University of Hawai'i at Manoa

Department of Urban & Regional Planning

PLAN 605: Planning Models

Course Syllabus

Spring 2015

Tuesdays, 1:30 – 4:15 p.m.
Saunders 116

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Associate Professor

Introduction

This course is intended for students with an interest in analytic methods that are used in planning and public decision-making. It focuses on quantitative models used in the analysis of demographic, economic, land use, transportation, and environmental phenomena in urban and regional planning. The principal topics include: the roles and limitations of mathematical and statistical models in planning; models used in evaluating and managing public projects and programs; models used for the optimization and allocation of resources and economic activity; linear and nonlinear trend extrapolation techniques; and models used in regional income and employment analysis. The course has four student learning objectives:

1. To gather, analyze, and interpret secondary data used in planning;

2. To promote confidence in supporting written arguments with quantitative reasoning;

3. To become proficient in using computer spreadsheets; and

4. To gain a critical perspective of how models are used in urban and regional planning.

Prerequisites

The course assumes that students have had mathematical training in basic algebra and the use of logarithms, as well as exposure to descriptive and inferential statistics such as Plan 601, Econ 321, Pols 310, Geog 380, Psy 210, Soc 475, or the equivalent. Knowledge of computer spreadsheets (e.g., Excel) is essential for completion of all homework assignments. If you need a tutorial on spreadsheets, please inform the instructor.

Course Requirements

The course uses a lecture and class discussion format. Lectures are based on assigned readings listed in the attached Class Schedule. Course requirements include:

	Points
Six homework assignments	500
Class participation	50
Term paper proposal	30
Term paper	170
Mid-term exam	100
Final exam	150
	1000

Homework assignments will be distributed in class and should be submitted at the end of class on the dates indicated in the Class Schedule. Written tutorials will be distributed to help students develop math and computer skills needed to do the homework assignments and possibly the term paper. Tutorials will not be graded.

Students are expected to participate in class discussions and to stay current in the readings. Students who participate regularly in class are more likely to receive a better grade for the course.

Both examinations will cover topics discussed in the lectures, readings and homework assignments. Examinations will consist of multiple-choice questions and short problems similar but less complex than the homework assignments. The instructor will review pertinent topics on the exam during the class period prior to the exam. Bring pencils, erasers, and a well-charged, battery-operated calculator to each exam. Students will not be allowed to use computers or smart phones during exams.

Grading Policy

The following table shows the minimum points needed to earn certain grades:

Grade	Points
A+	976
A	926
A-	900
B+	876
B	826
B-	800
C+	776
C	726
C-	700
D	600

Incomplete grades will be given only if you have compelling reasons, such as extended illness or unexpected overseas travel. Please notify the instructor whenever you must be absent from classes for an extended period. Time management is an important academic and job skill. Hence, insufficient time to complete assignments is not an adequate reason for requesting an incomplete grade.

Office Hours

My office is located in Saunders 107A. Regular office hours are from 3:00 to 4:30 p.m. on Mondays and from 4:30 to 6:00 p.m. on Tuesdays. If these hours are not convenient, please make an appointment. At the university, I can be reached by telephone (956-8684), facsimile (956-6870), and e-mail (flachsba@hawaii.edu). Please leave a voice mail message if I am not in the office. If you send assignments to me by facsimile, please note that the department may assess page charges. Please do not submit written assignments as attachments to e-mail messages unless instructed to do so.

Lecture Notes

I am willing to share digital copies of his lecture notes with students upon request. These notes may include topics that will not be presented or discussed in class. Please pick up handouts distributed in classes that you are unable to attend.

Readings

Several lectures are based on the following textbooks. These books are not on sale at the University Bookstore, but they will be on the reserve shelf in the Wong Audio Visual Center on the third floor of Sinclair Library.

Klosterman, Richard E. 1990. *Community Analysis and Planning Techniques*. Rowman & Littlefield Publishers, Inc., Savage, Maryland.

