-Wholesale trade
-Retail trade
-FIRE
-Bus/ Repair
-Pers.
-Ent.
-Health
-Education

-Other

-PA

Below, example data is shown in Table 7c for 1990 Bergen county for only some of the relevant fields:

TABLE 7C Example Employment By Type 1990 Data For Bergen County

Workplace	Total	Ag/Other	Mining	Constr.	Manu	Trans	CPU	Whole	Retail	FIRE
Bergen County	**442,318**	**4,233**	**377**	**24,366**	**87,889**	**23,167**	**10,220**	**36,590**	**74,148**	**35,801**
Allendale borough	2,802	35	0	199	675	61	0	262	401	158
Alpine borough	629	17	0	145	7	45	27	21	104	33
Bergenfield borough	8,021	66	122	321	775	304	138	477	1,573	1,755
Bogota borough	1,636	0	0	134	228	80	6	232	281	129
Carlstadt borough	12,946	21	12	505	5,614	1,413	172	2,382	1,154	355
Cliffside Park borough	3,733	0	12	419	310	166	72	160	1,125	277
Closter borough	3,476	100	0	149	450	230	34	239	776	379
Cresskill borough	2,759	16	0	242	581	44	148	95	547	196
Demarest borough	891	7	0	76	37	22	0	7	62	22

Source: http://www.nymtc.org

3.4. Economics Data

This data is available in the US Bureau of the Census database. This database contains data for New Jersey with the following fields for each sector:

-Number of establishments

-Sales or receipts

-Number of jobs

-Output per capita

-Jobs per thousand population

-Establishments per hundred thousand population.

In addition, economics data is available for some counties of New Jersey that had the higher population in 1992 compared to other counties.

An example of these data is given in tables Table 8a and 8b.

TABLE 8A 1992 Economic Census-New Jersey Area Profile (Example)

Sector	Number of Establishments	Sales or receipts ($million)	Number of jobs	Output per Capita	Jobs/1000 population		Establishments/100K population	
					Number	% of US	Number	% of US
Mining	114	279	2500	36	0	13	1	12
Construction	19643	16493	131376	2109	17	92	251	112
Manufacturing	13277	86775	573900	11096	73	110	170	117
Transportation	7897	12402	127336	1586	16	131	101	140
Communications	1257	7598	74759	972	10	188	16	104

Source:US Bureau of the Census Database

TABLE 8B Counties in New Jersey with higher Population in 1992 - Economics Data (Example)

County name	Population (1992)	Retail		Wholesale		Services	
		No.of establs.	Sales($mil.)	No.of establs.	Sales($mil.)	No.of establs.	Rcpts($mil.)
Bergen	834983	6030	8755	3795	48845	9936	7197
Essex	773420	4219	4489	1616	15194	6381	5841
Middlesex	684456	3872	5696	1771	21700	5227	4435
Monmouth	565928	3914	4969	1116	4470	5381	3065

Source:US Bureau of the Census Database

3.5. Land Use Data

New Jersey land use data is available at the Rutgers University. This land use database contains the following information:

-Vacant land valuation
-Residential valuation
-Farm valuation
-Commercial valuation
-Industrial valuation
-Apartments valuation
-Number of parcels: vacant land
-Number of parcels: residential
-Number of parcels: farm

-Number of parcels: commercial

-Number of parcels: industrial

-Number of parcels: apartments

For every municipality in New Jersey the growth patterns in terms of above mentioned indicator options are available in graph format, on a comparative basis with its four adjacent counties. In addition, data for residential housing units is available in Workforce New Jersey Public Information Network database. This database contains information between the years 1980 and 1998 with the following fields:

-County

-Total value

-Total units

-Single-family units

-Two-family units

-Three or four-family units

-Five or more family units

An example of this data is given in table 9a below:

TABLE 9A Example Data for New Privately Owned Residential Housing Units Authorized to be Built, Annual 1980

County	Total value	Total units	Single-family units	2-family units	3-or 4-family units	5- or more-family units
Atlantic	56611156	1324	692	74	6	552
Bergen	87595393	1276	817	190	7	262
Burlington	36566122	920	868	6	0	46
Camden	43958847	1396	1224	132	0	40
Cape May	78939727	1588	635	476	33	444

Source: Workforce New Jersey Public Information Network database

In addition, data for number of housing units by structure size is available in NYMTC database at municipality level for the years 1990 and 1996. This database contains the following fields for each county (Data for only 15 NJ counties is available in this database):

-Municipality names

-Total units for 1990 and 1996

-Single family for 1990 and 1996

-Multifamily for 1990 and 1990

including vacant and seasonal housing units.

An example data is given below in Table 9b for Union county:

TABLE 9B Example Data for Number of Housing Units For Union County

	1990			1996		
Municipality Name	Total Units	Single Family	Multifamily	Total Units	Single Family	Multifamily
Union County	187,033	100,345	86,688	189,539	101,778	87,761
Berkeley Heights township	3,924	3,761	163	4,308	4,145	163
Clark township	5,638	4,470	1,168	5,652	4,484	1,168
Cranford township	8,407	6,446	1,961	8,533	6,472	2,061
Elizabeth city	41,315	6,663	34,652	41,539	6,684	34,855
Fanwood borough	2,507	2,388	119	2,518	2,399	119

Source: http://www.nymtc.org

In addition to land use data described briefly above, there is also data for floorspace area for New Jersey municipalities for the year 1996. This data is also available in NYMTC database and contains the following fields (data for only 15 NJ counties' municipalities is available in this database):

-Area name

-Total floorspace

-Residential floorspace

-Nonresidential floorspace

An example of this data is given in Table 9c below.

TABLE 9C Example Data for Floorspace Area (1996 Data)

Area Name	Total Floor Space	Residential Floor Space	Non-Residential Floor Space
ALLENDALE BORO	5,278,308	3,261,600	2,016,708
ALPINE BORO	1,519,298	979,600	539,698
BERGENFIELD BORO	18,847,268	13,508,000	5,339,268
BOGOTA BORO	5,366,829	4,237,600	1,129,229
CARLSTADT BORO	12,060,698	3,339,000	8,721,698
CLIFFSIDE PARK BORO	16,178,279	13,369,600	2,808,679
CLOSTER BORO	6,887,604	4,491,800	2,395,804
CRESSKILL BORO	6,118,088	4,167,000	1,951,088

Source: http://www.nymtc.org

3.6. Transportation Data

A huge amount of transportation database is available and they are kept in several different databases. Most of the trip data is supplied by NJDOT. Number of trips, modes and automobile usage can be found within these databases. Trip data contains the 24 hour vehicle trips made within specified zones in New Jersey. The following trip modes and trip types are contained in the database:

Mode 1 = Single Occupancy Vehicles
Mode 2 = 2 Person High Occupancy vehicles (HOV)
Mode 3 = 3 Person HOV
Mode 4 = 4 + Person HOV
Mode 5 = Transit

Trip types are:
-Home based work trip (For all modes)
-Home based shop trips (For modes 1,2,3,5)
-Home based other trips (For modes 1,2,3,5)
-Non home based trips (For modes 1,2,3,5)

An example of trip data for the year 1996 is given in the following table; Table 10.

TABLE 10 Example Trip Data (Home based work trips made in 1996 from zone 1)

To zone:	1	2	3	4	5	6	7	8	9	0	To zone:
1	272	1	18	3	0	7	0	0	0	0	10
11	4	23	0	2	0	7	3	2	1	1	20
21	5	0	7	1	12	18	10	3	10	0	30
31	5	0	16	1	12	0	40	4	12	18	40
41	1	1	4	6	9	0	4	22	7	1	50
51	9	1	0	5	1	4	39	76	4	16	60

Source: NJDOT Database

3.7. Traffic and Congestion Data

For the time being, only traffic volumes for each county in New Jersey between the years 1993 and 1997 is available. Other traffic data will be gathered by means of surveys. Data for travel times and travel distances are available in calibrated Transplan Model. The traffic volume data is available in the New Jersey Department of Transportation Bureau of Data Resources database. This database contains the following fields:

-Station ID
-Route
-Milepost
-Street name and location
-Municipality and county
-Year
-AADT (in both directions, unless otherwise stated).

