SUMA K4169 Sustainability Metrics  
Instructors: Adam Freed & Aaron Koch

Course Description

Over the past two decades, various institutions, both public and private, have begun to set clear targets for environmental performance and are increasingly focusing on the use of analytical tools to assess problems and measure their progress toward sustainability. This course will address the use of metrics, data, and indicators to measure sustainability, including how they are used to shape policies and track progress.

Students will be asked to consider the strengths and limitations of quantitatively analyzing data. The course will survey a broad range of environmental challenges and evaluate the choices confronting public officials, private companies, colleges and universities, environmental advocates, and citizens.

A goal of this course is to make students acquainted with the debate, challenges, and opportunities of a changing climate. The course will focus on the solutions and responses to environmental challenges by using real world and current examples. Classes will particularly focus on the various policy initiatives and actions that policymakers are taking globally and locally, including the specific efforts of the C40 Cities (the 40 largest cities in the world) as well as New York City’s efforts through PlaNYC.

Students will be required to critically evaluate what they read and hear. In addition, the course will give students an opportunity to learn how to express their ideas verbally and in written form and conduct critical analysis of environmental data to develop and implement public policy. Assignments will give students the opportunity to use their technical and analytical skills while understanding the real world applications that will be important to their future professional work as planners, policymakers, advocates, architects, designers, and/or environmentalists.

Course Objectives

By the end of this course students should be able to:

- Understand the use and development of sustainability indicators, including city, national, university, and corporate indicators
- Understand the complexity and challenges in making cross-jurisdictional comparisons
- Evaluate the transparency and effectiveness of sustainability programs
- Use metrics to identify environmental needs and develop public policy
- Analyze and evaluate demographic, environmental, operational, and performance data to develop sustainability indicators
• Understand that addressing complex environmental challenges involves making trade-offs and that choices are made based on the perspective and interests of the decision-makers
• Understand why the quantitative analysis of data is critical for understanding environmental issues and designing the most effective solutions
• Describe the process of life cycle analysis and explain how to apply life cycle analysis to complex environmental issues
• Understand the strengths and weaknesses of cost-benefit analysis

Course Schedule
Week 1: Sustainability Metrics Overview
Week 2: Life Cycle Analysis
Week 3: Measuring Sustainability: Cities and Governments
Week 4: Climate Change Mitigation: Measuring GHG Emissions
Week 5: Energy: Efficiency and Green Buildings
Week 6: Air Quality: Particulate Matter and Heating Oil
Week 7: Solid Waste: Transportation and Landfill Diversion
Week 8: Water: Supply and Freshwater Protection
Week 9: Green Infrastructure: Stormwater and Trees
Week 10: Climate Resilience: Science and Impacts
Week 11: Climate Resilience: Risk and Strategies
Week 12: Measuring Sustainability: Colleges and Universities
Week 13: Measuring Sustainability: Corporations

Course Requirements
You do not have to purchase any reading material for this course. All required readings will be made available to students. Course readings will include reports from governments, NGOs, and corporations, as well as articles from peer-reviewed journals, mass-market periodicals, and the popular press. “Required” readings are to be read BEFORE coming to class. “Supplemental” readings will also be provided throughout the class. While they are not required, they will provide additional information that will enhance your knowledge of the course subject matter.

Week 1: Sustainability Metrics Overview
Required Readings:
• Supplemental Readings:


Week 2: Life Cycle Analysis

Required Readings:

Supplemental Readings:
- Blanke, Michael and Bernhard Burdick, “Food (Miles) for Thought: Energy Balance for Locally-Grown Versus Imported Apple Fruit,” University of Bonn, 2005.
Cycle Energy Consumption of Incandescent, Compact Fluorescent, and LED Lamps,”
• February 2012.

Week 3: Measuring Sustainability
Required Readings:
• The Economist Intelligence Unit, “US and Canada Green City Index.” Siemens, 2011 (pages 1-20, 28-29).
• City of Santa Monica, “Sustainable City Report Card”. Santa Monica Office of Sustainability and the Environment, September 2010.
• City of New York, “PlaNYC 2012 Progress Report”. Mayor’s Office of Long-Term Planning & Sustainability, April 2012 (pages 28-29).