Krueckeberg, Donald A. and Arthur L. Silvers. 1974. *Urban Planning Analysis: Methods and Models*. John Wiley and Sons, New York, New York. pp. 288-317 and 389-406.

Stanley K. Smith, Jeff Tayman, and David A. Swanson. 2001. *State and Local Population Projections: Methodology and Analysis*. Kluwer Academic/Plenum Publishers, New York, New York.

Wang, Xinhao and Rainer vom Hofe. 2007. *Research Methods in Urban and Regional Planning*. Springer and Tsinghua University Press, Beijing, China.

Listed below are assigned readings in the Course Reader (CR). In the Class Schedule, the symbol (CR) appears after pages assigned from these readings. I will transfer a digital file of the Course Reader, which is about 147 MB in size, to your thumb drive.

Armstrong, Harvey and Jim Taylor. 2000. *Regional Economics and Policy, Third Edition*. Blackwell, Malden, Massachusetts. Ch. 1.

Cartwright, Timothy J. 1993. *Modeling the World in a Spreadsheet: Environmental Simulation on a Microcomputer*. The Johns Hopkins University Press, Baltimore, Maryland. pp. 1-16.

Catanese, Anthony J. 1972. *Scientific Methods of Urban Analysis*. University of Illinois Press, Urbana, Illinois. pp. 155-185 & 251-278.

Dickey, John W. and Thomas M. Watts. 1978. *Analytic Techniques in Urban and Regional Planning*. McGraw Hill, New York, New York. pp. 124-131 & 165-184.

Gabbour, Iskandar. 1993. "SPOP: Small-area population projection," In: *Spreadsheet Models for Urban and Regional Analysis*. Richard E. Klosterman, Richard K. Brail, and Earl G. Bossard, editors. Center for Urban Policy Research, New Brunswick, New Jersey. pp. 69-84.

Gaber, John. 2007. "Simulating planning: SimCity as a pedagogical tool," *Journal of Planning Education and Research* 27(2): 113-121.

Isserman, Andrew M. 1984. "Projection, forecast, and plan: On the future of population forecasting. *Journal of the American Planning Association* 50 (2): 208-221.

Iverson, Scott C. 1985. *Quantitative Methods for Public Administration in Developing Countries*. John Wiley & Sons, New York, New York. Ch. 5.

Kelso, William A. 1984. "Analytic Techniques in Public Sector Decision Making," *Decision Making in the Public Sector*. Lloyd G. Nigro, editor. Marcel Dekker, Inc., New York, New York. pp. 9-42.

Klosterman, Richard E. 2013. "Perspective: Lessons learned about planning: Forecasting, participation, and technology." *Journal of the American Planning Association* 79 (2): 161-170.

Krueckeberg, Donald A. and Arthur L. Silvers. 1974. *Urban Planning Analysis: Methods and Models*. John Wiley and Sons, New York, New York. pp. 288-317 and 389-406.

Leach, John. 1993. "Seven steps to better writing," *Planning* 59 (6): 26-27.

Meier, Kenneth J. 1984. "The Limits of Cost-Benefit Analysis," *Decision Making in the Public Sector*. Lloyd G. Nigro, editor. Marcel Dekker, Inc., New York, New York. pp. 43-63.

Patton, Carl V. 1986. "Being roughly right rather than precisely wrong: Teaching quick analysis in planning curricula," *Journal of Planning Education and Research* 6 (1): 22-29.

Patton, Carl V. and David S. Sawicki. 1993. *Basic Methods of Policy Analysis and Planning, 2nd edition*. Prentice-Hall, Englewood Cliffs, New Jersey. pp. 275-289 & 332-359.

Sassone, Peter G. and William A. Schaffer. 1978. *Cost-Benefit Analysis: A Handbook*. Academic Press, New York, New York. Ch. 6.

