

Master of Science in Sustainability Management

Sustainable Cities - PS4130

3 Credits

Instructor: Jit Bajpai

Course Overview

For the first time in history over half the world's population lives in urban areas. Today there are over 400 cities of more than a million residents compared to 12 cities in 1900. By 2050 the share of the world's urban population is expected to reach 70 percent, and most growth will occur in the developing world. As urban population growth continues, urban centers face the problems of aging infrastructure, economic growth, changing climate, congestion, pollution, and demands of inhabitants to enhance their quality of life. Cities consume 75 percent of world's energy and produce almost 80 percent of global GHG emissions. In response many cities are striving to be a low carbon city while sustaining healthy economic and social life. But addressing the new urban agenda requires a new model of cooperation across sectors and all tiers of government to redirect the urban economic development into paths that are restorative. The purpose of this course is to prepare its students to understand, analyze, and develop policies and procedures to address the sustainability issues being faced by urban centers of developed and developing world, their decision-makers and inhabitants.

Learning Objectives

Students in the course are assumed to have had no previous in-depth exposure to sustainable urban development and urban planning. By the end of the course, students will have learned to develop strategies and related actions to enhance sustainability of cities covering the following areas:

- Sustainability enhancing practices in urban development and planning;
- Emerging policies, practices and technologies that promote efficient and low carbon delivery of urban services including transportation, energy, waste, water and sanitation;
- Approach to manage climate change risks and related adaptation actions; and
- Practices of sustainability planning adopted by global cities.

Textbooks and Course Readings

Chapters from a variety of different textbooks and journal articles will be used throughout this course. All texts can be found either electronically or have been placed on reserve in the University library system. Unless otherwise noted, the required readings must be read and a short note (one page) as described above must be submitted one day prior to the class. Some readings are identified as recommended (i.e., you are not required to read them), but they contain information that may be useful as you complete your course assignments.

Text Books:

- Protney, Kent, "Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities", Cambridge, MIT Press, 2003.
- Dixon Tim, Enmes M, Hunt M & Lannoa S, "Urban Retrofitting for Sustainability: Mapping the transition to 2050", Earthscan from Routledge, London, NY, 2014

Method of Grading and Evaluation

Attendance (10% of Final Grade)

Attendance is mandatory for each class session. If you have to miss class for any reason, you must notify the professor by e-mail before the start of the class session. Each unexcused absence will negatively impact your overall grade in the class. Two or more unexcused absence could result in failure to pass the course.

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Reading Responses (10% of Final Grade)

Each week, students will post brief “Reading Responses” between 250-300 words to the Coursework by 11:00am the day before class. These submissions will be succinct responses to that week’s reading assignments, identifying at least 2 key themes of the reading and suggesting one area for further class discussion. Reading responses will not be individual grades, but an overall grade will be assigned based on timely submission and completeness of the responses.

First Group Case Study: 10%

Students will be randomly assigned to one of the case study groups to develop answers to the assigned case study questions. Each group will submit a short memo which summarizes the answers of their respective group (not exceeding three pages) a day before the class. Students will come prepared for discussion and peer learning during the class.

Midterm Examination: 25%

The midterm examination will be to prepare around 10-15 pages long (double-spaced, Times New Roman 12-point font) paper responding to the questions on an assigned case study. The midterm examination will be due at the start of class on the assigned date.

Group Case Study Presentation: 15%

Each student will be randomly assigned to one of the five or six case study groups. Working as a group, students will prepare a 5 to 7- minute PowerPoint presentation responding to the questions outlined for the case study.

Final Examination: 30%

The final examination will be a 10-page (double-spaced, Times New Roman 12-point font) paper. The final examination will be due by e-mail on an assigned date.

Grading Policies:

The following identifies how points awarded to individual assignments translate into letter grades for the course:

A= 93-100, A-= 90-92, B+=87-89, B= 84-86, B-=80-83, C+=77-79, C=74-76, C-=70-73, D=66-69, F=

65 or fewer

Course Policies

Late Assignment Policy

Assignments (e.g., case study group memo., mid-term paper, group presentation slides and final exam paper) are due on the dates/times identified. For each assignment one letter grade will be deducted per day of delay in submission. Pre-read assignments not received by the time of final grades will receive zero points.

Incompletes

As outlined in the School’s grading and academic starts policy, “A grade of ‘I’ (incomplete) is a temporary grade indicating failure to complete assigned work. The mark is given only upon the request of the student and at the discretion of the instructor.

