



NYU

**ROBERT F. WAGNER GRADUATE
SCHOOL OF PUBLIC SERVICE**

URPL-GP 2625.001

Environmental Infrastructure for Sustainable Cities

Fall 2021

Instructor Information

- Carter H. Strickland, Jr. (FYI, <https://www.linkedin.com/in/carter-strickland-jr/>)
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- Office Hours: via Zoom by appointment (and also after every class)

Course Information

- Class Meeting Times: Mondays, 4:55 – 6:35pm
- Class Location: GCASL 365, located at 238 Thompson Street

Course Prerequisites

1. CORE-GP.1018, Microeconomics for Public Management, Planning, and Policy Analysis; or
2. CORE-GP.1020, Management and Leadership; and
3. Co-requisites, any one of the following:
 - a. URPL-GP.1603, Urban Planning: Methods and Practice
 - b. URPL-GP.1620, Spatial Analysis and Visualization
 - c. URPL-GP.2608, Urban Economics
 - d. URPL-GP. 2631, Transportation, Land Use, and Urban Form
 - e. URPL-GP.2660, History and Theory of Planning

Course Description

This class is about the physical structures and systems that determine the sustainability of cities and their environmental impact. We call those systems “environmental infrastructure.”

The premise of the class is that compact, walkable cities are the least carbon- and energy-intensive pattern of settlement today because of their integrated networks of infrastructure that allow us to move, eat, drink, play, and survive extreme weather. As our population shifts to urban and coastal areas, we will need to build more infrastructure systems to accommodate growth and to increase sustainability. Yet we are building too little, too slowly to maintain our existing infrastructure, let alone to facilitate next generation systems that will accelerate our society to a truly low-carbon future. Our transportation, water, parks, freight, solid waste, and energy infrastructure systems are crumbling, and new needs such as coastal flood mitigation and resiliency are not being met. With little political will for massive public works programs and

current procurement practices that are slow and costly, cities are starting to use innovative ways to deliver these critical assets, including design-build procurement, long-term concessions, private operation, maintenance and financing, and other forms of public-private partnerships. Cities are pooling resources to solve problems through infrastructure exchanges and accelerators, and are creatively reimagining and reusing obsolete and neglected land and buildings, and are integrating services to create infrastructure that is multi-purpose, resilient, and sustainable. And the federal government and some states are considering transformative, large-scale infrastructure investments for the first time.

Course Objectives

This course is designed to create sustainability leaders who will understand infrastructure requirements, policy, funding, construction, and operations that are necessary to build the cities of tomorrow and achieve a sustainable society. Using case studies primarily from New York City and other U.S. cities of “environmental infrastructure” – public water, transportation, freight, parks and open space, resiliency, solid waste, and energy infrastructure – this course covers the project life cycle from planning to project delivery and asset management. (Select international examples will be used as appropriate.) Broadband and other communications infrastructure, while not strictly environmental in the same sense, is recognized in the post-Covid period as critical to economic viability and land use patterns, as well as connected to smart cities, and is a new topic that will be discussed. Students will discuss the role of infrastructure and different policy approaches towards planning and project conception, cost-benefit analysis, prioritization, alternative delivery and private-public partnerships, coalitions of interested stakeholders and partners, funding and financing, governance, and operations and maintenance. They will apply these lessons to current infrastructure issues in both group and individual formats that mimic the professional settings they will face after graduation, and will learn to receive and provide constructive feedback from and to their peers.

Learning Objectives

By the end of this course, students will have the capacity to be active infrastructure leaders because they will be able to:

- Discuss the importance of infrastructure to improving the environment and creating sustainable cities and communities;
- Understand the importance of federal, state, and municipal policy to infrastructure development, how policy is created, and how policy can be influenced;
- Discuss and analyze standard infrastructure development stages and requirements, as well as different procurement approaches;
- Explain the characteristics and benefits of public private partnerships and alternative delivery mechanisms and analyze whether those mechanisms are appropriate for any or all stages of a particular project;
- Present analysis and solutions in different formats (group oral presentation with slides/graphics, and a written memorandum and business case);
- Develop expertise on the subject matters chosen for the group and individual project; and
- Will network with current infrastructure leaders.

Required Readings

Required readings and optional readings are listed for each class.

The following books and reports are useful for general reference but are not required except as indicated:

- Ascher, Kate, and Wendy Marech. *The Works: Anatomy of a City*. New York: Penguin, 2005 (or the 2007 copy). Textbook available in the NYU Library (Bobst Library, Reserve Desk). New and used copies are also available on Amazon for a reasonable price.
- New York City, [PlaNYC \(2007\)](#)
- New York City, [PlaNYC \(2011\)](#)
- New York City, [OneNYC \(2015\)](#)
- Regional Plan Association, [The Fourth Regional Plan \(2017\)](#)

NYU Brightspace

All announcements, resources, and assignments will be delivered through the NYU Brightspace site. I may modify assignments, due dates, and other aspects of the course as we go through the term with advance notice provided as soon as possible through the course website.

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. All students enrolled in this class are required to read and abide by [Wagner's Academic Code](#). All Wagner students have already read and signed the [Wagner Academic Oath](#). Plagiarism of any form will not be tolerated and students in this class are expected to report violations to me. If any student in this class is unsure about what is expected of you and how to abide by the academic code, you should consult with me.

