

Cities and Environment (EVST S119)

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Meetings: Tuesday and Thursday, 9:00 am - 12:15 pm

Office hours: Tuesday, 2:00 pm - 3:00 pm and by appointment

Overview

Although urbanization and environmental change seem to be happening at very different scales – local versus global – there are many important connections between these two challenges. Aggregated globally, effects of urbanization constitute some of the most significant human impacts on the functioning of the Earth as a system. These effects include emissions of greenhouse gases and heat from cities as well as flows of fuels, construction materials, and food from hinterland into the cities.

This course will examine the feedbacks between urbanization and environmental change at local, regional, and global scales. It will consolidate knowledge scattered in different disciplines studying urban areas such as meteorology, ecology, urban planning, and architecture in order to provide a big picture of how urbanization change natural flows of energy, water, carbon, and nutrients. Topics include urbanization in the context of land use change, the urban heat island, urban biogeochemistry, as well as climate change and its impacts on urban areas. This course will also include computer modeling of urban vegetation responses to environmental changes within a city and guided tours of sites around the Yale Campus and in New Haven that show various solutions to mitigating the impact of a city on the environment.

Central Questions

- What distinguishes an urban system from a natural ecosystem?
- Which implications do these differences have for the environment?
- What measures can minimize the effects of cities on the environment?
- Is it possible to design a city that is friendly to people and environment alike?

Objectives

- To develop an understanding of the fundamental physical and biogeochemical feedbacks between urbanization and global environmental change;
- To develop and practice data interpretation and computation skills through hands-on experience with computer-model simulations;
- To learn how to assess existing measures mitigating the impact of urbanization on environment;
- To explore and articulate how conscious and anticipatory urban planning has a potential to limit the impact of urbanization on the environment.

Reading Materials

- Selected chapters from Oke, T.R., Mills, G., Christen, A. & Voogt, J.A. (2017) *Urban Climates*. Cambridge University Press.
- Selected chapters from Seto K.C., Solecki W.D. and Corrie A.G. (2016) *The Routledge Handbook of Urbanization and Global Environmental Change*, Routledge.
- Selected chapters from Gehl, J. (2010) *Cities for people*. Island Press, Washington.
- Selected draft chapters from Churkina, G. (in preparation) *Urban Areas and Global Environmental Change: the Physical and Biogeochemical Feedbacks*. Cambridge University Press.

Students are not required to buy these books. All required readings will be available in electronic format either from the Yale library or from Canvas.

Grading and Assessment

Assessment: % of Final Grade

Class Participation 20%

Modeling Exercises 30 % (3 assignments X 10%, 10%= 5% (modeling)+5% (short paper))

Oral presentation 20%

Draft of Final Paper 10%

Final Paper 20 %

Assignments: There will be three primary assignments for this course.

1. **Modeling Exercises:** Students will be given three modeling assignments and will be asked to perform model simulations in class on June 15th, 19th, and 21nd. In these assignments, students will learn how urban vegetation responds to environmental changes within a city and how it can mitigate certain adverse city's effects on the environment. After the initial check of the results by the instructor, the students will be asked to write short papers (1-2 pages long) interpreting results and to submit them via Canvas by **June 7th, 19st and 21rd** respectively **by 11:59 PM**. The template for these papers will be provided in class.
2. **Research Paper:** Students will be asked to choose one research topic from a list distributed to the class on May 29. Before the final submission, the paper will be presented and discussed in class and its draft will be evaluated by the instructor. Feedback received after their presentations and final paper drafts will help students to develop their final papers. Student research for these papers must include a combination of independent library research with readings from the class. Wikipedia and blogs will NOT be accepted as a source of information.
 - a. **Oral Presentation.** Each student will have 15 minutes to present their research on the chosen topic in class. Presentations will be evaluated on organization, professionalism, strength and thoughtfulness of the conclusions. The class will have a maximum of 15 minutes for discussion and questions following each presentation.
 - b. **Draft of Final Paper** is an extended outline of the paper with clearly stated objectives and conclusions. The draft must be submitted via Canvas as a PDF document by **June 14, 2018 at 11:59 PM**.
 - c. **Final Paper** should not exceed 20 pages. Evaluation of the paper will be based upon the quality of the background information presented, its structure, the quality and level of analysis, and strength and thoughtfulness of conclusions. Final papers must be submitted via Canvas as a PDF document by **June 28, 2018 at 11:59 PM**.

Attendance and Academic Integrity

Attendance: Students are expected to attend all course meetings. Attendance will be taken and grades will be lowered for any unexcused absences. If you must miss a class please, email me at galina.churkina@yale.edu as soon as you know you will miss it and make arrangements with a classmate to collect notes and arrange to make up modeling assignments.

Academic Integrity: Students must adhere to standards of academic honesty which are detailed in the Yale College [Undergraduate Regulations](http://yalecollege.yale.edu/campuslife/undergraduate-regulations) (<http://yalecollege.yale.edu/campuslife/undergraduate-regulations>). Academic dishonesty or cheating includes unacknowledged paraphrasing or quoting, use of another student's material, incomplete acknowledgement of sources including internet sources, or submission of the same work to complete the requirements of more than one class.

Course Overview

Class	Date	Topic	Readings	Assignment or Remarks Due
1	May 29	Urbanization and Global Environmental Change: an Overview		
2	May 31	What distinguishes a city from a natural ecosystem?	What distinguishes an urban system from a natural ecosystem? (Chapter 2) from Churkina, G. <i>Urban Areas and Global Environmental Change</i> .	
3	June 5	Urbanization and its feedbacks with the local and regional weather and climate: temperature and heat island, CO2 dome	Urban Heat Island (Chapter 7) from Oke TR, Mills G, Christen A & Voogt JA <i>Urban Climates</i> .	
4	June 7	Urbanization and its feedbacks with the local and regional weather and climate: precipitation and its links with air pollution	Clouds and Precipitation (Chapter 8) from Oke TR, Mills G, Christen A & Voogt JA <i>Urban Climates</i> .	Student presentations Modeling assignment 1 due
5	June 12	Urbanization and its feedbacks with the water cycle: water sources and supplies	Pfister S, Schiulze S & Hellweg S, Water supply and urban water availability from <i>The Routledge Handbook of Urbanization and Global Environmental</i>	Student presentations
6	June 14	Urbanization and its feedbacks with the water cycle: water quality	Murphy C, Urban water quality from <i>The Routledge Handbook of Urbanization and Global Environmental</i>	New Haven field trip Draft paper due
7	June 19	Urbanization and its feedbacks with the biogeochemical cycles: carbon cycle	Urbanization and its feedbacks with biogeochemical cycles (Chapter 4) from Churkina G, <i>Urban Areas and Global Environmental Change</i> .	Student presentations Modeling assignment 2 due
8	June 21	Urbanization and its feedbacks with the biogeochemical cycles: nitrogen cycle	Urbanization and its feedbacks with biogeochemical cycles (Chapter 4) from Churkina G, <i>Urban Areas and Global Environmental Change</i> .	Student presentations Modeling assignment 3 due
9	June 26	The Human Scale: roads, buildings, vegetation	Senses and scale (Chapter 2) from Gehl J, <i>Cities for people</i> .	Student presentations Tour of “smart” buildings
10	June 28	Final Discussion: Human and environmentally friendly cities	Life, space, buildings – in that order (Chapter 5) from Gehl J., <i>Cities for people</i> .	Film “The Human Scale” Final paper due