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The student and faculty member must sign a completed 'Request for Grade of Incomplete Form' before the final class session. The 'I' must be removed within one year after the end of the semester in which the student received the grade. Students seeking an extension of this time limit must have the approval of the instructor and successfully petition of the director of their program. If no petition is made, or if the petition is unsuccessful; the grade is changed to an N-Permanent Incomplete- which remains on the student's permanent record."

School Policies

Copyright Policy

Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

Academic Integrity

Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at <http://sps.columbia.edu/student-life-and-alumni-relations/academic-integrity-and-community-standards>. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

Accessibility

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>.

Course Content

Week 1: Course Overview and Introduction to Urban Sustainability

- Course Overview
- Why adopt sustainability principals for cities?

Required Readings:

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Campbell Scott, "Green Cities, Growing Cities & Just Cities: Urban Planning & the Contradictions of Sustainable Development", *Journal of American Planning Association* 62:3, 296-312, 1996

<http://www.tandfonline.com/doi/pdf/10.1080/01944369608975696>

Recommended Readings:

William E. Rees, "Achieving Sustainability: Reform or Transformation?" *Journal of Planning Literature*, Vol. 9, No.4, May 1995, pp-343-361. <http://jpl.sagepub.com/content/9/4/343.full.pdf+html>

Portney, Kent E., "Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities", Cambridge, "Chapter 1: The Conceptual Foundations of Sustainable Cities: Sustainability, Sustainable Economic Development, and Sustainable Communities", MIT Press, 2013.

Class Exercise: Participants will complete in advance the personal ecological footprint estimate using the online calculator and determine the potential for reduced resource usage. <http://www.carbonfootprint.com/calculator.aspx>

Week 2: Urban Development and Economics

- Why cities take different forms of development?
- What are key determinants of land uses and their distribution within a city?

Required Readings: (First and one of the remaining two)

Luis M.A. Bettencourt, "The kind of problem a city is". Santa Fe Institute, 2013
<https://www.santafe.edu/research/results/working-papers/the-kind-of-problem-a-cityis>

Bret Clark, "Ebenezer Howard and Marriage of Town & Country: An Introduction to Howard's Garden Cities of Tomorrow", *Organization & Environment*, Sage, 2003 <http://oae.sagepub.com/content/16/1/87.full.pdf+html>

Mathias Wendt, "The Importance of Death and Life of American Cities by Jane Jacobs to Profession of Urban Planning", *New Visions for Urban Affairs*, Volume 1, Spring 2009 <https://cpb-us-w2.wpmucdn.com/sites.udel.edu/dist/a/7158/files/2018/01/theimportance-of-death-and-life-of-great-american-cities-1961-by-jane-jacobs-to-the-profession-of-urban-planning-t7jm1p.pdf>

Recommended Readings:

Bajpai, Jitendra N., "Building a foundation for smart Indian cities", published in "Insight", a Journal of Indian School of Business, Hyderabad, April 2015. <https://isbinsight.isb.edu/building-a-foundation-for-smart-indian-cities/>

Arthur O'Sullivan, "Urban Economics", Seventh Edition, Chapters 1, 6 & 7, McGraw Hill, 2009

<https://clio.columbia.edu/catalog/SCSB-8710612>

Week 3: Urban Growth Management and Sustainability Indicators

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- How land development and transport interactions shape urban economy, inclusiveness and environment?
- What should be measured and monitored to nurture sustainability?

Required Readings:

Portney, Kent E., “Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities”, Cambridge, “Chapter 2: Measuring the Seriousness of Sustainable Cities”, MIT Press, 2013

Case Study Discussion - Urban Expansion and Mobility Trends in Mexico Metro Area

1. Angel Shlomo et al., 2016 Atlas of Urban Expansion, http://atlasofurbanexpansion.org/cities/view/Mexico_City
2. World Bank: Mexico City Case Study (file in canvas)

Assignment Questions:

- What major factors are influencing urban footprint expansion of Mexico City?
- How transport supply is affecting travel pattern and mode choices?
- How city is performing in meeting current mobility needs of its residents compared to other cities?
- What measures would you consider to improve quality of environment and access to opportunities for city residents?

Week 4: Urban Travel Management

- What major factors influence travel behavior and demand?
- How to reduce transport linked GHG emissions?
- What are emerging technologies, practices and policies that affect choice of modal options and reduce use and ownership of vehicles?