Henry and Lucy Moses Center for Students with Disabilities at NYU

Academic accommodations are available for students with disabilities. Please visit the [Moses Center for Students with Disabilities \(CSD\) website](#) and click the “Get Started” button. You can also call or email CSD (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

NYU's Calendar Policy on Religious Holidays

[NYU's Calendar Policy on Religious Holidays](#) states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify me in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.

NYU's Wellness Exchange

[NYU's Wellness Exchange](#) has extensive student health and mental health resources. A private hotline (212-443-9999) is available 24/7 that connects students with a professional who can help them address day-to-day challenges as well as other health-related concerns.

Student Resources

This course does not have a textbook per se, and all readings are available online or through the library. Wagner offers many [quantitative](#) and [writing](#) resources as well as [skills workshops](#). The library offers a variety of [data services](#) to students.

Class Policies

Participation and Attendance

Students are expected to be fully prepared for class by completing all reading and actively thinking about the issues to be discussed. Students are also expected to participate actively in class by enhancing our understanding, and not diverting or dominating the discussion but showing awareness of the flow of thought. Insightful questions count as least as much as insightful comments. Your participation will require that you answer questions, defend your point of view, and challenge the point of view of others. If you need to miss a class for any reason, please discuss the absence with me in advance.

Late Work

There will be no credit granted to any written assignment that is not submitted on the due date noted in the course syllabus without advance notice and permission from the instructor.

Citation & Submission

All written assignments must cite sources and be submitted to the course website (not via email).

Assignments and Evaluation

Grading

Grades will be determined from the following allocation:

- Participation (20%), including on discussion boards and during in class meetings.
- Group Presentation on an Infrastructure Problem and Potential Solutions (30%)
- Individual Memorandum and Business Case Analysis on an Infrastructure Delivery Plan (50%)

1. Participation

This class is designed to facilitate discussion, so full and active participation is a key, and graded, part of the course.

- *Discussion boards.* I will be assigning students each week to post reflections on the topic and readings before each class on a discussion board. It is my expectation that others will jump in with additional observations, disagreements, and other reactions.
- *In class discussion.* I will call on people, probably the discussion board posters in the first instance. My expectation is that other students will join in after that.

2. Group Presentation

Students will form “consultancies” of up to four students that have been “hired” by a public agency or authority to help solve a complex issue related to infrastructure. The output will be a Powerpoint to inform public officials whether to support an infrastructure project (but be prepared to answer how presentation would be adjusted for meetings with the public financial backers, and other stakeholders). Students will be challenged to explain the issue, to present analysis, and to propose solutions in 15 minutes with 10 slides.

You are free to structure the presentation as the team feels is best to make the case or solve the problem identified. The presentation should most if not all of the following questions:

1. Problem definition: What is the problem? Why is it a problem? For whom is it a problem? What are the economic, environmental, and social costs?
2. Problem analysis: What are the causes of the problem? What role can infrastructure and supporting policy interventions play in solving it? What data exists or can be created to help inform the problem?
3. Solution generation: What is the solution? How does it solve the problem? What is required for its implementation, and is it feasible in a reasonable timeframe? Who should do what and when? What are threats along the way? How can these be dealt with?
4. Solution and alternatives analysis: In which measure does the solution solve the problem? How certain of its effectiveness are we? Do the benefits/advantages outweigh the costs/disadvantages? How can the solution be improved following the assessment?

Progress Milestones:

- Indicate general area of interest (Class 3)
- Identify teams (Class 4);
- Topics submitted (Class 5); consultation with professor (by Zoom or office hours);
- Team meetings (outside of class between Classes 4 and 8);
- In-class presentation with questions and feedback from non-presenting students (Classes 9 and 10); and
- Group self-assessment (Class 11).

3. Individual Paper

Following the same structure and questions used to frame the group presentation, each student will prepare a memorandum and business case evaluation for an infrastructure delivery plan to address an historical or current environmental or social issue. If the topic is historical infrastructure, the memorandum should describe what happened, why, and how, and the perceived benefits and costs, and should also include critical analysis, such as whether there were better alternatives, why alternatives were rejected, how project or program procurement,

governance, financing could have been improved, etc. The length should be long enough to inform the audience but not too long to fit into a busy schedule – the target length should be between 15 and 20 pages (or about 3,500 to 5,000 words).

To inspire your selection of a topic for your group and individual project, here are some infrastructure developments or topics, many of which were developed in response to environmental and social problems, but some of which may represent problems in of themselves (e.g., neglected or underused infrastructure) or innovative delivery approaches. I encourage you to be creative and to pick a topic that interests you to the point of obsession. You can become the world expert on any topic with enough dedication!

