

DEPARTMENT OF CITY AND REGIONAL PLANNING

University of North Carolina at Chapel Hill

PLAN 745: Development Impact Assessment

Professor Todd BenDor

Email: bendor@unc.edu

Phone: 962-4760

Office Hours: 4:00 – 5:00 M, and by Appt. (please email to confirm availability)

Office: New East 307

Spring 2016

11:15 – 12:30 MW (New East 301)

Lab (Field Trips): 9:30 –10:45 T

Course website: <http://sakai.unc.edu>

Teaching Assistant: Jane Zhao

Email: janezhao@live.unc.edu

Office Hours: 12:45-1:45 MW

Office: 2nd Floor computer lab in New East

Objectives

This course provides intensive instruction in methods for predicting, evaluating, and mitigating potential adverse impacts of land development projects, particularly as they affect urban infrastructure. Our purpose is to promote basic skills in using impact assessment techniques, foster the ability to apply those techniques to the assessment of impacts from actual development projects, and develop skills in reporting impact assessment analyses, findings, and recommendations in a competent, professional manner.

Development impact assessment methods are used in a variety of ways in public and private planning, including evaluation of land use planning alternatives, assessment of private and public development proposals, and marketing of development proposals. By analyzing and discussing various examples of those applications, the course will help develop an appreciation of the strengths and limitations of various impact assessment approaches in specific applications.

Course Format and Requirements

The course will meet for two sessions each week. Sessions on Mondays and Wednesdays will include lectures and discussion of key concepts covered in lectures and assigned readings. Occasional lab sessions will additionally consist of field trips and guest speakers. While the lectures, labs, and readings are important, an equally critical aspect of learning in this course comes from student preparation of a comprehensive impact assessment for a large proposed mixed-use development project.

Course requirements include: (1) class attendance and participation; and (2) completion of a comprehensive impact assessment for a large mixed-use project. Although participation in them will not be required, the field trips, guest speakers, and discussions that occur during lab sessions will be useful in answering questions for the assignments.

Students will conduct a comprehensive assessment by analyzing eight potential impacts (grouped into 6 modules) of a proposed mixed-use project and combining the assessments into a comprehensive report. This report will detail a set of your personal recommendations to the town manager for dealing with the impacts you have identified. Each section of the comprehensive impact assessment is prepared by students working as *individual* analysts and will be graded separately.

Detailed instructions and data for the comprehensive impact assessment exercises are provided on Sakai (<http://sakai.unc.edu>).

Course Grading

Students are required to:

- 1) Complete 6 mandatory sections of the comprehensive report (60%);
- 2) Participate in class discussions and attend lecture regularly (15%), and;
- 3) Complete a final comprehensive report with corrections to sections of the report completed earlier in the semester and final recommendations in the form of a memo to the town manager (25%). The final impact assessment report will be graded based on completion of additional sections (title page, contents, memorandum of town manager with your personal recommendations) *and* upon inclusion of corrected versions of reports prepared earlier in the semester with a note to the instructor indicating the specific corrections that have been made.

Grading Notes: Generally, *H* work goes beyond the bare minimum requirements (e.g., reports results of sensitivity analyses of key assumptions, models changes proposed as mitigation, or includes outstanding maps and illustrations of results). *L* or *F* work substantially fails to meet minimum requirements either due to incomplete coverage of required information, inaccurate or improper analysis, or sloppy/unprofessional reporting of results.

- Students are expected to complete all assignments individually. Discussions with classmates about assignments are encouraged, but all final work must be entirely your own.

Policy on Late or Incomplete Work: As a matter of departmental policy, and in order to be fair to your fellow students (particularly in light of the extensive time requirements of this course), late assignments will not ordinarily be accepted.

- No extensions will be given.
- Zero points will be assigned to work not turned in on time.

IF YOU HAVE A MEDICAL EMERGENCY, PLEASE INFORM THE INSTRUCTOR AS SOON AS POSSIBLE. Grades of incomplete may be given in the event of a medical or other emergency. In these cases, a written application for an incomplete on any assignment must state the reasons for the request and propose a new deadline.

Other Academic Business

- Please turn off your cellphones before entering class.

Missing Class: Students are permitted to miss class for EXCUSABLE absences only (for details about what an excused absence is, see UNC-Chapel Hill's attendance policy below).