Required Readings: (Any two)

Bajpai, Jitendra N., “Emerging Vehicle Technologies and the Search for Urban Mobility Solutions”, Journal of Urban, Planning & Transport Research, Vol. 4, 2016, Issue 1 <http://www.tandfonline.com/eprint/rmWFcyHMerxiadEquKhA/full>

Suzuki H, Cervero R., Luchi K., “Transforming Cities with Transit”, Pages 1-21, World Bank, 2012. <http://documents.worldbank.org/curated/en/947211468162273111/pdf/Main-report.pdf>

Ewing Reid, Cervero R., “Travel and the Built Environment”, Journal of American Planning Association, May 11, 2010 <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf>

Recommended Reading:

Dixon Tim, Enmes M, Hunt M & Lanno S, “Urban Retrofitting for Sustainability: Mapping the Transition to 2050, Part II Chapter 7: Urban design & the retrofit agenda”, Earthscan from Routledge, London, NY, 2014

Case study readings: (One of the following will be assigned to each student for class discussion) Lam, S.H. and Toan T.D., “Land Transport Policy and Public Transit in Singapore”, Transportation 33(2): 171-188, 2006 <http://www.springerlink.com/content/q5r8g4211x38664h/fulltext.pdf>

ESMAP, Bogota, Columbia, Bus Rapid Transit for Urban Transport, Nov. 2009 <https://www.esmap.org/node/660>

ESMAP, Cairo - Arab Republic of Egypt, Taxi Scraping & Recycling Project, 2010 <https://www.esmap.org/node/659>

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Fix NYC: Advisory Panel Report (Page 1 to 25), January 2018.
<https://www.hntb.com/HNTB/media/HNTBMediaLibrary/Home/Fix-NYC-Panel-Report.pdf>

Week 5: Inclusive Urban Development

- How cities define, measure and address social sustainability?
- Can environmental sustainability address social sustainability in cities?
- How land development policies and non-government actors may enhance inclusiveness of cities?

Required Reading:

Portney, Kent E., "Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities", Cambridge, Chapter 6: Is Sustainable City a More Egalitarian Place? Sustainable Communities, Environmental Equity, and Social Justice, MIT Press, 2003.

Bertaud Alain, "Affordability: Household's income, regulations and Land supply", Part I, Working Paper #38, Dec. 2016.
https://marroninstitute.nyu.edu/uploads/content/Affordability_Part_I_AB.pdf

Recommended Reading:

Jenks Mike, Jones Colin, "Dimensions of the Sustainable City", Chapter 5: Social Acceptability, SpringerLink, 2010 (e-book in library) <https://clio.columbia.edu/quicksearch?q=Dimensions+of+sustainable+cities&commit=Search>

Perlman Janice E., Sheehan Molly O'Meara, "Fighting Poverty & Environmental Justice in Cities", 2007 State of the World: Our Urban Future, Chapter 9, World Watch Institute.
<http://www.worldwatch.org/files/pdf/State%20of%20the%20World%202007.pdf>

Review the summary of two case studies:

Innovation in Housing for the Poor: Cemex https://www.sharedvalue.org/sites/default/files/resource-files/Cemex_SVICase_06-08-15.pdf

SEWA: Empowerment through mobilization of poor woman on a large scale.
http://web.worldbank.org/archive/website00819C/WEB/PDF/INDIA_SE.PDF

Week 6: Solid Waste & Circular Economy

- What factors influence urban waste generation?
- What are effective practices and technologies of waste management?
- How the paradigm of circular economy may help cities in reusing and reducing waste?

Required Readings: (Any two)

Dixon Tim, Enmes M, Hunt M & Lannoa S, Chapter 14: "Re-engineering the city for sustainable solid waste resource management", Earthscan from Routledge, London, NY, 2014

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Hoornweg Daniel, Bhada-Tata Perinaz, “What a Waste: A Global Review of Solid Waste Management”, Chapter 7: “Waste and the Environment”, Pages 25-31, World Bank, Urban series 68135, March 2012
https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/3363871334852610766/What_a_Waste2012_Final.pdf

Hahn N., Martin S. & Zils M., “Remaking the Industrial Economy”, McKinsey Quarterly, Feb 2014.
<https://www.mckinsey.com/business-functions/sustainability/our-insights/remakingthe-industrial-economy>

Mid-term assignment

Week 7: Urban Energy Planning & Solutions

Guest Speaker: Prof. Vijay Modi, Mechanical Engineering & Earth Institute, Columbia University

- What are key attributes of urban energy systems?
- How to manage urban energy systems by land development policies?
- How a city should leverage drivers and technological solutions to promote sustainable urban energy systems?
- What are efficiency capturing options in the private sector (e.g., buildings, site planning and distributed generations)?