Steiner, Henry Malcolm. 1996. *Engineering Economic Principles*. McGraw-Hill, New York, New York. pp, 69-88.

Thompson, Gerald E. 1972. *Statistics for Decisions: An Elementary Introduction*. Little, Brown and Co., Boston, Massachusetts. pp. 67-88.

Wachs, Martin. 1989. "When planners lie with numbers," *Journal of the American Planning Association* 55 (4): 476-479.

Wachs, Martin. 2001. "Forecasting versus envisioning," *Journal of the American Planning Association* 67 (4): 367-372.

White, Michael J., et al. 1985. *Managing Public Systems: Analytic Techniques for Public Administration*. University Press of America, New York, New York. Ch. 7.

Reserved Readings

Some of the assigned readings in the Class Schedule can be found on the reserve shelf of the Wong Audio Visual Center on the third floor of Sinclair Library (SL).

Brail, Richard K., editor. 2008. *Planning Support Systems for Cities and Regions*. Lincoln Institute of Land Policy. Cambridge, Massachusetts.

Brail, Richard K. and Richard E. Klosterman, editors. 2001. *Planning Support Systems: Integrating Geographic Information Systems, Models, and Visualization Tools*. ESRI Press Books, Redlands, California.

Cartwright, Timothy J. 1993. *Modeling the World in a Spreadsheet: Environmental Simulation on a Microcomputer*. The Johns Hopkins University Press, Baltimore, Maryland.

Klosterman, Richard E. 1990. *Community Analysis and Planning Techniques*. Rowman & Littlefield Publishers, Inc., Savage, Maryland.

Klosterman, Richard E., Richard K. Brail, and Earl G. Bossard. 1993. *Spreadsheet Models for Urban and Regional Analysis*. Center for Urban Policy Research, Rutgers, the State University of New Jersey, New Brunswick, New Jersey.

Krueckeberg, Donald A. and Arthur L. Silvers. 1974. *Urban Planning Analysis: Methods and Models*. John Wiley and Sons, New York, New York. pp. 288-317 and 389-406.

Smith, Stanley K., Jeff Tayman, and David A. Swanson. 2001. *State and Local Population Projections: Methodology and Analysis*. Kluwer Academic/Plenum Publishers, New York, New York.

Homework Assignments

The purpose of the six homework assignments is to develop your analytical skills in the use of quantitative methods and models in planning applications. These assignments will be distributed in class throughout the semester. Students may discuss and work together on these assignments but must submit independent work. Unless otherwise indicated, please submit each assignment after class on the date shown in the Class Schedule. Do not send completed assignments to the instructor by e-mail.

Please show all work in an organized format and underline or highlight final answers to each question. You do not need to type your work if you can write or print legibly. Attach pages with a staple or paper clip in the upper left-hand corner. About 20 percent of the maximum value of the assignment will be deducted for each school day that your assignment is late. This rule is necessary to be fair to students who submit their assignments on time.

Graded assignments will usually be returned within a week after the due date. Any assignment submitted after it has been graded and returned will be considered "very late." The maximum points that can be earned for a "very late" assignment are half the indicated point value of the assignment. Exceptions may be granted in cases involving extended absence from class due to illness or comparable reasons.

Term Paper

The term paper will give you an opportunity to develop your own planning model, support written arguments with quantitative reasoning, and instill a critical perspective of models used in planning applications. For this paper, you may either (A) develop a model using secondary data that allows you to analyze or understand a current planning problem, or (B) analyze and evaluate a model developed by someone else. Each option is described in more detail below. Please consult with the instructor prior to finalizing a topic.