General

- Biden’s Infrastructure plan
- Green New Deal
- New York Environmental Bond Act
- American Revitalization and Recovery Act (2009)
- Depression-Era infrastructure initiatives (WPA, CCC, etc.)
- East Midtown Rezoning and infrastructure
- Amazon HQ2 Competition
- Sunnyside Yards Redevelopment

- LaGuardia Airport renovation / Public-Private Partnerships
- Tri-Boro Rail
- Stewart Airport renovation, business plan
- California High Speed Rail
- Amtrak NE Corridor (Stations, Penn/Moynihan Station redevelopment, Acela)
- Multi-modal stations
- Brooklyn-Queens light rail system (BQX)
- Uber / Lyft / rideshare
- Electronic tolling / cordon or congestion pricing
- LIRR Third Rail
- MTA Budget

Transportation

- Complete Streets Plan
- Bike lanes / Open Streets Plan / Five Borough Bike Plan
- Bikeshare / scootershare (docked and undocked)
- State Greenways Plan / Empire State Trail / Long Island Greenway
- Better Buses Action Plan
- Rapid Bus Transit
- 14th Street Bus Plan
- Queens Master Bus Plan
- Autonomous Vehicles
- Electric Charging Station Networks
- Gateway tunnel(s) (and/or the original tunnels built by Pennsylvania Railroad)
- East Side Access project
- NYC Ferry
- Airport rail connections (LaGuardia, Denver, JFK)

Water / Wastewater

- Rondout West Branch Tunnel Repair
- Green Infrastructure
- Stormwater Utilities
- Lake Powell Pipeline
- Carlsbad Desalination Plant
- Santa Clara Reuse Plant
- San Antonio Water Purchase Agreement
- Bayonne, NJ O&M Agreement
- Rialto, CA O&M Agreement
- Three Gorges Dams
- Resource recovery from wastewater (phosphorus, Class A biosolids, energy, reusable water)
- Colorado/Texas/California Water Plans
- Lead service lines and replacement initiatives

- Building water tanks and health initiatives

- Google Fiber Deployment Plan
- NYC Broadband Plan

Energy

- Transmission Lines (HydroQuebec, Hudson Valley)
- Indian Point Nuclear Plan
- Pipelines (Keystone, Spectra, Constitution, Northeast Energy Direct)
- Vehicle charging stations (Electric, CNG, hydrogen)
- LNG Piers
- Fracking
- Off-shore/On-shore Wind Power farms
- Solar installations (distributed and in solar farms)
- Microgrids / nanogrids
- Anaerobic digester or landfill gas
- Biomass-based liquid fuels
- Distributed generation (microturbines, fuel cells, storage)
- Hydropower

Resiliency

- Restore Mother Nature Bond Act
- Flood buyout programs / NJ Blue Acres / Buyback and deconstruction / migration programs
- BIG U (and its variants, including the East Side Coastal Resiliency project)
- Seaport City Multi-Purpose Barrier
- Seaport Fidi Resiliency Plan
- Battery Park City resiliency plan
- NY Harbor Surge Barrier (and/or surge barriers in Venice, the Thames River, etc.)
- Post-Katrina levees in New Orleans
- Mid-Barataria Barrier
- Wetlands restoration programs
- Disaster response systems

Solid Waste

- Marine Transfer Stations / 91st Street MTS
- Transfer Stations
- Scrap Yards
- Composting facilities
- Landfills
- Incinerators / Waste to Energy Facilities
- Anaerobic Digesters
- Garbage disposals
- Organic waste systems (collection, composting, biogas)
- Recycling systems and markets
- Bag taxes and other reduction systems

Parks, Open Space, Natural Infrastructure

- Open Streets Plan
- QueensWay
- Brooklyn Bridge Park
- Hudson River Park
- Plazas / sidewalks / Greenstreets / green corridors
- Great American Outdoors Act
- Parks
- Marine Park
- Urban trail systems
- Urban forest systems
- Orchard Beach/Pelham Parkway
- Jamaica Bay Wetlands
- Protective Beach Dunes
- Oyster reefs
- Floyd Bennett Field plans

Communications

- Link NYC

Progress Milestones:

- Topics submitted (Class 11 at the latest!);
- Consultation with professor (office hours); and
- Submission of final paper (end of semester).

Student work and progress towards course goals will be evaluated by professional standards, i.e., demonstrating a thorough understanding of applicable concepts, comprehensive research, rigorous analysis, and an unbiased, persuasive, and clear recommendation for action. In other words, a public official would find the presentation or document to be a sound basis to make a decision. Your emphasis should be on originality of approach and/or new analysis, depth of thought, clarity of expression, and brevity, not the number of words. Students are encouraged to spend at least twice as much time thinking and talking through the problem and solutions, especially on developing a unique approach to a problem, as in writing. Once students have a clear, logical framing of the problem and solution, the writing will be better and easier.

Students must include their Wagner mailbox number on a paper so that the paper can be returned.