Resources: Our purpose as professors is to help you to excel in this learning environment. Should you need further assistance beyond the help of the professor, please consult the following on-campus resources:

- The Writing Center: <http://www.unc.edu/depts/wcweb/>
- Academic Success Program (for students with learning disabilities (LD) and/or attention-deficit/hyperactivity disorder (ADHD): <http://www.unc.edu/depts/lds/>
- Learning Center: <http://www.unc.edu/depts/acadserv/learn.html>
- Counseling and Wellness Services: <http://campushealth.unc.edu>
- UNC's Attendance Policy: http://www.unc.edu/ugradbulletin/procedures1.html#class_attendance

The University's Honor Code is in effect. The University of North Carolina at Chapel Hill has had a student-administered honor systems and judicial system for over 100 years. The Honor Code represents UNC-Chapel Hill students' commitment to maintain an environment in which students respect one another and are able to attain their educational goals. As a student at Carolina, you are entering a community in which integrity matters--integrity in the work you submit, and integrity in the manner in which you treat your fellow Carolina community members. Because academic honesty and trustworthiness are important to professional planning, this is a significant University and Departmental tradition.

Your attention is called to the Instrument of Student Judicial Governance for policies and procedures pertaining to the honor system. We are committed to treating Honor Code violations seriously and urge all students to become familiar with its terms set out at <http://honor.unc.edu/honor/code.html>. If you have questions it is your responsibility to ask the professor about the Code's application. Please consult with the instructor if you are uncertain about your responsibilities under that code with respect to this course.

The professor reserves the right to make changes to the syllabus, including project due dates, when unforeseen circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.

The University of North Carolina – Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in difficulties with accessing learning opportunities. All accommodations are coordinated through the Accessibility Resources and Service Office. Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately early in the semester to discuss your specific needs. Students with documented disabilities should contact the Department of Disability Services at 919-962-8300 (SASB North, Suite 2126) to coordinate reasonable accommodations.

All the Important Deadlines

Deadlines for completion of each section of the report and points available for it are as follows:

Interim reports (10 points each)

1. Introduction: February 10
 2. Public Service Impacts: February 17
 3. Traffic level of service impacts: March 3
 4. Water supply and wastewater impacts: March 23
 5. Stormwater discharge impacts: April 18
 6. Climate Change impacts: April 28 (as part of Final report)
 7. Final impact assessment report and memo to town manager: April 28 (5 pm in TA's box)
- All reports (except for the last) are to be turned in at the end of class on the date they are due. To be fair to your fellow students, exceptions will only be made in case of documented illness or family emergency.

Tentative Lab Schedule:

March 2: Water Treatment Plant Field Trip – details TBA

March 22: Wastewater Treatment Plant Field Trip – details TBA

ALTHOUGH WE WILL AIM TO KEEP WITH THE SCHEDULE IN THIS SYLLABUS, IT MAY CHANGE

Topic Outline and Schedule

I. Background and Basic Concepts in Development Impact Assessment

Overview of course

1. Introduction to the comprehensive impact assessment exercise and report
2. Key choices: (1) conduct an impact assessment?, (2) approach employed, (3) impacts evaluated, and (4) methods used
3. Key choices: (5) standards adopted, (6) mitigation required, (7) monitoring and enforcement procedures
4. Overview of GIS methods

II. Estimating the Impacts of Development

5. Public Services
6. Traffic level of service
7. Water supply
8. Wastewater
9. Stormwater
10. Habitat and Wetlands
11. Climate change

III. Putting It All Together

12. Course review, feedback, and discussion of final impact assessment reports
13. Submission of final impact assessment reports

Reading Material and Assignment Background Information

Required Textbook: Elmer, Vicki and Adam Leigland. 2014. *Infrastructure Planning and Finance: A Smart and Sustainable Guide*. Routledge.

Available in the Bookstore and on Amazon

Additional reading selections that elaborate on concepts presented in lectures as well as detailed instructions for completing required sections of the impact assessment report are available on Sakai.

Assignment instructions include background information, methods, and data that you would normally assemble from a wide variety of sources. To make the impact assessment feasible to conduct in a very short period of time, this material is pre-packaged.

For each course topic a key required reading is provided to enhance your understanding of class lectures and for use in estimating and mitigating development impacts. Following each required reading, additional resources are listed that can be examined in detail depending upon your interest in the subject. I recommend downloading and reading through all of the materials, as they may serve you as useful references during future classes or in your career.

I. Background and Basic Concepts in Development Impact Assessment

January 11: *Overview of course*

R.K. Jain, et. al. "Introduction". *Environmental Assessment, 2nd Edition*. New York: McGraw-Hill, 2002, pp. 1-12

Mary M. Edwards, "Chapter 1, Introduction" and "Chapter 6, Putting It All Together," in *Community Guide to Development Impact Analysis*," Madison, WI: Wisconsin Land Use Program, University of Wisconsin-Madison, March 2000, pp. 3-7 and 73-76.

Richard K. Morgan. 2012. Environmental impact assessment: the state of the art. *Impact Assessment and Project Appraisal*, 30(1): 5-14.

For those of you new to planning and need a good overview of planning and infrastructure relationship: Elmer and Leigland Textbook: Chapter 3 (Growth, Demand, and the Need for Infrastructure) and Chapter 5 (Local Plans and Infrastructure)

January 13: *Introduction to Course Case Study* - **Field Trip to Roberson Square Site During Class Hours**

Meet at:

Open Eye Café (Directly north of Roberson Square study site)
101 South Greensboro Street
Carrboro, NC 27510-2338
(919) 968-9410

Robert W. Burchell, et al., "Environmental Setting," in *Development Impact Assessment Handbook*, Washington, DC: Urban Land Institute, 1993, pp. 38-41.

Robert D. Sculley, "A Basic Strategy for EIR Preparation," San Francisco, CA: Tetra Tech, Inc., October 1998.

Additional resources:

Bruce Hendler, *Caring for the Land*, Planning Advisory Service Report No. 328. Chicago: American Planning Association, 1977, pp. 5-65.

Also note that a variety of resources related to the Roberson Square impact assessment are available on Sakai. These resources will help you understand the project and complete the first assignment.

January 18: MLK HOLIDAY – No CLASS

January 20: *Key choices: (1) Whether to Conduct Impact Assessments; (2) Approach Employed; (3) Impacts Evaluated, (4) Methods Used*

Overview: Elmer and Leigland Textbook: Chapter 7 (Smart and Sustainable Development Rules)

Edward J. Kaiser, David R. Godschalk, and F. Stuart Chapin, Jr., "Development Proposal Evaluation," in *Urban Land Use Planning*, Fourth Edition, Urbana, IL: University of Illinois Press, 1995, pp. 438-453.

Leonard Ortolano, "Chapter 16: Forecasting Environmental Effects of Proposed Projects and Regulatory Actions," *Environmental Regulation and Impact Assessment*, New York: John Wiley and Sons, Inc., 1997, pp. 347-373.

Vicki Elmer and Adam Leigland. "Chapter 14: Exactions and Impact fees," pp. 227-245 in *Infrastructure Planning and Finance: A Smart and Sustainable Guide*. Routledge, 2013.

Additional resources providing an overview of development impact assessment:

California Environmental Quality Act (CEQA) model: Robert Olshansky. "The California Environmental Quality Act and Local Planning". *Journal of the American Planning Association*. Vol. 62, No. 3, Summer 1996, pp. 313-330

North Carolina State Environmental Policy Act (SEPA): N.C. Department of Administration. "Environmental Assessment Guidelines". March 1999, pp. 1-7.

Developer perspectives: Robert W. Burchell, et al., "Chapter 2: Legal and Administrative Considerations," in *Development Impact Assessment Handbook*, Washington, DC: ULI-the Urban Land Institute, 1994, pp. 16-25.

Zhao Ma, Dennis R. Becker, and Michael A. Kilgore. 2009. Characterising the landscape of state environmental review policies and procedures in the United States: a national assessment. *Journal of Environmental Planning and Management* 52(8): 1035-1051.

Additional resources:

Tim Snell and Richard Cowell. "Scoping in environmental impact assessment: Balancing precaution and efficiency?" *Environmental Impact Assessment Review*, Volume 26, Issue 4, May 2006, Pages 359-376.

Thomas D. Boston. "The Effects of Revitalization on Public Housing Residents: A Case Study of the Atlanta Housing Authority". *Journal of the American Planning Association*. Vol. 71, No. 4, December 2005, pp. 393-407.

January 25 - February 1: *Geographic Information Systems (GIS) for Impact Assessment*

***This section will be guest taught by Philip McDaniel, the UNC GIS Librarian. We will be meeting in Davis Library Room 247. ***

***Students are encouraged to enroll in the free Environmental Systems Research Institute (ESRI) Virtual Campus course entitled "Learning ArcGIS Desktop." This course will augment the GIS overview section of this course and consists of 8 modules scheduled to take 24 hours. This course is very well laid out and can be completed on your own. Module 1 can be skipped if you feel you completed the GIS work in PLAN 714 and/or the planning GIS

Bootcamp successfully. The course can be accessed at: <http://www.esri.com/training/main>. IDs and Passwords used to access the course can be accessed by emailing the UNC GIS Librarian, Philip McDaniel at pmmcdani@email.unc.edu.***

Kang-tsung Chang. Chapter 1 – Introduction, pp. 1-10; Chapter 3 – Vector Data Model, pp. 31-49; and Chapter 6 – Attribute Data Input and Management, pp. 100-113 in *Introduction to Geographic Information Systems*, Boston: McGraw-Hill, 2002.