The first task will be to describe your topic in a brief memorandum, which is due on the date shown in the Class Schedule. This memo should not exceed three pages. The proposal should contain:

a preliminary title
the purpose and scope of your project
why you think the topic is important
questions you intend to answer
how you intend to accomplish the work
anticipated data sources
some preliminary references

This memo will help me to assist you with your topic and offer suggestions. Do not propose a project that cannot be finished this semester. Once I have approved the topic, continue your research and write the paper. Unless you receive permission, the final paper should not exceed 12 double-spaced pages with one-inch margins (not counting tables, figures, references, and appendices which should be attached at the end of the paper), using a legible font (e.g., 12 point). Appearance, format and writing style count, because they are important in professional planning practice. Please read the following article, which is in the Course Reader, on how to improve your writing skills. The term paper is due on the date shown on the Class Schedule.

Leach, John. 1993. "Seven steps to better writing," *Planning* 59 (6): 26-27.

Term papers will be penalized 10 percent of their maximum point value for each working day that the assignment is late. The two options for the term project are described below.

A. Model Development

This option is better suited to students who have completed Plan 601 or equivalent, as well as students who are doing research on a master's thesis or a doctoral dissertation that involves the analysis of quantitative data. This option will allow you to further develop skills that you learn in Assignments #2-1 and #3-1. Knowledge of statistical software (e.g., SAS, SPSS) may be necessary to develop your model.

In this option you will develop a multivariate regression model or models that help you understand and analyze a planning problem. The problem should involve forecasting future employment, population, travel behavior, housing supply/demand, or energy, environmental or social phenomena. Please use annual historical data available from secondary sources, such as:

State Department of Business, Economic Development and Tourism. *State of Hawai'i Data Book*. Honolulu, Hawaii. (Spreadsheets of various tables in this book can be found at this Web site: Hawaii.gov/dbedt/info/economic/databook/.)

Stacy C. Davis, Susan W. Diegel, and Robert G. Boundy. 2014. *Transportation Energy Data Book. Edition 33. ORNL-6989*. Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee. (Spreadsheets of various tables in this book can be found at this Web site: cta.ornl.gov/data.)

Begin by defining an urban or environmental problem and important elements of a system affecting that problem. Describe a simple conceptual model of 10 to 12 interrelated

elements or factors of the system and illustrate your description with a diagram. Identify the elements of the system that are amenable to measurement using secondary data. Identify the independent and dependent variables. For independent variables, state which could be controlled or influenced by public policy, which are affected by the private sector, and which variables are beyond human control.

Next, collect and "clean" the data for the variables in your models. Assess the extent of missing data for each variable and determine whether any variables are highly correlated using appropriate statistical measures. Then develop the parameters for several, multivariate regression models using your data set and suitable computer software (e.g., SAS, SPSS). Evaluate and interpret the results of your models and make recommendations on how they could be improved.

B. Model Evaluation

This option will enable you to become familiar with quantitative models used in urban and regional planning. There are three choices for this option:

1. Planners use models for forecasting and evaluation in various fields of planning including economic development, environmental protection, housing, resource management, and transportation. With assistance from the instructor, select a model used by a governmental agency or its consultant, or a model discussed in the planning literature, such as those listed below:

   Bartholomew, Keith and Reid Ewing. 2009. "Land use-transportation scenarios and future vehicle travel and land consumption: A meta-analysis," *Journal of the American Planning Association* 75 (1): 13-27.

   Bento, Antonio M., Maureen L. Cropper, Ahmed Mushfiq Mobarak, Katja Vinha. 2005. "The effects of urban spatial structure on travel demand in the United States," *The Review of Economics and Statistics* 87 (3): 466-478.

   Boarnet, Marlon G. and Randall Crane. 2001. "Chapter 5: An Empirical Study of Travel Behavior," in *Travel by Design: The Influence of Urban Form on Travel*. Oxford University Press, Oxford, England.

   Boarnet, Marlon G., Michael Greenwald, and Tracy E. McMillan. 2008. "Walking, urban design, and health: Toward a cost-benefit analysis framework," *Journal of Planning Education and Research* 27 (3): 341-358.

   Brail, Richard K., editor. 2008. *Planning Support Systems for Cities and Regions*. Lincoln Institute of Land Policy. Cambridge, Massachusetts. [Select one chapter.]

   Buehler, Ralph. 2010. "Transport policies, automobile use, and sustainable transport: A comparison of Germany and the United States," *Journal of Planning Education and Research* 30 (1): 76-93.

Calthorpe, Peter. 2011. *Urbanism in the Age of Climate Change*. Island Press, Washington, D.C. [The model is described in Calthorpe Associates 2011 below.]

Calthorpe Associates. 2011. Rapid Fire Model Technical Summary Model Version 2.0. San Francisco, California. [The instructor has a pdf of this report.]

Cervero, Robert. 2006. "Alternative approaches to modeling the travel-demand impacts of smart growth," *Journal of the American Planning Association* 72 (3): 285-295.

Chatman, Daniel G. 2013. "Does TOD need the T? On the importance of factors other than rail access," *Journal of the American Planning Association* 79 (1): 17-31.

Donegan, Mary, Joshua Drucker, Harvey Goldstein, Nichola Lowe, and Emil Malizia. 2008. "Which indicators explain metropolitan economic performance best?" *Journal of the American Planning Association* 74 (2): 180-195.

Downs, Anthony. 2004. "Appendix D: A Spatial Model for Simulating Changes," *Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*. The Brookings Institution, Washington, D.C., and the Lincoln Institute of Land Policy, Cambridge, Massachusetts. pp. 375-389.

Dumbaugh, Eric and Robert Rae. 2009. "Safe urban form: Revisiting the relationship between community design and traffic safety," *Journal of the American Planning Association* 75 (3): 309-329.

Dumbaugh, Eric and Yi Zhang. 2013. "The relationship between community design and crashes involving older drivers and pedestrians," *Journal of Planning Education and Research* 33 (1): 83-95.

Engel, Yan, Joshua and Dylan Passmore. 2013. "Carsharing and car ownership at the building scale," *Journal of the American Planning Association* 79 (1): 82-91.

Ewing, Reid and Keith Bartholomew. 2009. "Comparing land use forecasting methods: Expert panel versus spatial interaction model," *Journal of the American Planning Association* 75 (3): 343-357.

Ewing, Reid, Keith Bartholomew, Steve Winkelman, Jerry Walters, and Don Chen. 2008. *Growing Cooler: The Evidence on Urban Development and Climate Change*. Urban Land Institute, Washington, D.C.

Ewing, Reid, Michael J. Greenwald, Ming Zhang, Meghan Bogaerts, and William Greene. 2013. "Predicting transportation outcomes for LEED projects." *Journal of Planning Education and Research* 33 (3): 265-279.

Ewing, Reid and Shima Hamidi. 2014. "Longitudinal analysis of transit's land use multiplier in Portland (OR)," *Journal of the American Planning Association* 80 (2): 123-137.

Flachsbart, Peter G. 2001. A spreadsheet analysis of home energy improvements for an affordable housing project in Hawai'i. Paper presented at the 7th International Conference on Computers in Urban Planning and Urban Management. University of Hawai'i at Manoa. Honolulu, Hawai'i.

Flachsbart, Peter G. 1999. Appendix 4.1: Methodology for estimation of numbers of people exposed to motor vehicle pollution. In: *Urban Traffic Pollution,* Dietrich Schwela and Olivier Zali, editors. E & FN Spon, London, England. pp. 127-132.

Flachsbart, Peter G. 1999. "Models of exposure to carbon monoxide inside a vehicle on a Honolulu highway," *Journal of Exposure Analysis and Environmental Epidemiology* 9: 245-260.

Flachsbart, Peter and Susan Phillips. 1980. "An index and model of human response to air quality," *Journal of the Air Pollution Control Association* 30 (7): 759-768.

Ford, Andrew. 1999. *Modeling the Environment: an Introduction to System Dynamics Modeling of Environmental Systems*. Island Press, Washington, D.C.

