

11.953
Comparative Land Use and Transportation Planning
Assignment IV: *The Passaic Urban Design-Architectural Urbanism Studio*
Due Session 17

Background

The *Passaic Studio*¹ has “hired” our class to carry out a transportation analysis of their proposals. More specifically, the Studio students are proposing large scale urban interventions for multiple sites within a roughly 1,200 square kilometer area of land surrounding Passaic, New Jersey, as well as several large infrastructure interventions to complement the site proposals. The sites are not contiguous and entail a range of site-specific characteristics related to the *meso*- (relative location) and *micro*- (density, diversity, design) levels.

To carry out the relevant analysis, you will be divided into five (5) teams of four (4) students each². Each of the student teams will be responsible for carrying out the relevant analyses for a single Studio site. You can find a list of all the relevant GIS files and other data sources at the end of this Assignment.

Before you begin doing anything, please carefully review this entire Assignment description. Then, get together as a team and begin strategizing. You should familiarize yourselves with all of the information that we have provided. Furthermore, familiarize yourselves with the broader context: for example, use Google Earth, other map resources, etc. in order to better understand the study area context as well as the *broader surroundings*. Notice what information you have available as well as what information *you do not have available*. For this study area, you might find additional information on the web-site of the MPO, the NJTPA, among other sources. You can use any of this additional information (including strategies, long term plans, etc.) as you see fit, but the focus should ultimately be on completing the tasks outlined below.

Overall, it is very important that you start by looking at the big picture and then develop a team strategy and teamwork approach (rules of cooperation) before you get into the detailed analysis.

Your specific “client,” the student who has developed the site proposal that you are analyzing, will be available to answer questions and doubts, provide clarifications, etc. You should probably make an appointment to meet with your “client” as soon as you have understood the basics of the Assignment; you are encouraged to interact as frequently as necessary with your “client,” with the understanding that s/he maintains a hectic and demanding work schedule. Contact information will be provided.

¹ 4.163 J/ 11.332 J Urban Design—Architectural Urbanism Studio: Towards a New Monumentality in Passaic, New Jersey (Spring 2006); Instructor: Alexander D’Hooghe.

² One team will have an additional student.

Tasks

The analysis to be conducted involves the following 5 tasks.

(1) Characterize the relevant meso-scale relative location and micro-scale built environment of the site

(a) At the meso-scale, each team should develop rough accessibility measures for the site, calculated as a location-based measure.³ Specifically you should estimate, for your site, the number of jobs (by the three different employment class categories, as well as the total number), the number of persons, and the estimated amount of total household purchasing power within a 10-, 20-, and 30-minute automobile highway travel time from your site. You should calculate the accessibility measures for your site's "home" TAZ; for those sites that fall on TAZ boundaries, choose the smallest adjacent TAZ as the "home" TAZ.

To conduct this analysis, you will draw from two different data sources, both provided by the North Jersey Transportation Planning Authority (NJTPA).⁴ These data sources have been compiled into a single MS-Access File (TAZ_OD.mdb). The Table TAZ_OD provides – for each TAZ origin-destination pair ("O_Zone", "D_Zone", respectively) congested, auto highway TAZ-to-TAZ travel times ("Minutes") as estimated by an NJTPA model run. In addition, the Table provides – for the respective destination TAZ in 2006 – population ("POP06"), number of households ("HH06"), average household income ("INC06"), and employment (Basic Sector ["EMPBAS06"], Retail Sector ["EMPRET06"], Service Sector ["EMP SER06"], and Total of the three ["EMPTOT06"]).

Present your results in a Table.

What does this measure tell you about the site? What relevance does it hold for the site proposal(s)?

(b) For the *micro* scale, each team should physically characterize the existing conditions of the site and surroundings (at a minimum, within a 1-kilometer radius of the site's center, though this may vary depending on the scope of the proposed interventions; you should develop a buffer around the site to capture the relevant characteristics). The specific metrics to be calculated can be decided by the site team, but should include at least 2 variables in each of the three Ds: *Density*, *Diversity*, *Design*. The same metrics should then be calculated assuming the implementation of the proposed studio site intervention. Note that, in this case, information on the existing land use characteristics may be minimal. You should, however, derive characteristics, using clearly identified assumptions as

³ E.g., K.T. Geurs and B. van Wee. 2004. "Accessibility evaluation of land-use and transport strategies: review and research directions. *Journal of Transport Geography*, vol. 12, pp. 127-140.