Grading Rubrics and Scale

Detailed grading rubrics will be distributed before the group and individual assignments. Letter grades for the entire course will be assigned as follows:

Student grades will be assigned according to the following criteria:

- (A) Excellent: Exceptional work for a graduate student. Work at this level is unusually thorough, well-reasoned, creative, methodologically sophisticated, and well written. Work is of exceptional, professional quality.
- (A-) Very good: Very strong work for a graduate student. Work at this level shows signs of creativity, is thorough and well-reasoned, indicates strong understanding of appropriate methodological or analytical approaches, and meets professional standards.
- (B+) Good: Sound work for a graduate student; well-reasoned and thorough, methodologically sound. This is the graduate student grade that indicates the student has fully accomplished the basic objectives of the course.
- (B) Adequate: Competent work for a graduate student even though some weaknesses are evident. Demonstrates competency in the key course objectives but shows some indication that understanding of some important issues is less than complete. Methodological or analytical approaches used are adequate but student has not been thorough or has shown other weaknesses or limitations.
- (B-) Borderline: Weak work for a graduate student; meets the minimal expectations for a graduate student in the course. Understanding of salient issues is somewhat incomplete. Methodological or analytical work performed in the course is minimally adequate. Overall performance, if consistent in graduate courses, would not suffice to sustain graduate status in "good standing."
- (C/-/+) Deficient: Inadequate work for a graduate student; does not meet the minimal expectations for a graduate student in the course. Work is inadequately developed or flawed by numerous errors and misunderstanding of important issues. Methodological or analytical work performed is weak and fails to demonstrate knowledge or technical competence expected of graduate students.
- (F) Fail: Work fails to meet even minimal expectations for course credit for a graduate student. Performance has been consistently weak in methodology and understanding, with serious limits in many areas. Weaknesses or limits are pervasive.

Overview of the Semester

Week	Date	Topic	Deliverable
Week 1	Sept 13	The Role of Infrastructure in Economic Development, Environmental Protection, and Public Health	
Week 2	Sept 20	Making the Case for Infrastructure: Politics, Stakeholders, Planning, and Economics	
Week 3	Sept 27	Transportation	Identify area of interest
Week 4	Oct 4	Governance, Funding, and Financing Infrastructure	Teams formed or assigned
Week 5	Oct 12 (Tuesday)	Water & Wastewater	Group topics submitted
Week 6	Oct 18	Solid Waste	Guest Lecture
Week 7	Oct 25	Parks & Open Space	
Week 8	Nov 1	Energy	Guest Lecture
Week 9	Nov 8	Communications / Group Presentations	Group Presentations
Week 10	Nov 15	Group Presentations	Group Presentations
Week 11	Nov 22 / TBD	Infrastructure Tour	Guest Lecture Individual topics submitted
Week 12	Nov 29	Sustainable and Resilient Infrastructure	
Week 13	Dec 6	Integrated City-Level Infrastructure	
Week 14	Dec 13	Operational and Asset Management Challenges, Procurement, Private-Public Partnerships, Public-Public-Private Partnerships, Infrastructure Exchanges and Accelerators	
Week 15	No Class	Reading Period	Final paper due at 5pm

Detailed Course Overview

Week 1: The Role of Infrastructure in Economic Development, Environmental Protection, and Public Health

This class focuses on the relationship between infrastructure, the economy, public health, and the environment. We will examine the systems that exist to provide the necessities of life and the permanence of a city, which elements of a city can be provided by the free market (e.g., jobs, economic development, housing), and which typically involve public construction, regulation, and an appropriate public policy framework.

Discussion topics: Public “environmental infrastructure” and its relationship with social/civic, educational, housing, private facilities, and other infrastructure; patterns of development in an increasingly urban, coastal world; importance of managing infrastructure management to cities, economies, and the environment; public health and environmental metrics; historical interrelationship between infrastructure, economic development and the environment; preservation versus conservation; widespread changes in land use and climate change, how it informs our understanding of the “natural” world; climate change and adaptation; and the historic role of the Gallatin Plan, Erie Canal, and Eisenhower Interstate Highway System in development of the U.S.; the unique interaction of the federal and state governments for infrastructure development in the US; COVID19 and the future of cities.

Case Studies and readings

Required

- Zeynep Tufekci, [Why the Post Office Makes America Great](#), New York Times (Jan. 3, 2016)
- David Owens, [Green Manhattan](#), New Yorker (Oct. 18, 2004).
- Michael Bloomberg and Rohit T. Aggarwala, [Think Locally, Act Globally](#), American Journal of Preventive Medicine 35.5 414-23, (2008).
- Thacker, S., Adshead, D., Fay, M. et al. [Infrastructure for sustainable development](#), Nature Sustainability 2: 324–331 (Apr. 1, 2019) (PDF in Classes)

Supplemental

- Catherine Brinkley, [Pandemics Have Actually Made Cities Better](#), Fast Company, (May 19, 2020)
- Darren Anderson, [Future Shock in the Countryside](#), The Atlantic (Nov. 2, 2018)

Week 2: Making the Case for Infrastructure: Politics, Stakeholders, Planning, and Economics

This class provides an overview of the present state of the U.S. infrastructure and within that context focuses on (1) key decision-makers, the political context of infrastructure, the role of strategic planning, and other methods for creating momentum for investment in infrastructure, (2) the preliminary studies necessary for the development of infrastructure, and (3) the role of community engagement and partnerships.

Discussion topics: (1) The role of politics, interest groups, elected leaders, public opinion, and governmental institutions in the formulation and management of public policy and programs; (2) deciding what, when, and how to build; relationship between strategic plans, master plans, facility plans; agenda setting; stakeholder and citizen participation; setting priorities;

understanding and communicating risk; (3) Planning, Pre-Design, Feasibility Studies, and Site Selection; assessment and management; condition assessment and asset management; benefit-cost analysis; life-cycle analysis; time value of money; business cases; alternatives analysis; environmental review; permitting; site assembly; eminent domain; and (4) community mobilization and engagement; stakeholder meetings and charrettes; siting and environmental justice. City competitions: Olympics, World's Fairs, and Amazon HQ2.

Case studies and readings:

Required

- PlaNYC (2011) Introduction (pp. 3-13)
- OneNYC (2015) Introduction (pp. 14-17, 30-32, 113-119)
- Regional Plan Association, [The Fourth Regional Plan](#) (2017), Executive Summary
- American Society of Civil Engineers, [Infrastructure Report Card](#) (2021)
- Conrad De Aenlle, [World's Fairs and Their Legacies](#), New York Times (May 1, 2015).
- [Fact Sheet: The American Jobs Plan](#) (March 31, 2021)

Supplemental

- Quartz, [Leeside, USA: The Making of a Climate Utopia](#) (2021)
- Vox, [The Green New Deal Explained](#) (video) (June 12, 2019)
- Climate Xchange, [Biden's Clean Energy Plan proposes economic recovery through green investments](#) (July 23, 2020)

Week 3: Transportation

This class will discuss transportation infrastructure issues, including relationship to economic development, urban mobility, freight optimization in the urban context; emergency management provisions, user fees and tolling, rideshare and other technological innovations, and the role of information; fueling stations for alternative vehicles (e.g., EV chargers, CNG stations, hydrogen cell refills); parking and space policy for cars, bikes, scooters, car-share, bike docks, and charging stations.

Questions for class: Why do we value mobility? How do we pay for transportation services? What are the alternatives? To personalize this, please keep a record for a week of modes used, distances traveled, purposes, and economic and social value.

Case studies and readings:

Required

- The Works: Anatomy of a City, Moving People + Moving Freight (pp. 2-90)
- PlaNYC 2011, Transportation (pp. 86-99)
- Jonathan English, [Why New York City Stopped Building Subways](#), CityLab (Apr. 16, 2018).
- WNYC, [Whose Streets?](#), On the Media Podcast (Nov. 23, 2018).
- Regional Plan Association, [The Five Borough Bikeway](#) (2020)
- S. Griffiths et al, Policy mixes to achieve sustainable mobility after the COVID-19 crisis, Renewable and Sustainable Energy Reviews, Vol. 143:110981 (June 2021) (PDF)
- John Surcio, [Can 'Open Streets' Outlast the Pandemic?](#) – Bloomberg CityLab (April 29, 2021)

Supplemental

- NYC Economic Development Corp., [Freight NYC](#) (2018).

- David Zipper, [The High Cost of Bad Sidewalks](#) Bloomberg CityLab (June 16, 2020)
- Video: [New York Streets? Not so Mean Anymore](#) (Ted Talk with Janette Sadik Khan)
- John Seabrook, [The E-Scooters loved by Silicon Valley Roll into New York](#), The New Yorker (Apr. 19, 2021)

Week 4: Governance, Funding, and Financing Infrastructure

This class presents options for governance and funding and financing infrastructure, i.e., who should pay, how should funds be collected and spent, and related topics, and the critical link between financing, feasibility, and actual design and construction.

Discussion topics: Which level of government sponsors which infrastructure sector projects (e.g., transportation is federal and state, water, wastewater and solid waste are local); the role of special authorities and other efforts to de-politicize the process; taxes; tax increment financing; special improvement districts; user fees, enterprise funds, trust funds, and other income streams; municipal bonds (general obligation, revenue backed); tax exemption for municipal bonds; leveraging public assets; quantifying and monetizing benefits (e.g., naming rights); private financing (equity, debt); Federal Highway Trust Fund; Federal Land and Water Conservation fund; State Revolving Funds; TIFIA and WIFIA; Private Activity Bonds; earmarks.

Case studies and readings:

Required

- Louis Hyman, [The New Deal Wasn't What You Think](#), The Atlantic (Mar. 6, 2019)
- Congressional Budget Office, [Infrastructure Banks and Surface Transportation](#) (July 2012).
- Congressional Research Service, [Infrastructure Investment and the Federal Government](#) (2018) (PDF)
- Council on Foreign Relations, [The State of U.S. Infrastructure](#) (last updated 2018)
- New York City Economic Development Corporation, [Southern Manhattan Coastal Protection Study: Evaluating the Feasibility of a Multi-Purpose Levee](#) (2014).
- Lincoln Leong, McKinsey & Co., [The 'Rail plus Property' model: Hong Kong's successful self-financing formula](#) (June 2016).

Supplemental

- [America's Transportation Infrastructure -- A Funding Crisis](#), Traffic Technology Today (Nov. 28, 2020)
- Trump's Infrastructure Plan (Peter Navarro and Wilbur Ross, [Trump v. Clinton on Infrastructure](#) (Oct. 27, 2016).
- Kate Aronoff, [The Big Difference Between a Green New Deal and Biden's Climate Agenda](#), The New Republic (Apr. 20, 2021)

Week 5: Water and Wastewater

This class will discuss water and wastewater, two critical public health systems that have been critical to the very concept of dense development since the earliest cities. Discussion topics will include government and regulated private utility arrangements, generation, distribution, collection, treatment, and disposal; user fees and rate structures; conservation incentives; and watersheds and other natural systems.