Supplemental Readings:
• ICLEI Star Community Index website - http://www.iceliusa.org/sustainability/star-community-index/
• New York City Environmental Public Health and Sustainability Tracking Portal - https://gis.nyc.gov/doh/track/
• SustainLane - http://www.sustainlane.com/us-city-rankings/
• Our Green Cities - http://ourgreencities.com
• Global City Indicators Facility website - http://www.cityindicators.org/Default.aspx

Week 4: Climate Change Mitigation: Measuring GHG Emissions
Required Readings:

Supplemental Readings:
• Millard-Ball, Adam, “Do City Climate Plans Reduce Emissions?” AERE Summer Meeting, May 2011.

Week 5: Energy: Efficiency and Green Buildings
Required Readings:
• City of New York, “PlaNYC Update.” Mayor’s Office of Long-Term Planning and Sustainability, April 2011 (just the Energy Chapter, pages 100-117).
• City of New York, “Greener, Greater Buildings Plan.” Mayor’s Office of Long-Term Planning and Sustainability, December 2009.
• City of New York, “New York City Local Law 84 Benchmarking Report.” Mayor’s Office of Long-Term Planning and Sustainability, August 2012.
• Supplemental Readings:
  • Urban Green Council, “Cost of Green in NYC.” Fall 2009.

Week 6: Air Quality: Particulate Matter and Heating Oil
Required Readings:
• City of New York, “PlaNYC Update.” Mayor’s Office of Long-Term Planning and Sustainability, April 2011 (just the Air Quality Chapter, pages 118-131).
• City of New York, “Air Pollution and the Health of New Yorkers: The Impact of Fine Particulates and Columbia University: Sustainability Metrics - Fall 2012
• Ozone.” New York City Department of Health and Mental Hygiene, 2011.
Supplemental Readings:
• New York City Environmental Public Health and Sustainability Tracking Portal - https://gis.nyc.gov/doh/track/
• NYC Clean Heat - http://www.nyccleanheat.org/

Week 7: Solid Waste: Transportation and Landfill Diversion
Required Readings:
• City of New York, “PlaNYC Update.” Mayor's Office of Long-Term Planning and Sustainability, April 2011 (just the Solid Waste Chapter, pages 132-145).
• City of New York, “Request for Proposals for New and Emerging Solid Waste Management Technology.” Department of Sanitation, March 2012 (just Sections II and III).

Supplemental Readings:

Week 8: Water: Supply and Freshwater Protection
Required Readings:
• City of New York, “PlaNYC Update.” Mayor’s Office of Long-Term Planning and Sustainability, April 2011 (just the Water Supply Chapter, pages 74-85).
• NYC Water Board, “Public Information Regarding Water and Wastewater Rates.” April 2012.

• Columbia University: Sustainability Metrics - Fall 2012


• Supplemental Readings:

Week 9: Green Infrastructure: Stormwater and Trees

Required Readings:


• Supplemental Readings:

Week 10: Climate Resilience: Science and Impacts
Required Readings:


Supplemental Readings:


Week 11: Climate Resilience: Risk and Strategies

Required Readings:

- Faris, Craig, “City of Chicago Analysis of Economic Impacts from Climate Change.” Oliver Wyman, 2008.

Supplemental Readings:


Week 12: Measuring Sustainability: Colleges and Universities

Required Readings:

- Sustainable Endowments Institute, “The College Sustainability Report Card.” 2011 (this is an online- only report, so click through to read the Executive Summary, Categories, Methodology, Indicators, and results for Ivy League Schools).
• American College & University Presidents' Climate Commitment, “Celebrating Five Years of Climate Leadership.” 2011 (just the first section, pages 1-11).
• Columbia University Environmental Stewardship website (skim) - http://www.environment.columbia.edu/initiatives

Supplemental Readings:
• Yale University, “Sustainability Strategic Plan 2010-2013.”

**Week 13: Measuring Sustainability: Corporations**

Required Readings:
• Dow Jones Sustainability Indexes website - http://www.sustainability-index.com/default.html

Supplemental Readings:
• Ernst & Young, “Six Growing Trends in Corporate Sustainability.” In cooperation with GreenBiz Group, 2012.
• KPMG International, “Corporate Sustainability: A Progress Report.” In cooperation with the Economist Intelligence Unit, 2011.
Grading and Assignments
10% - Attendance and Class Participation
15% - Short Paper (1-2 pages)
20% - Data Analysis Paper (2-3 pages)
25% - Indicators Report (4-5 pages)
30% - Final Assignment (5-7 pages)

Participation is very important and will represent 10% of your grade. All students are expected to contribute to the classroom discussion throughout the course. On-time attendance at each class meeting is expected. Partial attendance, i.e. lateness or early departure, if not excused in advance, will impact the “Participation” component of the course grade. If you need to miss a class for any reason, please email the instructors in advance.

Papers and Reports are due by the beginning of class on the date that they are due. All assignments must be handed in on time. Any late submission will receive an automatic reduction of one letter grade.

Short Paper
This assignment is a 500-1,000-word paper proposing one new sustainability indicator for the City of New York. The PlaNYC Update released in April 2011 includes a list of 29 sustainability indicators across 10 chapters (such as transportation, air quality, climate change, etc.).

In 500 to 1,000 words, provide a brief critique of the existing PlaNYC sustainability indicators and propose one new indicator for an existing chapter. You may also propose a new indicator in a topic area that is not a chapter of PlaNYC. For your proposed indicator, explain why it is important to track this metric and why this indicator is filling a gap that is not currently covered.

Once you have described what indicator and topic area you are proposing and why, propose a target for 2030. An existing example from PlaNYC would be in the chapter/topic of “transportation” to have an indicator of “% of roads meeting a state of good repair” with a 2030 target of “100%.” The best papers will select a meaningful sustainability indicator that measures a topic effectively while also providing an ambitious yet achievable 2030 target. Successful papers will also explain where data for your chosen indicator might be found and how it might best be tracked.

For the current version of PlaNYC Sustainability Indicators, please review the PlaNYC April 2011 Update: http://www.nyc.gov/plany

Data Analysis Paper
This assignment is a 1,000-1,500-word paper analyzing a quantitative fact pattern on an assigned environmental sustainability topic. Graphs, tables, maps and/or other analytic tools should be used as appropriate to support and illustrate findings. Additional instructions regarding this assignment will be distributed during the course.

**Indicators Report**

This assignment is a 2,000-2,500-word paper proposing a set of sustainability indicators for a city or company of their choice. Students should identify between 5 to 10 indicators to track, explain why the indicators were chosen, and briefly discuss trends that can be seen from existing data. Graphs, tables, maps, and/or other analytic tools should be used as appropriate to support and illustrate findings. Data should be collected from a variety of primary sources, including but not limited to the Census (for US cities), municipal reports, NGO datasets, annual reports and financial statements (for corporations, and supplemental readings identified in this course. Additional instructions regarding this assignment will be distributed during the course.

Final Assignment The final assignment is a 2,500-3,500-word paper analyzing and advocating a position on a complex environmental issue, such as the closure of Indian Point, hydrofracking, waste conversion, or the banning of plastic bags. Additional instructions regarding this assignment will be distributed during the course.

**Policies**

**Academic Integrity**

The School of Continuing Education does not tolerate cheating and/or plagiarism in any form. Those students who violate the Code of Academic and Professional Conduct will be subject to the Dean’s Disciplinary Procedures. The Code of Academic and Professional Conduct can be viewed online: [http://ce.columbia.edu/node/217](http://ce.columbia.edu/node/217)

All work must be your own. The use of any research or external source must be cited and documented appropriately. The School provides some useful resources online; we strongly encourage you to familiarize yourself with these various styles before conducting your research: [http://library.columbia.edu/help/howto/endnote.html](http://library.columbia.edu/help/howto/endnote.html)

Violations of the Code of Academic and Professional Conduct will be reported to the Associate Dean for Student Affairs.

**Accessibility Statement**

Columbia is committed to providing equal access to qualified students with documented disabilities. A student’s disability status and reasonable accommodations are individually determined based upon disability documentation.
and related information gathered through the intake process. For more information regarding this service, please visit the University’s Health Services website: http://health.columbia.edu/services/ods/support