Forkenbrock, David J. and Lisa A. Schweitzer. 1999. "Environmental justice in transportation planning," *Journal of the American Planning Association* 65 (1): 96-111.

Frank, Lawrence D., James F. Sallis, Terry L. Conway, James E. Chapman, Brian E. Saelens, and William Bachman. 2006. "Many pathways from land use to health: Associations between neighborhood walkability and active transportation, body mass index, and air quality," *Journal of the American Planning Association* 72 (1): 75-87.

Fuguitt, Diana and Shanton J. Wilcox. 1999. *Cost-Benefit Analysis for Public Sector Decision Makers*. Quorum Books, London, England.

Gangrade, Sachin, Ram M. Pendyala, Robert G. McCullough. 2002. "A nested logit model of commuters' activity schedules," *Journal of Transportation and Statistics* 5 (2/3): 19-36.

Greene, R. W. 2002. *Confronting Catastrophe: A GIS Handbook*. ESRI Press, Redlands, California.

Guhathakurta, Subhrajit and Patricia Gober. 2010. "Residential land use, the urban heat island, and water use in Phoenix: A path analysis," *Journal of Planning Education and Research* 30 (1): 40-51.

Guo, Zhan, Asha Weinstein Agrawal and Jennifer Dill. 2011. "Are land use planning and congestion pricing mutually supportive," *Journal of the American Planning Association* 77 (3): 232-250.

Guthrie, Andrew and Yingling Fan. 2013. "Streetcars and recovery: An analysis of post-Katrina building permits around New Orleans street lines," *Journal of Planning Education and Research* 33 (4): 381-394.

Kimball, Mindy, Mikhail Chester, Christopher Gino, and Janet Reyna. 2013. "Assessing the potential for reducing life-cycle environmental impacts through transit-oriented development infill along existing light rail in Phoenix," *Journal of Planning Education and Research* 33 (4): 395-410.

Knaap, Gerrit J., Chengri Ding, and Lewis D. Hopkins. 2001. "Do plans matter? The effects of light rail plans on land values in station areas," *Journal of Planning Education and Research* 21 (1): 32-39.

Kuby, Michael, Anthony Barranda, and Christopher Upchurch. 2004. "Factors influencing light-rail station boardings in the United States," *Transportation Research Part A* 38: 223-247.

Lathey, Vasudha, Subhrajit Guhathakurta, and Rimjhim M. Aggarwal. 2009. "The impact of subregional variations in urban sprawl on the prevalence of obesity and related morbidity," *Journal of Planning Education and Research* 29 (2): 127-141.

Lee, Bumsoo and Yongsung Lee. 2013. "Complementary pricing and land use policies," *Journal of the American Planning Association* 79 (4): 314-328.

Levine, Jonathan, Joe Grengs, Qingyun Shen, and Qing Shen. 2012. "Does accessibility require density or speed?" *Journal of the American Planning Association* 78 (2): 157-172.

Li, Yanmei and Hazel A. Morrow-Jones. 2010. "The impact of residential mortgage foreclosure on neighborhood change and succession," *Journal of Planning Education and Research* 30 (1): 22-39.

Nelson, Arthur C. and David R. Peterman. 2000. "Does growth management matter? The effect of growth management on economic performance," *Journal of Planning Education and Research* 19 (3): 277-285.

Norman, Jonathan, Heather L. McLean, and Christopher A. Kennedy. 2006. "Comparing high and low residential density: Life-cycle analysis of energy use and greenhouse gas emissions," *Journal of Urban Planning and Development* March: 10-21.

Ottensmann, John R. 2000. "Applications of spreadsheet optimization capabilities in teaching planning methods: Facility location and spatial interaction," *Journal of Planning Education and Research* 20 (2): 247-258.

Renski, Henry and Susan Strate. 2013. "Evaluating alternative migration estimation techniques for population estimates and projections," *Journal of Planning Education and Research* 33 (3): 325-335.

Saunders, M. J., T. Kuhnimhof, B. Chlond, and A. N. R. da Silva. 2008. "Incorporating transport energy into urban planning," *Transportation Research Part A* 42: 874-882.

Shen, Qing. 2001. "A spatial analysis of job openings and access in a U.S. metropolitan area," *Journal of the American Planning Association* 67 (1): 53-68.

Smith, Stanley K. and Scott Cody. 1994. "Evaluating the housing unit method: A case study of 1990 population estimates in Florida," *Journal of the American Planning Association* 60 (2): 209-221.

Stone, Brian Jr., Adam C. Mednick, Tracey Holloway, and Scott N. Spak. 2007. "Is compact growth good for air quality?" *Journal of the American Planning Association* 73 (4): 404-418. [See also the companion article by Steve Winkelman in the same issue of this journal.]

Tayman, Jeff. 1996. "The accuracy of small-area population forecasts based on a spatial interaction land-use modeling system," *Journal of the American Planning Association* 62 (1): 85-98.

Thompson, Gregory L. and Jeffrey R. Brown. 2006. "Explaining variation in transit ridership in U.S. metropolitan areas," *Transportation Research Record* 1986 (1): 172-181.

Waddell, Paul. 2002. "UrbanSim: Modeling urban development for land use, transportation and environmental planning," *Journal of the American Planning Association* 68 (3): 297-314.

Wegner, Michael. 1994. "Operational urban models: State of the art," *Journal of the American Planning Association* 60 (1): 17-29.

Willson, Richard, W. and Kyle D. Brown. 2008. "Carbon neutrality at the local level," *Journal of the American Planning Association* 74 (4): 497-504.

Wineman, Jean D., Robert W. Marans, Amy J. Schulz, Diaan Louis van der Westhuizen, Graciela B. Mentz, and Paul Max. 2014. Designing healthy neighborhoods: Contributions of the built environment to physical activity in Detroit," *Journal of Planning Education and Research* 34 (2): 180-189.

Winkelman, Steve. 2007. "Could the worst of times for the planet be the best of times for planning?" *Journal of the American Planning Association* 73 (4): 418-420.

Yang, Jiawen, Steven French, James Holt, and Xingyou Zhang. 2012. "Measuring the structure of U.S. metropolitan areas, 1970-2000," *Journal of the American Planning Association* 78 (2): 197-209.

Zhang, Yang. 2010. "Residential housing choice in a multihazard environment: Implications for natural hazards mitigation and community environmental justice," *Journal of Planning Education and Research* 30 (2): 117-131.

Your paper should try to answer the following questions and whatever additional questions you think are appropriate.

- What planning problems are addressed by the model?
- What is the purpose of the model?
- What assumptions does the model make?
- What are the model's limitations?
- What are the inputs and outputs of the model?
- What are the policy relevant inputs and outputs?
- How accurate and reliable are the forecasts made by the model?
- How was or could the model be used to support planning decisions?
- How does variation in model inputs affect outputs?

2. Select a model discussed in one of the following two books on reserve at Sinclair Library. To evaluate the model, you may use the data provided by the author(s) or you may use other data if they are available. In your paper, answer the questions above (at the end of Section B-1) as appropriate.

a) Richard E. Klosterman, Richard K. Brail, and Earl G. Bossard, editors. 1993. *Spreadsheet Models for Urban and Regional Analysis*. Center for Urban Policy Research, Rutgers, the State University of New Jersey, New Brunswick, New Jersey.