Case studies and readings:

Required

- The Works, pp. 152-183
- PlaNYC, pp. 58-85
- New York Times, [Living City | A Billion Gallons a Day](#) (2014) (Video)
- New York City Department of Environmental Protection, [NYC Green Infrastructure Plan](#) (2010) (Executive Summary)
- Janet Hering et al., [A Changing Framework for Urban Water Systems](#), Environ. Sci. Technol. 47:19, 10721–10726 (May 8, 2013)

Supplemental

- Michelle Nijhuis, [The Abandoned Plan That Could Have Saved America From Drought](#), BuzzFeed (Sept. 18, 2015).
- ASCE, [Drinking Water Report Card \(2021\)](#)
- ASCE, [Wastewater Report Card \(2021\)](#)

Week 6: Solid Waste

Waste management is a key service of city government because sanitation has an enormous impact on climate, public health, the environment and the economy. Nevertheless, under our decentralized regulatory system, solid waste management service levels, costs and environmental impacts are widely variable, unlike other environmental infrastructure systems. Waste generation is growing faster than other environmental pollutants and we need to develop policies and procedures to meet the community's needs while reducing emissions, increasing equity, improving the environment, economy and public health.

Discussion topics: Importance of solid waste management to city carbon reduction goals; logistics, economics, and failures of composting and recycling; benefits and disadvantages of various waste management technologies (e.g., incineration, landfilling, recycling, composting, anaerobic digestion); market failures and substitutes; monopoly and franchise systems; circular economies (closed loop systems); markets and market controls; and export markets.

Guest lecturer: Kathryn Garcia, former Commissioner, NYC Department of Sanitation

Case Studies and Readings:

Required

- The Works pp. 184-203.
- PlaNYC, pp. 132-145
- OneNYC, Zero Waste Plan, pp. 176-187
- New York City Department of Sanitation, [Comprehensive Solid Waste Plan](#) (2006). (Executive Summary).

- Rivka Galchen, The New Yorker, [How South Korea is Composting its Way to Sustainability](#) (March 2, 2020)
- L.J. Dawson, [How Cities Are Turning Food Waste Into Fuel](#), Politico (Nov. 21, 2019)

Supplemental

- Melanie Burford and Greg Moyer, [Living City | Where Does our Trash Go?](#), The New York Times (Sept. 25, 2014) (Video)
- Nicole Javorsky, [How American Recycling Is Changing After China's National Sword](#), CityLab (Apr. 1, 2019)
- Anne Barnard, [7 Reasons Recycling Isn't Working in NYC](#), The New York Times (Jan. 29, 2020)

Week 7: Parks and Open Space

Parks and open space in cities have long been a sought-after amenity in cities, and are even built by developers to enhance the value of their residential and commercial property. Now parks are conceived as a first-order intervention for a number of urban issues.

Discussion topics: The public health, recreational, economic, safety and environmental impacts of parks; developer-built parks; waterfront parks and resiliency, the role of conservancies; what needs to change for parks to be considered critical environmental infrastructure; measuring benefits and park progress; the 10-minute walk campaign.

Case studies and readings:

Required

- Peter Harnik, Trust for Public Land, [Urban Parks are Making a Comeback](#) (Oct. 2008).
- PlaNYC, pp. 30-45
- Eric Klinenberg, Palaces for the People (2018) (Introduction, PDF in Brightspace)
- Natural Areas Conservancy and NYC Parks, [Forest Management Framework for New York City](#) (2018) (Executive Summary)
- Trust for Public Land, [Parkscore Index](#) (2021)
- Trust for Public Land, [NYC Park Equity Plan](#) (2021)

Supplemental

- Trust for Public Land, [Public Spaces/Private Money, The Triumphs and Pitfalls of Urban Park Conservancies](#) (Feb. 2015)
- Trust for Public Land, [The Economic Benefits of Parks and Recreation in Colorado Springs](#) (Jan. 2017)
- C.J. Hughes, [New Parks Sprout Around New York City](#), New York Times (June 8, 2018)
- Trust for Public Land, [Parks and the Pandemic](#) (2020)
- Trust for Public Land, [The Heat Is On](#) (2020)

Week 8: Energy

This class will discuss energy infrastructure systems, which underlie most other infrastructure systems. Unlike those systems, energy is generally provided by investor-owned utilities in the United States under a regulated monopoly paradigm, but in other countries the public sector has a different role.

Discussion topics: The role of government in shaping energy policy, sustainability, and dependability on a city level; supply versus demand management; energy-efficiency and green

building plans; the role of mandates, incentives, and market forces; interdependence with other environmental infrastructure systems (e.g., electric vehicles).

Guest lecturer: Anthony Fiore, Chief Energy Management Officer, NYC

Case studies and readings:

Required

- The Works, pp. 92-123
- PlaNYC, pp. 100-117
- Congressional Research Service, [21st Century U.S. Energy Sources: A Primer](#) (Nov. 5, 2018) (skim)
- D. Tong et al. [Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target](#), *Nature* 572, 373–377 (2019) (PDF in Brightspace)
- Daniel M. Kammen and Deborah A. Sunter, [City-integrated renewable energy for urban sustainability](#), *Science* (May 20, 2016) (PDF in Brightspace)
- ABB, [What is a Microgrid?](#) (Nov. 7, 2017) (short video)
- Reinhard Madlener et al., [Impacts of urbanization on urban structures and energy demand: What can we learn for urban energy planning and urbanization management?](#), *Sustainable Cities and Society*, 1: 45–53 (2011)
- Kaufman & Tan, [New York City's Building Emissions Law Shows the Importance of Economywide Climate Policy](#), *Columbia Center on Global Energy Policy Commentary* (Oct. 1, 2020)

Supplemental

- DW, [Smart City: How Amsterdam Revolutionizes Energy | Future Smart City Projects](#) (2021) (short video)
- C40, [Case Study: 98% of Copenhagen City Heating Supplied by Waste Heat](#) (Nov. 3, 2011).
- Feargus O'Sullivan, [Sweden Will Meet Its 2030 Green Energy Target 12 Years Early](#) CityLab (July 20, 2018).
- New York City, [One City: Built to Last Technical Working Group Report](#) (2016) (Executive Summary)
- Linda Poon, [NYC's Tall Order for Greener Buildings](#), Citylab (Sept. 26, 2017).

Week 9: Communications

Communications infrastructure – telephone, mail, telephone and radio, and now broadband – is does not directly affect pollution levels in cities in the same way as the other environmental infrastructure that is discussed in this class. However, communications infrastructure has a dramatic impact on land use patterns and the rapid cross-fertilization of ideas is one of the core benefits of city living – or so it was thought before the current coronavirus crisis made clear that cities depend on communications for their livelihood. Because alternatives may arise or already exist, investment in communications is as critical to sustainable cities as other infrastructure.

Discussion topics: The National Broadband Plan and the role of federal, state, and local government; Internet of things and smart infrastructure; data centers and water/energy demand; data security; privacy considerations; equity considerations; natural monopolies and regulation; communication as a public or private service.

Case studies and readings:

Required

- The Works, pp. 124-151
- Office of the Inspector General, [The Postal Service's Role as Infrastructure](#), (Dec.15, 2014)
- New York City, [The Internet Master Plan](#), (Jan. 2020) (Executive Summary only)
- Ava Kaufman, [Are New York's Free LinkNYC Internet Kiosks Tracking Your Movements?](#), The Intercept (Sept. 8, 2018)
- McKinsey Global Institute, [Smart Cities: Digital Solutions for a more Livable Future](#) (June 5, 2018) (Executive Summary Only)
- Amy Fleming, The Case for Making Low-Tech 'Dumb' Cities Instead of 'Smart' Ones, [The Case for Making Low Tech Dumb Cities Instead of Smart Ones](#) The Guardian (Jan. 15, 2020).

Supplemental

- Kim Lyons, [The Consortium behind New York City's LinkNYC kiosks is Delinquent and Owes the City Millions](#), The Verge (March 5, 2020)
- Blair Levin and Larry Downes, [Why Google Fiber Is High-Speed Internet's Most Successful Failure](#), Harvard Business Review (2018)
- Ingrid Burrington, [The Environmental Toll of a Netflix Binge](#), The Atlantic (Dec. 16, 2015)
- Aitor Hernández-Morales et al, [The Death of the City: Teleworking, not the Coronavirus, is Making City Living Obsolete](#) , Politico (Aug. 3, 2020)
- DW Shift, [Smart City: Surveillance or Utopia?](#) (Oct. 2019) (short video)

Week 9, Second Half: Group Presentations and Discussions

Student groups will make a presentation on an economic or environmental issue, present their analysis of alternatives, and propose solutions. Groups are allotted 15 minutes, plus 5 minutes for additional discussion.

Week 10: Group Presentations and Discussions, cont'd

Week 11: Infrastructure Tour

Time and content TBD. Past trips have included the New York City Department of Sanitation's 59th Street Pier for Recycling, the New York City Department of Environmental Protection's North River Wastewater Treatment Plant, and the Metropolitan Transportation Authority's East Side Access Project.

Guest Lecturer: Jamie Torres Springer, Commissioner, NYC Department of Design and Construction

Week 12: Sustainable and Resilient Infrastructure

This class takes the long view and covers the use of infrastructure to promote sustainability, resiliency, and adaptation to climate change.

Discussion topics: Concepts of sustainability and resiliency; centralized versus decentralized infrastructure; nature-based infrastructure; smart infrastructure; sustainable design and rating systems (LEED, Envision); the role of enduring and predictable subsidies for irrigation projects, solar farms, and wind farms; the ethanol problem; continuity of operations for communities and businesses; community engagement revisited.