An example of this data is given in Table 11a.

TABLE 11A Example Traffic Volume Data for Burlington County

Station ID	Route	Milepost	Street name and location	Municipality and county	Year	AADT
7-4-602	C201031	.00	Ark Rd Bet Church Rd and Lumberton Corp. lin.	Medford TWP. Burlington	1996	2870
5-8-424	C031356	.00	Barclay St Just south of Hanover Blvd.	Pemberton TWP. Burlington	1993	410
8-4-626		.00	Batsto –Washington Rd Bet Tylertown and Batsto-Quaker Br R.	Washington TWP. Burlington	1997	80
5-8-370	C381052	.00	Belmont La. Bet Buckingham Dr. and Barrington La.	Willingboro TWP. Burlington	1994	280
5-8-372	C381024	.00	Bradford La. Bet Sunset Rd, C0634 and Baldwin La.	Willingboro TWP. Burlington	1994	840

Source: NJDOT, Bureau of Data Resources Database

In order to be able to incorporate the safety and congestion issues into our model in later stages of this project, data for the number of accidents for the year 1996 available in New Jersey Division of Transportation Database is included here. An example of this data is provided below, in Table 11b.

TABLE 11B Example Accident Data for Bergen County in 1996

County	Road Type	Accident Classification			Total of Occupant		Total pedestrians	
		Fatality	Injury	Prop. Damage	Killed	Injured	Killed	Injured
Bergen	Interstate	3	335	474	3	527	0	3
	State Highway	18	2523	4302	21	3843	6	62
	State,Interstate Authority	6	415	868	6	620	0	8
	State Park	0	0	0	0	0	0	0
	County	17	4147	7518	17	6075	6	267
	Co Auth. or park	0	0	0	0	0	0	0
	Municipal	10	1784	5314	10	2494	3	162
	Private Prop.	0	0	0	0	0	0	0
	US Govt. Prop.	0	0	0	0	0	0	0

Source: New Jersey Division of Transportation Database

4. REVIEW OF SOME SELECTED PAPERS

In this section, a review of eight papers, related to the current project is presented below.

1. a)Paper Title: 'Accessibility and Environmental Quality' by V. Setty Pendakur and G.R. Brown, Journal of the Urban Planning and Development Division, April 1969.

   b)Study Area: This paper attempts to rationalize the divergent objectives of environmental quality and motor vehicle accessibility, by presenting an analysis of the conflict and balance between these two in a suburban shopping district. The specific focus of this study is based on the hypothesis that the quality-accessibility paradox is a conflict between two elements of the same movement system; the pedestrian and his need for a safe and pleasant shopping environment, and the need for a high level of motor vehicle accessibility for sustained economic viability of a ribbon-type of shopping district.

   c)Data Collected: i)traffic counts per 5-minute intervals

   ii)noise levels

   iii)accident records at intersections

   iv)pedestrian interviews (questions about safety and delay in crossing the street, the adequacy of crossing aids, noise levels, appearance characteristics)

   v)Car driver interviews (questions about safety, congestion, delay from pedestrians, delay in finding a parking space, ability to maintain desired speed, ability to park close to final destination, clarity of traffic signs and signals).

   vi)Factual data obtained through above interviews (trip purpose, trip frequency, mode, age, sex, parking location and final destination).

   d)Purpose of Data Collection: Aim is to evaluate the motor vehicle accessibility and environmental quality around a shopping district in Vancouver. In other words, to find out about the systems concept of the accessibility-environmental quality conflict which has important planning implications. Sound levels and traffic volumes per 5-minute intervals were graphed with respect to time span of 2 p.m. to 5 p.m.

   e)Model Used: A systematic framework of the relationship between accessibility and environmental quality is developed. This can be called as an 'approach' rather than a model

f) Impact of Investment on Economic Development: What is meant by 'economic development' ? It is the totality of features that contribute to the well-being and the welfare of the society. Therefore, 'social cost' is among the basic issues to be considered when an investment is made. Social cost can be due to the decrease in pedestrian safety and convenience, air pollution, traffic noise and aesthetic deterioration. The main idea of this paper is the following; "The goals of transportation planning and traffic engineering must reflect improvement of the level of accessibility within urban areas coincident with travel demand, but these should be pursued proper concern for the hard to define *social costs* which accompany transport improvements." Thus, this paper draws attention to these social costs, which are hard to quantify and are consequently largely ignored in transportation planning. This study is part of a research program at the University of British Columbia related to community consequences of increasing urban accessibility.

g) Key Results: The system concept of the accessibility – environmental quality conflict has important planning implications. In instances where elements of each concept are mutually supporting, the objectives of accessibility and of environmental quality converge toward a single goal and the achievement of these objectives is dependent upon priorities and budget constraints; and not on an evaluation of alternatives within the system. For the conflicting elements of the system, planning objectives are diverging. If we allow complete pedestrian freedom, accessibility may be decreased below that which maintains competitive economic viability under existing conditions. Therefore, the problem demands a trade-off of other objectives; between which the interaction is complex. This pilot study indicates an individual awareness of most of the elements constituting accessibility but an indifference to many of the environmental disamenities.

2. a) Paper Title: 'Assessing Impact of Urban Transportation' by David E. Boyce and A. M. ASCE, Proceedings of the American Society of Civil Engineers, August 1972.

b) Study Area: This paper describes the impact studies of the Lindenwold High-Speed Line, which is a prototype of transit systems that will probably be constructed over the next two decades; likewise, these impact studies may be regarded as prototype studies in that they will be followed by impact studies of much larger rapid transit systems, in particular the BART system.

c)Data Collected : i)license plate numbers and corresponding addresses of registrants for passenger identification, his station and mode of access

ii)license plate numbers of all cars parked in station lots before and after the morning peak, of all kiss-and-ride autos by 15-minute intervals

iii)addresses of the people studied to determine the distance to each station

iv)the real estates sales by municipality and county, lot number, property classification, assessed value of land

v)mortgage appraisal by collecting information on property location, lot size, dwelling unit characteristics, sales price and sales date.

d)Purpose of Data Collection: The first goal is to evaluate the impact of station locations and parking capacities on the market area served by each station. Data numbered i, ii and iii are utilized to fulfil this goal. The second goal is to evaluate the impact of Lindenwold high-speed line and its stations on land value. Data numbered iv and v are utilized to fulfil this goal.

e)Modeling Approach: Simple model of station choice and specific location model.

f)Impact of Investment on Economic Development: One question which it would be desirable to answer in an impact study is whether the existence of the facility resulted in an overall increase in economic activity in the metropolitan area. This question is only somewhat applicable for the Lindenwold Line, but highly significant in the case of the San Francisco Bay Area. However, it does not seem possible to answer such a question, except possibly through the systematic comparison of a metropolitan area with a transit facility with other metropolitan areas without such transit facilities. Clearly in the case of Lindenwold Line, and probably in the Bay area situation, such a study is simply not feasible. However, it is feasible to ask whether the amount of economic activity around each station is changed or not, and how these activity levels compare with other similar locations which are not served by the transit facility.

g)Key Results : Since the proposed models 'A Simple Model Of Station Choice' and 'Specific Location Model' are not tested yet, no results are available. However, preliminary examination of the data shows the presence of a significant component. The component shows that sales prices in the more newly developed suburban areas rose more sharply than those in the older, more established areas. Several of the areas identified by the component

as undergoing a relatively rapid increase in land value are in the vicinity of High-speed Line stations.