Additional resources:

Juliana Maantay and John Ziegler. "Map projections and coordinate systems," Chapter 2 – Spatial Data and Basic Mapping Concepts, pp. 39-53 and Chapter 6 – Sources of Urban Data, pp. 157-177 in *GIS for the Urban Environment*. Redlands, CA: ESRI Press, 2006.

Agustin Rodriguez-Bachiller with John Glasson. "GIS and Impact Assessment" (Chapter 3), pp. 52-80 in *Expert Systems and Geographic Information Systems for Impact Assessment*. London: Taylor and Francis, 2004.

Robert B. Kent and Richard E. Klosterman. 2000. GIS and Mapping: Pitfalls for Planners. *Journal of the American Planning Association* 66(20): 189-198

February 3: *Key choices: (5) standard, (6) mitigation, (7) monitoring and enforcement*

Carissa Schively Slotterback. Evaluating the Implementation of Environmental Review Mitigation in Local Planning and Development Processes. *Environmental Impact Assessment Review*, 2008 (article in press, accepted January 3, 2008).

David P. Lawrence. Impact Significance Determination – Back to basics. *Environmental Impact Assessment Review*, 27, 2007, pp. 755–769.

Elmer and Leigland Textbook: Chapter 4 (Institutions of Infrastructure: The Providers) and Chapter 8 (Developing the Public Infrastructure Project)

Examples of Master Environmental Assessments on Sakai:

World Trade Center: Lower Manhattan Development Corporation. 2004. The World Trade Center Memorial and Redevelopment Plan Final Generic Environmental Impact Statement. [Online]. Available: http://www.renewnyc.com/plan_des_dev/environmental_impact_contents_april2004.asp

Domestic Example: City of Lakewood, CA. 2007. Master Environmental Assessment (MEA) for the City of Lakewood Comprehensive General Plan.

International Example: Dublin Docklands Development Authority. 2003. Dublin Docklands Area: Strategic Environmental Assessment of the Draft Master Plan. [Online]. Available: <http://www.dublindocklands.ie/files/business/docs/seareportfinal030603.pdf>

Additional resources: Elmer and Leigland Textbook: Chapters 9-15 provide a comprehensive overview of infrastructure financing

II. Estimating the Impacts of Development

February 8, 10: *Public Service impacts*

Overview: Elmer and Leigland Textbook: Chapter 25 (Public Schools as Public Infrastructure) and 21 (Parks, Recreation, and Open Space)

School impacts:

Larry W. Canter. "Education Services Impacts," pp. 519-525 in Chapter 14 – Prediction and Assessment of Impacts on the Socioeconomic Environment, *Environmental Impact Assessment, 2nd Edition*. New York: McGraw-Hill Science/Engineering/Math, 1995.

Mary M. Edwards, "Worksheet 4.5: Education and Libraries" in *Community Guide to Development Impact Analysis*," Madison, WI: Wisconsin Land Use Program, University of Wisconsin-Madison, March 2000, pp. 104 (A20).

Parks and recreational facility impacts:

Sue Enger. "Parks/Open Space/Recreation Facilities Standards," pp. 21-37 in *Level of Service Standards - Measures for Maintaining the Quality of Community Life*. Report No. 31, Municipal Research and Services Center of Washington, September 1994.

James D Mertes and James R. Hall. "Section 3: Level of Service Guideline for System Planning." *Park, Recreation, Open Space, and Greenway Guidelines*, National Recreation and Park Association: Lubbock, TX, 1995

On Reserve in Planning Library: James D Mertes and James R. Hall. *Park, Recreation, Open Space, and Greenway Guidelines*, National Recreation and Park Association: Lubbock, TX.

Public safety impacts:

Larry W. Canter, Samuel F. Atkinson, and F. Larry Leistritz, "Police and Fire Protection," pp. 104-117 in *Impact of Growth: A Guide for Socio-Economic Impact Assessment and Planning*, Chelsea, MI: Lewis Publishers, Inc., 1985.