⁴ Sincere thanks to Bob Diogo, Principal Planner of NJTPA, for graciously providing access to these and all other data provided by NJTPA.

necessary. If appropriate, you can develop these metrics “by eye” (e.g., looking at orthophotos, street maps, etc.).

(2) Calculate the travel demand for the site, with implementation of the proposed project.

For this step, you should focus on the number of trips attracted and generated. The procedures employed should follow those used in the North Point DEIR⁵ implementation. Your calculations should be based on “Full Build” conditions (you can assume the year of implementation as 2006). In other words, each team should construct a simple estimate of “with project” travel demand, including: the number of trips generated and attracted to the site for weekday and weekends, for AM and PM Peaks and for the entire day. You should refer to the North Point methodology, but the following provides an outline of the basic steps for you to follow in your analysis:

(a) Vehicle trip generation. Estimate the number of trips that will be generated and attracted at each site. These should be derived, based on the relevant land use characteristics of the site, using the associated rates contained in the *ITE Trip Generation*⁶ Manual. It is part of your task to find and justify your trip generation estimation methodology, based on the guidance provided in the *ITE User’s Guide* (vol. 3), and the characteristics of the land uses proposed for your site. You must carefully justify this decision within your report and clearly document the procedure used (e.g., show all equations, etc.).

(b) Vehicle occupancy and person trip generation. Remember that the ITE rates are for *vehicle* trip generation. The North Point analysis used average vehicle occupancy (derived from Census data) to convert the *vehicle* trip generation rates into person trip generation rates. You should derive vehicle occupancy rates from the 2000 Census data provided in the CensusTracts shapefile (fields P03210-P03309). You can apply the relevant Census Tract vehicle occupancy to your site (in the case of a site that falls on Census Tract boundaries, it is up to you to determine – **and defend** – the occupancy used). Although this vehicle occupancy is only for commuting, you can use it as a proxy for vehicle occupancy for all trips. Clearly present the methodology and calculations used to estimate the vehicle occupancy. For simplicity’s sake, you can assume the same vehicle occupancy applies to “entering” and “exiting” trips. Based on this analysis, present the *person* trip generation associated with your site, for AM and PM peaks and for the entire day.

(c1) Mode shares and trips by mode. The North Point analysis used estimated mode share data (derived from the Census Journey to Work data, with some

⁵ Epsilon Associates, et al. 2002. “Transportation,” Chapter 5 in *Final Environmental Impact Report (EOEA #12650): North Point*. Submitted to MEPA Office, Executive Office of Environmental Affairs by North Point Land Company LLC, October 31.

⁶ Institute of Transportation Engineers (ITE). 1997. *Trip Generation*, 6th Edition, Washington, DC. All three volumes are available in the reference section of Rotch Library (HE371.A2.I5 1997).

modifications, as detailed in pp. 5-222 to 5-240 – you do not need to concern yourselves with the application of the EPA COMMUTER Model) and applied those to the person trip generation. Notice that the total of the different commuting modes does not equal the total number of workers. Some commuters work at home, but also have indicated a mode that they take to work. In this way, the mode shares for the trips generated by each land use in the site were calculated and, based on this, the total number of trips by all modes was estimated. You should follow this procedure in deriving trips by mode for your sites. Again, you can apply the relevant Census Tract (work trip) mode share to your site (as above, in the case of a site that falls on Census Tract boundaries, it is up to you to determine – **and defend** – the mode share used). Clearly present the methodology and calculations used to estimate the mode shares. For simplicity's sake, you can assume the same mode share applies to “entering” and “exiting” trips. Based on this analysis, estimate the total amount of trips (daily, AM and PM peak) by each mode. Again, although this mode share is only for commuting, you can use it as a proxy for mode share for all trips.

(c2) Alternative mode shares and trips by mode. In all cases, the site proposals imply fairly radical changes to the existing built environment. These changes may well imply changes to mode choice, relative to the “status quo” as reflected in the 2000 Journey to Work data). Using whatever precedent you choose (e.g., drawing from relevant readings/materials), derive alternative mode share and trips by modes for this site. Again, you will have to make some assumptions here; make sure to clarify the procedures used and detail all assumptions. Based on this analysis, estimate the total amount of trips (daily, AM and PM peak) by each mode.