3. a)Paper Title: 'Economic Impacts and Transportation Projects' by James T. Jarzab, Journal of Transportation Engineering, Volume 112, No.3, May 1986.

b) Study Area : In this paper, the insights into available methods of evaluating the economic impact of transportation projects or programs on the state or local economy are presented.

c)Data Collected: The study was based on estimations, no real data collected.

d)Purpose of Data Collection: Aim is to forecast the economic activity generated by the construction of the 1983 Northeastern Illinois Transportation Improvement Program, by analyzing the changes in business volume, local personal income, housing expenditures, non-housing expenditures, housing investment, non-housing investment and tax revenues. This is done by comparing the estimated program cost (labor and material cost) with the economic impact forecast.

e)Models Used: Location quotient model, Input-Output forecasting model and Input-Output impact model.

f)Impact of Investment on Economic Development: The economic value of a transportation improvement to an economy is two-fold. First, there is the net value of the construction activity, which accompanies most transportation projects. Second, there is the value of the operating cost savings to the economy because of decreased travel time and cost of operations resulting from the project. In this paper, only the economic activity resulting from the construction phase of a project or group of projects are studied. This economic activity can be in the form of increased business volume, change in local personal income or change in housing expenditures.

g)Key Results: In this paper, the network improvements resulting from the capital programs have not been modeled; therefore, the findings reflect only the economic activity resulting from the construction phase of a project. It must be stressed that these construction impacts are for the most part transitory, and the more lasting economic impact may in fact be the operational improvements resulting from the program. It is hoped that future analysis will be able to link the two for a more meaningful measure of economic importance. Obviously, the desirability of generating an estimate of economic impact will vary among projects; i.e., it is

rarely worth the effort to evaluate projects whose dollar values are small in relative magnitude to the size of the local economy. However, when dealing with major programs or projects, estimation of economic impacts can give transportation policy makers additional means of evaluating the overall effects of their actions. This information can facilitate the political process so intimately entwined with major transportation improvements.

4. a)Paper Title: 'Regional Transport Development and Economic Growth' by Kenneth A. Brewer, M. ASCE and Robert O. Richards, Jr., Transportation Engineering Journal of the American Society of Civil Engineers, Volume 102, No.TE2, May 1976.

b) Study Area: In this paper, the concept of regional types from Hoover's work is extrapolated to a within-state regional scale while the transportation mode impact study concept is extended up from the project scale to a region. Simultaneously, socioeconomic characteristics and an integrated transportation character or rural regions is heuristically compared for transportation policy implications.

c)Data Collected: All data collected is for the 9 regions in Iowa.

i)population density per square mile

ii)regional employment in manufacturing, in economic support service

iii)regional population in central place county (as a percentage).

d)Purpose of Data Collection: Aim is to evaluate how well regional transportation and economic development complement one another. In other words, aim is to assess the impact of transportation development on regional socioeconomic patterns by comparing the investment in transportation modes in large regions and economic and social development of the same area.

e)Model Used: Rank-size distributions of regional attributes.

f)Impact of Investment on Economic Development: It is the main idea of this paper that transportation and economic development plans for regional development often presume complementary effects on the resulting pattern of land use and activities.

g)Key Results: There has long been a need for a method whereby the investment in transportation modes in large regions can be compared to the economic and social development of the same area in order to assess the impact of transportation development on regional socioeconomic patterns. This research resulted in a simple regression form of rank-

size analysis of both transportation and socioeconomic characteristics that yielded parameters that lead to a set of rural region categories. Each category of rural region has certain implied sensitivities to transportation investment within the socioeconomic system. Thus, an objective communication tool has been developed to facilitate interaction between the transportation planner and the land use planner.

5. a)Paper Title: 'Study of the Impact of the Lancashire-Yorkshire (M62) Motorway' by E. J. Judge.

b) Study Area : A study of the effect of the Lancashire-Yorkshire (M62) Motorway was initiated in late 1968 at Leeds University under the sponsorship of the Department of the Environment. This paper describes the background of the study and discusses some specific aspects of it. The main issues addressed are; i)whether there are indirect benefits of road investment that should be incorporated in appraisals, ii)what account should be taken of regional effects, iii)the nature of and the allowance made for traffic that at present is not included except on an ad hoc basis.

c)Data Collected: Data is collected according to 16 cities in Lancashire and Yorkshire regions.

i)data by before traffic surveys
ii)data by households surveys
iii)population
iv)migration per one thousand population
v)total persons employed
vi) total persons unemployed
vii)economic activity rate (percentage of population in age group 15 to 64 economically active)
viii)wage rate
ix)O-D data to estimate journey times by private car with and without M62 motorway

d)Purpose of Data Collection: Aim is to analyze the relationship between transport costs and subregional employment growth. Besides, purpose is to investigate the nature and the magnitude of generated traffic.

e)Model Used: Cross-sectional analysis of the impact of the motorway.

f)Impact of Investment on Economic Development: Mainly, the impacts of M62 Motorway on migration rate, unemployment rate, level of economic activity, earnings and travel time have been studied.

g)Key Results: When journey times by private car with and without M62 motorway were compared, nearly 35 % decrease was observed in travel time. Traffic growth in the immediate motorway corridor was quite dramatic, namely an increase of over 30 % for the whole survey period and an increase of over 45% on weekdays.

6. a)Paper Title: 'Predicting Transportation Impact in Northeast Georgia' by Paul F. Vendt and James B. Kau.

b) Study Area : This paper describes the general structure of the Georgia Transportation Planning Land Use Model and summarizes the implementation of an experimental model for a 17-county test area in north Georgia. In this paper, a technique for using the model in the transportation decision process is presented.

c)Data Collected: Data is collected according to 159 counties in Georgia.

i) population density
ii)employment density
iii)housing density
iv)mean income

d)Purpose of Data Collection: These data provided the empirical basis for a two-stage, multiple regression analysis that was designed to measure the specific influence of changes in accessibility on economic development. In other words, the effect of changes in accessibility resulting from the improved highway facility on relevant socioeconomic variables such as population and employment.

e)Models Used: The Georgia Transportation Planning land use models.

f)Impact of Investment on Economic Development: In this paper, accessibility and land use impacts of transportation investments are predicted by means of a least squares regression analysis, with population density, household density, employment density, percentage of single-family dwellings and mean income as the major socioeconomic variables.

g)Key Results: In this paper, an accessibility measure that assumes a deteriorating highway condition resulting from increased congestion is computed. The projected impact of a

changed transportation system on population, employment, households and single-family dwellings is also given in the paper for three counties directly affected by the proposed transportation improvement, under three transportation assumptions. First assumption is that no improvement will be applied to the current transportation system. Second is a deteriorating highway condition and the third one is the introduction of an improved interstate highway.

7. a)Paper Title: 'Economic Impacts of Transportation Investments: The Case of Federal Express' by Lock Haven, Transportation Journal, Winter 1997.

b) Study Area: This paper examines and compares two approaches to estimating the economic benefits of an air cargo hub facility on a local economy. Four medium-sized Midwestern local economies are studied; i)Indianapolis, ii)Memphis, iii)Louisville, iv)Cincinnati.

c)Data Collected: i) employment (manufacturing, transportation sector)
ii) personal income
iii)unemployment

d)Purpose of Data Collection: Goal is to estimate the economic benefits (such as jobs and further business opportunities) of an air cargo hub facility on a local economy. Two different models are used. Employment data is used to develop employment multipliers for input-output model. These multipliers measure the direct ripple effect of a change in regional economy. Employment, personal income and unemployment data are used to test the econometric model, which aims towards determining how changes in employment in the air cargo sector of the regional economy are related to changes in total employment in the region.

e)Models Used: Input-Output model and Econometric modeling.

f)Impact of Investment on Economic Development: In the case of air cargo hubs, business relocation effects are large enough to force a structural shift in the regional economy, with new firms substituting local production for business services that were previously imported to the region. The location of the hub brings jobs and further business opportunities to the region.

g)Key Results: Facilities such as air cargo hubs change the economic characteristics of a metropolitan area sufficiently to alter the location decisions of other businesses and alter the

economic structure of the region. An air cargo hub, for example, can lengthen the 'shipping day' enough to provide a locational advantage to firms who rely on air cargo.

8. a)Paper Title: 'A Model-Procedure for Estimating Economic Impacts of Alternative Types of Highway Improvement' by Lock Haven, Transportation Journal, Summer 1997.

b) Study Area: In this paper, a methodology to measure some of the economic benefits of state highway programs is presented. A model-procedure to estimate income, output and employment impacts of special types of highway improvement within a regional context is presented. Also, an application of the model using the state of Kansas is given.

c)Data Collected: i) employment
ii)income
iii)unemployment

d)Purpose of Data Collection: Aim is to present a methodology to measure some of the economic benefits of state highway programs.

e)Model Used: Input-Output model.

f)Impact of Investment on Economic Development: This paper examines the empirical linkage between highway investment and economic development/growth as measured by regional income, output and employment. This is sometimes referred to as the land use effects of road improvements.

g)Key Results: It is stated in the paper that highways have their greatest economic impact during the construction phase with a smaller, lagged impact occurring over the long run. Economic impacts of highways vary widely by region, industry and time period. However, the greatest impacts appear to be in metropolitan areas. Highways have economic impacts in rural areas but good highways do not guarantee economic development if the area lacks other resources that are necessary for growth.

Now, it will be useful to summarize the information given in this section in a compact manner, in table format. A brief explanation about Table 12 is useful at this point; 'accessibility' is concerned with travel time, volumes, distances traveled, safety, and comfort. 'Land use' pattern assessment is directly related to the types, locations, densities and land values of the properties. The phrase 'economic development' comprises all the meanings related to improved

environment, changes in employment, income level, in other words, welfare of the society. So, evaluation of impacts on such complicated parameters requires very exhaustive and careful data collection efforts.

TABLE 12 Summary of data required to assess the impact of transportation investment on Several parameters (Data of Reviewed Papers)

Parameter	Data Required
Accessibility	*O-D surveys (to estimate *travel times* with and without the transportation facility) *Traffic counts (*volumes*) *Accident records (*safety*) *Car driver interviews *Factual data (to estimate *distances traveled*)
Land use	*Real estate sales *Mortgage appraisal *Housing density
Economic development	*Population density *Employment *Noise levels *Appearance characteristics

5. SUMMARY OF DATA AVAILABILITY AND SOURCES

In Table 13 below, availability of required data is presented on the basis of data identified by the literature review and data identified by Working Paper No.1.

TABLE 13 Data Availability

Data identified by the literature review	Data Identified by Working Paper No.1	Availability (Y or N)
Travel behavior as a measure of accessibility:	Accessibility meaningful to travel behavior:	
-Travel time	-Actual travel time by mode	N*
-Travel distances	-Travel distances	N*
	-Network accessibility (eg.minimum travel time)	N*
	-Corridor travel time	N*
-Comfort		N
-Vehicle operating costs		Y
-Trip attractions		Y
-Traffic volumes		Y
-Accident records		Y
Economic Development:	Economic Development:	
-Employment	-Employment	Y
	-Income and poverty	Y
	-Land use changes	Y
-Population density		Y
Population	Population	Y
Land use:	Land use:	
-Real estate sales		N
-Housing density	-Magnitude	Y
	-Type	Y
	-Location	Y

*Available from the calibrated Transplan Model

It is clear that we have most of the data we need to perform the trend analysis mentioned in the Working Paper No.1 by Berechman et al.(1999). However, the size of this data makes it almost impossible to manipulate it using traditional tools such as an Excel. Thus, we propose the development of a GIS framework, which will unify all the data we have. The development of the GIS framework involves:

-selection and acquisition of the GIS tool (possibly TRANS CAD)
-creation of a common database structure
-manipulation of existing databases according to the common database structure

-merging of all databases.

Once the above tasks are completed, we will proceed with 'trend analysis'.

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