Mary M. Edwards, "Worksheet 4.4: Public Safety" in *Community Guide to Development Impact Analysis*," Madison, WI: Wisconsin Land Use Program, University of Wisconsin-Madison, March 2000, pp. 103 (A19).

February 15-24: *Traffic level of service impacts*

***This section will be guest taught by Joshua Reinke / Staff, Traffic Engineering Consultants at Ramey Kemp and Associates, Inc. ***

Overview: Elmer and Leigland Textbook: Chapter 20 (Streets and Streetscapes) and 21 (Automobiles and Mass Transit)

Methods for Predicting Traffic Impacts:

Institute of Transportation Engineers. Transportation Impact Analyses for Site Development (Student Supplement), 2006.

Papacostas, P. and P. Prevedouros. "Traffic Impact and Parking Studies". Transportation Engineering and Planning, 3rd edition. Upper Saddle River, NJ: Prentice-Hall, Inc. Chapter 9: Traffic Impact and Parking Studies, 2001, pp. 456-497.

Additional resources:

Numerous Examples of Traffic Impact Assessment Reports are located on Sakai.

U.S. Department of Transportation, Federal Highway Administration. "Chapter 4C. Traffic Control Needs Studies". *Manual on Uniform Traffic Control Devices, 2003 Edition with Revisions 1 and 2, December 2007.*

Examples of Traffic Impact Assessment Requirements: Chapel Hill, NC, Montgomery County, MD and County of Barnstable, MA

Town of Chapel Hill, "Transportation Impact Statement Guidelines", Chapel Hill, NC, October 2001.

The Maryland-National Capital Park and Planning Commission, Montgomery County Department of Park and Planning, "Local Area Transportation Review and Policy Area Mobility Review Guidelines," Silver Spring, MD, 2008. [Online]: Available: <http://www.montgomeryplanning.org/transportation/documents/LocalAreaTransportationReviewandPolicyAreaMobilityReviewGuidelines.pdf>

Cape Cod Commission, Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, County of Barnstable, MA, Revised January 9, 2003.

Additional resources:

Reid Ewing and Robert Cervero. 2001. Travel and the Built Environment: A Synthesis. *Transportation Research Record*, 1780: 87-114.

Randall Crane, "Cars and Drivers in the New Suburbs: Linking Access to Travel in Neotraditional Planning," *Journal of the American Planning Association*, (Winter 1996): 51-65.

Morten Skou Nicolaisen, and Patrick Arthur Driscoll. 2014. Ex-post evaluations of demand forecast accuracy: A literature review." *Transport Reviews* 34(4): 540-557.

February 29 - March 7: *Water supply impacts*

*** March 2: [Lab Session 1] Field trip to OWASA water treatment plant ***

*** March 7: Pat Davis (Sustainability Manager at OWASA), Guest Speaker ***

Overview: Elmer and Leigland Textbook: Chapter 16 (Water Supply)

Technical take on this topic: Haested Methods. 2007. [Computer Applications in Hydraulic Engineering: Connecting Theory to Practice \(7th edition\)](#). Bentley Systems: Exton, PA. Chapter 1 (Sections 1.1 - 1.2, 1.4 – 1.6, 1.10 – Problems 2 – 8, 13 and 14), Chapter 6 (Sections 6.1 – 6.3, 6.5, and 6.9 – 6.10 for tutorial and examples).

Additional resources:

Insurance Service Office, "Guide for Determination of Needed Fire Flow," Jersey City, NJ: Insurance Service Office, 2008.

Tony Nye and Karen Mancl. "Fact Sheet: Water Sources for Fire Protection in Small Communities." Columbus, OH: The Ohio State University Extension, 2001

Jerry A. Nathanson. "Chapter 2: Hydraulics," pp. 27-41; and "Chapter 7: Water Distribution Systems," pp 181-184, 200-211 in *Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control*. 4th ed., Englewood Cliffs, NJ: Prentice Hall, 2002.

Ronald F. Cilensek. "Water Treatment Plant Construction Cost Estimating," Ch. 26 in: American Water Works Association. *Water Treatment Plant Design, 4th edition*. New York: McGraw-Hill Professional, 2005.

March 14 – 16: Spring Break (NO CLASS)

March 21 – 23: *Wastewater impacts*

*** March 22: [Lab Session 2] Field trip to OWASA wastewater treatment plant ***

Overview: Elmer and Leigland Textbook: Chapter 17 (Wastewater and New Paradigms)

Technical take on this topic: Haested Methods, *Computer Applications in Hydraulic Engineering: Connecting Theory to Practice*, Haested Methods, Inc., 2007, Chapter 7.

Additional resources:

Ronald F. Cilensek. "Water Treatment Plant Construction Cost Estimating," Ch. 26 in: American Water Works Association. *Water Treatment Plant Design, 4th edition*. New York: McGraw-Hill Professional, 2005.

Jerry A. Nathanson. "Chapter 2: Hydraulics," pp. 41-44; and "Chapter 8: Sanitary Sewerage Systems," pp 217-231 in *Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control*. 4th ed., Englewood Cliffs, NJ: Prentice Hall, 2002.

March 28-30, April 6-April 11: *Stormwater impacts*

Overview: Elmer and Leigland Textbook: Chapter 18 (Stormwater and Flooding)

Peak Discharge Impacts:

Haested Methods, *Computer Applications in Hydraulic Engineering: Connecting Theory to Practice*, Haested Methods, Inc., 2007, Chapters 2 and 5.

Jerry A. Nathanson. "Chapter 9: Stormwater Management," pp. 251-269 in *Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control*. 4th ed., Englewood Cliffs, NJ: Prentice Hall, 2002.

(Skim, but important): Natural Resource Conservation Service (NRCS). *Urban Hydrology for Small Watersheds* (Second Edition). Washington, D.C.: U.S. Department of Agriculture, 1986

Water Quality Impacts:

Jerry A. Nathanson. "Chapter 9: Stormwater Management," pp. 269-273 in *Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control*. 4th ed., Englewood Cliffs, NJ: Prentice Hall, 2002.

John Randolph, "Chapter 13, Land Use, Stream Flow, and Runoff Pollution," pp. 392-406; 434-466 in *Environmental Land Use Planning and Management*, Washington, DC: Island Press, 2004.

Additional resources:

North Carolina Department of Natural Resources. "Selecting the Right BMP," pp. 4-1 -7 in *Stormwater Best Management Practices Manual*, July 2007.

April 13-18: *Habitat and wetland impacts*

Sharon K. Collinge. 1996. Ecological consequences of habitat fragmentation: implications for landscape architecture and planning. *Landscape and Urban Planning* 36: 59-77.

Pavel Kindlmann and Françoise Burel. 2008. Connectivity measures: a review. *Landscape Ecology* 23:879–890

Palmer Hough and Morgan Robertson 2009. Mitigation under Section 404 of the Clean Water Act: where it comes from, what it means. *Wetlands Ecology and Management* 17(1):15-33.

Greg Snowden and Vincent Messerly. 2014. Mimicking Natural Wetlands: A Recipe for Success at a Northeast Ohio Mitigation Bank. *National Wetland Newsletter*, 36(3):5-9.

Additional resources:

Todd BenDor and Martin Doyle. 2010. Planning for Ecosystem Service Markets. *Journal of the American Planning Association* 76: 59-72.

April 20: Climate change impacts

Overview: Elmer and Leigland Textbook: Chapter 27 (Energy and Power)

Padgett, J. P., Steinemann, A. C., Clarke, J. H., & Vandenberg, M. P. 2008. A comparison of carbon calculators. *Environmental impact assessment review* 28(2): 106-115.

Additional resources:

Reid Ewing, et. al. "Overview," pp. 1-16 in *Growing Cooler: The Evidence on Urban Development and Climate Change*. Washington, DC: Urban Land Institute, 2007.

Elizabeth Wilson and Jake Piper. "Chapter 2: Climate Change Mitigation and Adaptation: Impacts and Opportunities," pp. 18-43 in *Spatial Planning and Climate Change*. Routledge, 2010.

Harriet Bulkeley. "Chapter 3: Accounting for urban GHG emissions," pp. 45-70 in *Cities and Climate Change*. Routledge, 2013.

David Morley, Editor. 2014. *Planning for Solar: Promoting Solar Energy Use Through Local Policy and Action*. Planning Advisory Service Report 575. American Planning Association: Chicago, IL

Carissa S. Slotterback. 2011. Addressing climate change in state and local environmental impact analysis. *Journal of Environmental Planning and Management* 54(6): 749-767.

University of Hamburg. *Why Weather isn't the same as Climate: Ten Climate Researchers Report*. University of Hamburg. 2012.

April 25: Course wrap-up + discussion of final impact assessment report

Elmer and Leigland Textbook: Chapter 29 (A New Paradigm for Infrastructure)

April 28: *Final Roberson Square Impact Assessment Report: Due at 5pm in TA's mailbox on second floor of New East.*