Case studies and readings:

Required

- New York City, [A Stronger, More Resilient New York](#) (2013) (pp. 9-18, 37-66, one of the infrastructure chapters, and one of the community chapters)
- Denise Nelson, Institute for Sustainable Infrastructure, [The Water Values Podcast](#) (Apr. 22, 2015).
- Regional Plan Association, [The New Shoreline: Integrating Community and Ecological Resilience around Tidal Wetlands](#) (Sept., 2018).
- NYC Economic Development Corp., [Hunts Point Resiliency](#), (June 18, 2019 Public Meeting presentation)

Supplemental

- Rebuild by Design, [Safer and Stronger Cities: Strategies for Advocating for Federal Resilience Policy](#). (Executive Summary and Introduction).
- B.I.G., [The Big U - B.I.G. Team's Vision for Rebuild By Design](#) (2015) (video)

Week 13: Integrated City-Level Infrastructure

Centuries ago, powerful countries built new cities on new territory; the Romans built Constantinople by the Romans, and the Dutch built New Amsterdam. What if we could build a city from the ground up today, using up to date technology? In fact, city planners and builders are tearing down old ports and decking over railyards to build new neighborhoods, and are even building whole cities in reclaimed land and deserts.

Discussion topics: the complex interaction between infrastructure systems in an urban environment in an era of climate change and urban renewal. Discussion topics include urban land use forms and contexts; hierarchies of infrastructure; work and conflicts; legal issues; aggregation versus dispersal; value creation and capture (enhance adjacent areas, intrinsic); resiliency; stormwater management; transportation corridors and transit oriented development.

Case studies and readings:

Required

- Emily Nonko, [Hudson Yards wants to become NYC's next great neighborhood](#), Curbed (Sep. 19, 2018).
- Zoe Rosenberg, [Sunnyside Yard plan is a utopian vision for an urban future](#), Curbed (Mar. 4, 2020)
- David Ee, [Humanising and Re-integrating Canary Wharf with London](#), (2018).
- Patrick Sisson, Songdo, [South Korea's City of the Future, Has a Green Vision](#), Curbed (Nov. 2, 2015).
- Philippe Mesmer, [Songdo, Ghetto for the Affluent](#), Le Monde (May 29, 2017).
- Laura Bliss, [Inside a Pedestrian-First 'Superblock'](#), City Lab (Aug. 7, 2018). Also watch the video.

- Sarah Moser, Marian Swain, and Mohammed H. Alkhabbaz, [King Abdullah Economic City: Engineering Saudi Arabia's Post-oil Future](#), *Cities* 45: 71-80 (2015).

Supplemental

- David L.A. Gordon, [The Resurrection of Canary Wharf](#), *Planning Theory & Practice*, 2:2, 149-168 (2001).
- Alex Bozikovic, [Google's Sidewalk Labs signs deal for 'smart city' makeover of Toronto's waterfront](#), *The Globe and Mail* (June 12, 2018).
- Laura Bliss, [How Smart Should a City Be? Toronto Is Finding Out](#), *CityLab* (Sep. 7, 2018).

Week 14: Operational and Asset Management Challenges, Procurement, Private-Public Partnerships, Public-Public-Private Partnerships, Infrastructure Exchanges and Accelerators

This class discusses the operational performance of infrastructure, institutionalizing investments, challenges with current government procurement of infrastructure design and construction, as well as creative solutions for financing, developing, and operating infrastructure that involve private or public partners.

Discussion topics: Project life-cycle (design, construction); variety of state and city procurement legislation; anti-corruption reforms; Wicks Law; role of labor unions; Project Labor Agreements; design-bid-build; design build and progressive design build; advanced procurement options; role of technical, procurement, legal, financial, design consultants; risk allocation and costing; guarantees and indemnities; project management; programs versus projects; on-call contracts; asset life cycle; asset performance; level of service; capital versus operational tradeoffs; governance models. Revisiting stakeholders; advocacy groups; public-public partnerships and intergovernmental agreements; public-private partnerships (P3), public-public-private partnerships (P4); design build through design-build-finance-operate and maintain (DBFOM); international practices and norms where tax exempt financing doesn't exist; concession arrangements and contract oversight; conflict resolution; federal-state-local partnerships and federalism; infrastructure exchanges and accelerators, including the West Coast Exchange and the Intermountain Infrastructure Exchange; Partnerships British Columbia.

Case studies and readings:

Required

- Jonathan English, [Why Did America Give Up on Mass Transit? \(Don't Blame Cars\)](#), *City Lab* (Aug. 31, 2018).
- Brian Rosenthal, [The Most Expensive Mile of Subway Track on Earth](#), *New York Times*, (Dec. 28, 2017).
- Alon Levy, [Why American Costs Are So High \(Work-in-Progress\)](#), *Pedestrian Observations Blog* (March 3, 2019)
- John Surico, [Stretching New York City's Capital Dollars](#), *Center for Urban Future* (Apr. 2021)
- Partnerships BC, [Understanding Public Private Partnerships](#) (2011).

Supplemental

- The City of Portland, [2015 Citywide Assets Report](#).
- Regional Plan Association, [RPA Reveals Underlying Reasons MTA Megaprojects Cost More than Twice as Much Than Peer Cities and Basic Steps to Save Billions](#) (Feb. 6, 2018).

- Hunter Blair, Economic Policy Institute, [No Free Bridge: Why public-private partnerships or other 'innovative' financing of infrastructure will not save taxpayers money](#) (Mar. 21, 2017).
- Eno Center for Transportation, [Partnership Financing: Improving Transportation Infrastructure Through Public Private Partnerships](#) (2011).