This book has a companion diskette that must be used on an IBM PC. The diskette is available from the instructor. Select one of the following chapters:

Chapter 13	SMOKE: Air Pollution Dispersion
Chapter 14	RISK-EQ: Earthquake Risk Analysis
Chapter 15	MANAGER: Project Management
Chapter 17	AHP: Multiple Criteria Evaluation
Chapter 19	REIA: Real Estate Investment Analysis
Chapter 20	TRANSIT: Guideway Systems Cost Estimation
Chapter 21	RETAIL: Retail Trade Spatial Interaction

b) Timothy J. Cartwright. 1993. *Modeling the World in a Spreadsheet: Environmental Simulation on a Microcomputer*. The Johns Hopkins University Press, Baltimore, Maryland.

This book does not have a companion diskette. First, read the introduction, "Simulation Modeling and Spreadsheets" on pages 1-16. Then select one of the following chapters listed below and build the model discussed in that chapter using a computer spreadsheet. The recipe to build the model appears in the appendix. Run the model using data provided by the author to verify that you have correctly constructed the model. Then test the sensitivity of the model's outputs to different inputs. Discuss the model and your results in the paper. Choose your model from one of the following chapters:

Chapter 1	Blowing Smoke: Atmospheric Dispersion of Air Pollution
Chapter 2	Running Water: The Underground Transport of Pollutants
Chapter 4	Sustainable Yield: Managing the Forest for the Trees
Chapter 5	Here Comes the Sun: Energy from a Flat-Plate Collector
Chapter 6	Macroeconomic Policy: Econometrics and the Klein Model
Chapter 7	Urban Form: The Lowry Model of Population Distribution
Chapter 8	Affordable Housing: The Bertaud Model
Chapter 9	Traffic on the Roads: Modeling Trip Generation and Trip Distribution
Chapter 10	Throwing Things Away: A Model for Waste Management
Chapter 11	Multi-Criteria Analysis: An Environmental Impact Assessment Model

3. Become familiar with a simulation game such as SimCity or SimEarth. A brief description of each follows:

a) In SimCity, you make decisions on zoning, balancing budgets, installing utilities, manipulating the city's economy, and controlling crime, traffic and pollution. You can create your own city or start with different pre-built cities.

b) In SimEarth, you work with a model of the earth's ecosystems to learn about the interdependence of our planet's physical and ecological systems. Some knowledge of the earth's ecosystem is necessary to play SimEarth.

If you choose Option B-3, do the following:

- Briefly review the origin and evolution of simulation games.

- Select one aspect of the game (e.g., pollution in SimCity or global warming in SimEarth) and create a conceptual diagram that includes both the important variables involved and the functional relationships between them.

- Describe the specific strengths and weaknesses of the simulation. Suggest ways the simulation could be improved to remove weaknesses.

- Evaluate the overall reality of the simulation. Determine whether any important variables or functional relationships are missing from the game.

- Recommend how the simulation could be used in planning, both as an educational tool and as a means to inform or make policy decisions.

Here are four references for this option:

Bremer, Michael. 1990. *SimEarth: The Living Planet User Manual*. MAXIS, Moraga, California.

Dargahi, Nick. 2005. *Simearth Strategies and Secrets*. Sybex Inc., a division of John Wiley & Sons, Hoboken, New Jersey.

Gaber, John. 2007. "Simulating planning: SimCity as a pedagogical tool," *Journal of Planning Education and Research* 27 (2): 113-121. [This article is toward the front of the Course Reader.]

Kramer, Greg. 2007. SimCity Societies: Prima Official Game Guide. Prima Games, a division of Random House, Roseville, California.

Calculator and Personal Computer

You will need a calculator and access to a personal computer to complete the homework assignments and term project. Microsoft Excel will be the standard computer software for this course. In addition to the department's computer lab in Saunders 112, there are PC and Mac labs on campus. Bring your calculator to class for in-class exercises and during examinations. Laptop computers will not be allowed during exams, but may be used during lectures. If you need to purchase a calculator, buy one that has the following basic key functions:

standard arithmetic operations (+ - x ÷)
logarithmic and exponential functions of numbers
mean and standard deviation of a set of numbers
powers and roots of numbers
reciprocals of numbers