Required Readings (Any two):

Mckinsey & Co. (July, 2019). The Global relevance of New York State’s clean power targets.

<https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/theglobal-relevance-of-new-york-states-clean-power-targets?cid=other-eml-alt-mipmck&hlkid=96a5758fde2e4c1e9e0841c859770cc3&hctky=10079840&hdpid=d485cf06-772e-4bb0-aab2-212337dd4597>

Dixon Tim, Enmes M, Hunt M & Lannoa S, “Urban Retrofitting for Sustainability: Mapping the transition to 2050, Part II Chapter 9: “The smart grid & the interface between energy, ICT and the city”, and Chapter 10: “Solar energy in urban retrofit”, Earthscan from Routledge, London, NY, 2014

Feng Liu, Anke S. Mayer, John F. Hogan, “Mainstreaming the Building Energy Efficiency Codes in Developing Countries: Global Experience and Lessons from Early Adopters”, Executive Summary, The World Bank Working Paper 204, ESMAP, 2010
<https://www.esmap.org/node/755>

Recommended Reading:

New York City Govt., One NY: The plan for a strong and just city, Pages 168-170 & 174- 175
<http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf>

MIT Design Advisor: Building Energy Simulator <http://designadvisor.mit.edu/design/>

Week 8: Mid-term Case Study Review & presentation on Toronto Project by Sidewalklabs

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Mid-term case study Q&A discussion

Guest Speaker: Rit Aggarwala, Head of Urban Systems at Google Alphabet's Sidewalklabs and Professor of Practice at SIPA, Columbia University.

Week 9: Urban Spatial Structure

Guest Speaker: Alain Bertaud, Former Lead Urban Specialist, World Bank, and Senior Research Scholar, Marron Institute, NYU

- How to nurture cities as a connected labor market?
- How megacities are integrating access needs with expansion of spatial economy?

Required Readings: (Any two)

Ng, W., Aggarwala, R.T., Kennedy, S.J., Doyle Wiese, L.E.. Sidewalk Labs Street Design Principles Version 1.0. (New York: Sidewalk Labs, 2019)

Sidewalk-Labs-Street-Design-Principles-v.1.pdf

Bertaud Alain: "Cities as labor markets", Working Paper #2, NYU, Feb. 19, 2014 <http://marroninstitute.nyu.edu/content/working-papers/cities-as-labor-markets>

Echenique M. H., Hargreaves A.H., Michel G. and Namdeo A., "Growing Cities Sustainably", Journal of American Planning Association, 78:2, Pages 121-137, 2012 <http://www.tandfonline.com/doi/pdf/10.1080/01944363.2012.666731>

Recommended Readings:

Transport Research Board, "Driving and the Built Environment: The Effect of Compact Development on Motorized Travel, Energy Use, and CO2 emissions", Summary, Special Report 298, Washington, D.C., 2009, http://www.nap.edu/openbook.php?record_id=12747

Week 10: Urban Water & Sanitation

Guest Speaker: Prof. Upmanu Lall, Director of Water Center, Earth Institute & Professor of Earth & Environmental Engineering, Civil Engineering and Engineering Mechanics, Columbia University

- How to balance supply, demand and quality of urban water?
- What are effective practices, technologies and policies for urban water management?
- What are re-use and eco-friendly strategies in urban settings?

Required Readings (any two):

IDB. (2019), The Future of Water, Chapter 1: One Water and Resource Recovery: Emerging water and sanitation paradigm (Pages 1-13). [http://water.columbia.edu/files/2019/04/FINAL_The_Future_of_Water_28March2019.pdf?utm_source=SDSN&utm_campaign=44067cb972-](http://water.columbia.edu/files/2019/04/FINAL_The_Future_of_Water_28March2019.pdf?utm_source=SDSN&utm_campaign=44067cb972-EMAIL_CAMPAIGN_2018_03_02_COPY_01&utm_medium=email&utm_term=0_23021000594_4067cb972-178196157)

[EMAIL_CAMPAIGN_2018_03_02_COPY_01&utm_medium=email&utm_term=0_23021000594_4067cb972-178196157](http://water.columbia.edu/files/2019/04/FINAL_The_Future_of_Water_28March2019.pdf?utm_source=SDSN&utm_campaign=44067cb972-EMAIL_CAMPAIGN_2018_03_02_COPY_01&utm_medium=email&utm_term=0_23021000594_4067cb972-178196157)

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Dixon Tim, Enmes M, Hunt M & Lannoa S, “Urban Retrofitting for Sustainability: Mapping the Transition to 2050, Part III Chapter 13: “Retrofitting sustainable integrated water management at household, building & urban scales”.