(d1) Capacity analysis. Based on the estimate of trips by each mode from the previous step, analyze the transportation infrastructure capacity implications for all relevant infrastructure. For auto-based transport, you should examine the impacts relative to the current highway capacity (as reported in the major highway Congestion Management System file; CMS31ALL). You will have to make some assumptions at this stage, make sure to make these clear. Furthermore, assess the site's proposed parking facilities, do they seem adequate based on your demand estimates? For public transit modes you have some basic network information in the shapefiles we have provided; you should use this information, together with relevant information on public transit levels of service (e.g., from available schedules) to assess existing capabilities and any possible requirements for changes.

(d2) Alternative capacity analysis. Based on your alternative mode shares (c2, above), repeat your capacity analysis (d1) above.

(3) Identify required transportation mitigation.

Based on your analysis in the previous step, identify required mitigation measures; these should be identified for both (d1) and (d2). You can be as creative as you like in this

section, but you should also aim to propose *realistic* measures. In this section, you should make reference to relevant materials covered in the course (readings, lectures). Specifically, answer the following:

- (a) What transportation mitigations should the site be required to fulfill?
- (b) What should these mitigations entail?
- (c) What alternative development proposals would you recommend for this site?
- (d) How would you expect those alternatives to influence the transportation impact analysis conducted in the previous step? (clearly document the procedures you use in this step).

(4) Identify the major shortcomings to your analysis.

Our analyses always suffer from lack of time, resources, data, expertise, etc. In this section, you should identify the major shortcomings to each task (i.e., (1) – (3), above) in your analysis, in particular:

- (a) What simplifications did you need to make, what did your analysis not consider, and why?
- (b) What could this imply for your analysis?
- (c) What would you need to do (in terms of data, methodologies, etc.) to improve your analysis, realistically?
- (d) How might these improvements change your results?

(5) Additional Information.

You really want to satisfy your client with your transportation and land use planning expertise, as a way to attract future business. This desire leads you to want to “go beyond the call of duty” in developing your analysis. You should include a final section in your client report that reflects this “extra effort.” This could include discussions of important institutional implications (e.g., relations between infrastructure and service providers, city, state and MPO plans, etc.), broader data gathering and/or expanded analytical techniques, and/or any other aspect you find relevant and worth mentioning. Be creative, but realistic.

Requirements

1. Before beginning this assignment, each of you must have signed and returned to the instructor the data use confidentiality agreement.
2. Your final report should be submitted on Friday, at the beginning of the presentation of your results to the Passaic Studio. Your report should be *no more* than 15 pages, double spaced. You should not feel obligated to fill 15 pages and are encouraged to be concise

(as always, brevity is appreciated). You should carefully use tables and figures in your report. Additional supporting data, figures, tables, etc. can be included as an Appendix to the report (beyond the 15 pages); but the report should be self-standing (i.e., not dependent on the Appendix for being understood). **Before handing in your final assignment, review your document, make sure that you have responded to all the tasks outlined above, check for accuracy, do a proof-read, etc.**

3. In your report, be sure to carefully document your procedures and all assumptions used. In many cases, there are several different justifiable approaches to take. Make sure that we can follow your approach clearly in the report.

4. In Session 17, each team will be required to present their results to the Passaic Studio. You will be provided 15 minutes for presentation, with roughly 5 minutes for questions, per team. The method of presentation will be PowerPoint; however additional supporting materials (drawings, maps) can be used, if desired.

6. Finally, this is a group project, which means we expect you to work *as a team*, with each team member carrying her/his own respective load. Clearly, this will require close cooperation and understanding as a group. This also makes grading the assignment particularly difficult. To help understand the relative contribution of each team member to the overall product, each team member should **individually** submit a separate document (via email) to the instructor that describes in 3 or 4 sentences her/his **individual** contribution to the team project. This document **must** be submitted before 1 pm, on Friday 14 April.

Data Sources

TAZ_OD.mdb. MS-Access file with TAZ Origin-Destination model skim highway travel times, as well as Destination TAZ employment and population information for 2006 (as described in detail in (1)(a), above). These data were provided for the **class use only**, by the North Jersey Transportation Planning Authority (NJTPA), and all **use is subject to the confidentiality agreement you sign in class.**

TAZ. A folder containing GIS files (TAZ_NJRTM_Conf06data Revised) of the NJTPA TAZs. This file includes the 1368 TAZs that are within the NJTPA's formal planning jurisdiction. In addition to the TAZ number (ZONE), the file contains the population, income and employment data (as described in detail in (1)(a), above), and the TAZ area in square kilometers (AREAKM2). These data were provided for the **class use only**, by the North Jersey Transportation Planning Authority (NJTPA), and all **use is subject to the confidentiality agreement you sign in class.**

NJCMS3_1ArcGIS. A folder containing information from the New Jersey Congestion Management System (NJCMS), including GIS files representing the major roadways and relevant characteristics (in the associated table). Within the folder, you will find an excel table, NJCMS31ALL Fields.xls, that describes the contents of the data in the GIS. This table is self-explanatory; note, however, that V/C refers to the volume to capacity ratio (v/c ratio): the ratio of vehicle flow rate to capacity for the given facility.

NJTPA_Districts. A folder containing GIS files of planning districts, spatial units of analysis employed by NJTPA to broadly characterize the region; not that these districts are different spatial aggregations than the TAZs – generally a single district comprises multiples TAZs. This file contains data on the district area (in square miles); the estimated district population and employment (in 2000) (NJTPA00POP and NJTPA00EMP, respectively); the district name and its respective County; and finally, the Area_Type, which is a rough categorization of the “character” of the district (primarily, urban, suburban, rural) and its development density (low, medium, high, core). These data were provided for the **class use only**, by the North Jersey Transportation Planning Authority (NJTPA), and all **use is subject to the confidentiality agreement you sign in class**.

TransitLines. A folder containing GIS files of New Jersey Transit passenger rail lines and stations (ALL_PASSENGER_LINES_polyline and ALL_PASSENGER_STA_point, respectively) and bus lines (bus_njt_polyline). These files have little additional useful information, except for, e.g., the Station Name, the bus route, or the rail line. These data were provided for the **class use only**, by the North Jersey Transportation Planning Authority (NJTPA), and all **use is subject to the confidentiality agreement you sign in class**.

Census_Journey to Work. A folder containing GIS files of census tract boundaries and journey-to-work data from the 2000 Census. Within the folder, you will find an excel table, CensusTravelData.xls, that describes the contents of the data in the GIS, and contains another worksheet that contains the same data that is in the shapefile. You can compare the OID or STC fields to the shapefile to find the tract number you need. Notice that the census tract boundaries are fairly closely aligned with the TAZ boundaries in most cases.

Roadways. A folder containing TIGER LINES data from the US Census Bureau that identifies all roadways. The FENAME field contains the name of the street. Notice that the streets are broken up into different pieces between each intersection, so that selecting one portion of the roadway will not select the entire road. This data is meant for use in your micro-scale assessment of the site. Note: In some cases, the TIGER lines files will not line up exactly with the CMS31ALL shapefile that you will use to evaluate road capacity.

Muncoast. A folder containing GIS files with the town/city boundaries for all New Jersey jurisdictions.

Studio_Sites. A folder containing a shapefile with points representing all of the sites being considered in the Passaic studio, identified by letter and the first name of the person working on that site. Note that these points only represent an approximation of where the site is in the context of the GIS map – see the actual drawings to determine actual boundaries.

Additional Information Sources

<http://www.transoptions.org/subpage.php?sc=co&adid=11>

- Information on public transportation services in the counties.

<http://www.njtransit.com/>

- information on public transportation services operated by New Jersey Transit

<http://www.njtpa.org/welcome.html>

- information on transportation plans, etc. from the regional MPO (North Jersey Transportation Planning Authority, Inc.)

You can find additional GIS files of New Jersey and adjoining states on the MIT Geodata Repository. To access this, right-click on the toolbar and select MIT Geodata Repository. This will create a button on the toolbar from which you can access additional shapefiles. Follow directions to create an account the first time you log on, and you have instant access to GIS data from the census and other sources.