Vision 2020: New York City Comprehensive Waterfront Plan, Chapter 3: “Goal 4- Improve Water Quality”.
http://www.nyc.gov/html/dcp/pdf/cwp/vision2020_nyc_cwp.pdf

Recommended Reading:

California Water Action Plan, Draft Action Plan for Public Review, 2014
http://resources.ca.gov/docs/Final_Water_Action_Plan.pdf

Week 11: Case Studies – Student Presentations

Each of the six case study groups will prepare in advance a brief presentation (10 minutes or 5-6 slides) on their respective case study lessons for the class. The presentation should highlight the key features of sustainability actions, their effectiveness and potential for replication. After the group presentations each group will be given five minutes to answer a question given to them in the class.

- Hammarby Sjostad, Stockholm, Sweden
<http://www.aeg7.com/assets/publications/hammarby%20sjostad.pdf>
http://large.stanford.edu/courses/2014/ph240/montgomery2/docs/HS_miljo_bok_eng_ny.pdf
https://www.itdp.org/wp-content/uploads/2014/07/20.-092211_ITDP_NED_Hammarby.pdf
<http://www.hammarbysjostad.se/hammarby-sjostad/hammarby-sjostad/?lang=en>
- Paris Resilient Strategy
<http://www.100resilientcities.org/wp-content/uploads/2017/10/Paris-Resilience-StrategyEnglish-PDF.pdf>
- London Environment Strategy:
https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf
- Copenhagen: Solution for Sustainable City
http://www.danishwaterforum.dk/activities/Water_and_green_growth/Copenhagen_Solutions.pdf
http://kk.sites.itera.dk/apps/kk_pub2/pdf/1353_58936BnEKE.pdf Climate plan:
<https://www.energycommunity.org/documents/copenhagen.pdf> Adaptation plan
https://en.klimatilpasning.dk/media/568851/copenhagen_adaption_plan.pdf
- Resilient Chennai Strategy: Kaleidoscope, my city through my eyes
<http://www.100resilientcities.org/wp-content/uploads/2019/06/Resilience-StrategyChennai-English.pdf>
- Tokyo Sustainability Plan
<http://www.metro.tokyo.jp/english/about/vision/index.html>
<http://www.metro.tokyo.jp/english/about/plan/index.html>
http://www.metro.tokyo.jp/english/about/environmental_policy/documents/01_full_text_in_english_1.pdf

Week 12: Analysis of GHG Emissions and Energy Efficiency

- What is the internationally accepted protocol for measuring GHG emissions in cities?
- How a municipality could develop an energy efficiency and related emission reduction plan for services provided to city residents?

Required Readings:

World Bank, “The Low Carbon City Development Program (LCCDP) Guidebook, A Systems Approach to Low Carbon Development in Cities”, Executive Summary (Pg. 8 -15) and Emission Inventory (Pg. 46-48), 2014

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<https://openknowledge.worldbank.org/bitstream/handle/10986/21731/946950WP00PUBL0gram0Guidebook0FINAL.pdf?sequence=1>

C40, ICLEI, WRI, “Global Protocol for Community Scale GHG Emissions”, Executive Summary, June 2012.

<https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities>

New York City Govt., “Inventory of New York City Greenhouse Gas Emissions”, Appendix A to D (pages 39- 46), Nov.2014.

http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC_GHG_Inventory_2014.pdf

Recommended Readings:

UNFCCC, “CDM Methodology Booklet”, Nov. 2010 http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf#IV

Release final exam assignment on 22th Nov. with final submission on 6th Dec. Thanksgiving holiday Nov. 29-30

Week 13: Climate Change & Cities

- How to identify and manage climate risks?
- What are emerging approaches to adaptation planning and financing?

Required Readings:

Urban Land Institute, A Guide to Assessing Climate Change Risks. <http://uli.org/wp-content/uploads/ULI-Documents/ULI-A-Guide-for-AssessingClimate-Change-Risk-final.pdf>

UN Habitat: Guiding Principles for City Climate Action Planning

<http://e-lib.iclei.org/wp-content/uploads/2016/02/Guiding-Principles-for-City-ClimateAction-Planning.pdf>

Recommended Readings:

New York City Govt., One NY: The plan for a strong and just city, Vision 4: Our Resilient City, Pages 214-251, 2015
<http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf>