## Sustainability Metrics: SUMA PS5169

Columbia University:

**Logistics**

**Office Hours**: Mondays before class (6:00 – 8:00 pm) or by appointment

 ***\*\**** *Please email me to schedule a time to meet*

**Instructor**

Adam Freed

Email: afreed@gmail.com

**Course Description**

Over the past two decades, public and private institutions have set clear targets for environmental, economic, and social performance and they are increasingly using analytical tools to assess problems and measure progress. The advent of “Big Data” has accelerated this work – and opened up new possibilities and challenges. This course will examine the use of data and metrics to shape and implement sustainability policies and programs, and to assess and communicate their outcomes.

The course will survey a range of real world sustainability challenges and evaluate the choices confronting public officials, private companies, NGO’s, advocates, and citizens – and the data that can be used to diagnose problems, develop solutions, and measure success. Particular focus will be given to urban sustainability efforts and corporate sustainability. We will explore how data can be used and misused in each of these domains. Throughout we will emphasize the importance of context, comparability, and completeness of information.

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 how environmental data is used to develop 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 work as planners, policymakers, advocates, architects, environmentalists or other professions.

The course will feature guest lectures from speakers who are leaders in their fields. Lecture topics may be moved to accommodate speaker travel and availability. Notice will be provided to students in advance of any schedule changes.

This course satisfies the M.S. in Sustainability Management's quantitative analysis requirement.

**Course Objectives**

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| What do we want students to **know** and or **value** at the end of the course?  | Through the readings, lectures, in-class discussions, assignments and guest speakers, students will gain an understanding of how data can be used to identify the root causes of sustainability challenges, create targeted strategies to address them, engage stakeholders and build political coalitions, and track and communicate progress. Students will gain the skills to develop clear metrics and programmatic goals and critically evaluate the goals and measurements used by others. At the end of the course, students will understand how data can be used and misused, its power and shortcomings in communicating complex sustainability issues, and how to use data and analysis to solve complicated sustainability challenges. |
| What will students be able to **do** at the end of the course? | By the end of this course students should be able to: * Understand the use and development of metrics at the city, national, and corporate levels to track progress toward sustainability goals
* Evaluate the transparency and effectiveness of sustainability programs
* 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
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| What “big” questions/issues are dealt with in the course? | * How do you define and measure complex issues like sustainability and resilience?
* What makes a city or corporation “sustainable”?
* What is the role of data in program development and management?
* How do you identify the trade-offs in policy decisions and gather and use data to make more informed decisions?
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| How do these “big” questions/issues inform our teaching and assessment approach? | The class will provide a set of fundamental skills that students may apply in professional settings, with an emphasis on developing an analytic framework for sustainability and developing and monitoring solutions. The professor and guest lecturers will draw on their professional experiences to ground all topics and discussions in “real world” examples that go beyond academic studies. |

**Course Schedule**

* Week 1 (Sept. 9): Sustainability Metrics Overview
* Week 2 (Sept 16): Food Systems
* Week 3 (Sept. 23): Equity
* Week 4 (Sept 30): Climate Resilience - \*\*\* NO CLASS – TO BE RESCHEDULED \*\*\*
* Week 5 (Oct.7): Greenhouse Emissions
* Week 6 (Oct 14): Solid Waste
* Week 7 (Oct. 21): Mobility
* Week 8 (Oct 28): Corporate Sustainability

*\*\*\* Class will not be held on Nov. 4 due to the Academic Holiday \*\*\**

* Week 9 (Nov. 11): Air Quality
* Week 10 (Nov. 18): Water
* Week 11 (Nov. 25): Urban Sustainability
* Week 12 (Dec. 2): Wrap up discussion and presentations
* Week 13 (Dec 9): Presentations

**Readings**

A textbook will not be required for this course, although some articles and case studies may require purchase from online resources such as Harvard Business School Case Studies. All readings are listed in the Course Schedule section of this syllabus and will be posted to Courseworks.

“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.

**Course Requirements (Assignments and grading)**

* **Metric memo (10%)** - In April 2017, Columbia University rereleased its first sustainability plan, in which the University pledged to cut its greenhouse gas emissions 35% by 2020 and 80% by 2050.  Students will write a one-page memo recommending a non-GHG sustainability goal for Columbia. Memos must include:
* a clear and measurable goal for 2030
* a persuasive argument as to why your goal is important and material for Columbia
* a pressure, state, and response indicator (3 in total) to track progress toward your goal.
* **Case study (20%)** - Students will individually complete a case write-up, which are expected to be 2-3 pages and will be discussed in class on the date they are due. Specific questions to be answered will be provided in class
* **Problem set (20%)** - Students will be provided with a problem set and relevant information/sources to quantify the economic, social and environmental costs and benefits of a specified sustainability solution and will be asked to recommend an optimal implementation strategy weighing the relative costs and benefits. Students should individually complete the problem sets.
* **Final project (35%)** - Students will work as teams to propose a set of sustainability goals and indicators for a specific corporation (to be approved by the instructor) or for the City of Newark. Each project team will present their initial recommendations in class on Dec 2 and Dec 9, with an accompanying paper no longer than 8-10 pages due on Dec 16. Presentations should be no longer than 15 minutes and will be followed by 5 minutes of Q&A.
* **Class participation (15%)** - Class participation will be evaluated on a scale of 100-0. All students are expected to contribute to the classroom discussion throughout the course, including the in-class presentations and discussions with guest speakers. While classes will generally feature lectures on the specified topics each week, active discussion is encouraged to bring in students’ experiences and knowledge. Students should probe concepts introduced in the class and in readings and look for innovative solutions to challenges identified in the materials.

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.

**Course Policies**

**Participation and Attendance**

You are expected to do all assigned readings, attend all class sessions, and engage with others in class discussions. If you need to miss a class for any reason, please discuss the absence with the instructors in advance.

**Late work**

Papers and projects are due by the beginning of class on the date that they are due. All assignments must be handed in on time. Any late submissions, unless pre-approved by the professor, will receive an automatic reduction of one letter grade.

**Resources**

* GHG Protocol Calculation Tools - <http://www.ghgprotocol.org/calculation-tools/faq>
* Environmental Performance Index - <http://epi.yale.edu/>
* Moonen, Tim and Greg Clark, “The Business of Cities 2013” Jones Lang LaSalle, 2013. - <http://www.jll.com/Research/jll-city-indices-november-2013.pdf>
* STAR Communities Index - <http://www.starcommunities.org/>
* C40 Cities Climate Leadership Group - <http://www.c40.org/>
* Social Vulnerability Index - <http://artsandsciences.sc.edu/geog/hvri/sovi%C2%AE-0>
* US EPA Green Communities - <https://www.epa.gov/smartgrowth/tools-and-resources-sustainable-communities>
* Pivot Goals - <http://www.pivotgoals.com/>
* CDP - <https://www.cdp.net/en-US/Pages/HomePage.aspx>
* Global Reporting Initiative - <https://www.globalreporting.org/Pages/default.aspx>
* Dow Jones Sustainability Index - <http://www.sustainability-indices.com/>
* National Equity Atlas – <http://www.nationalequityatlas.org>
* Project Drawdown - <https://www.drawdown.org/solutions>

**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. SCE holds each member of its community responsible for understanding and abiding by the SCE 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>.

**Readings**

**Week 1: Sustainability Metrics Overview (September 9)**

Required Readings:

* Sachs, Jeffery, “Why the Sustainable Development Goals Matter.” Project Syndicate, March 30, 2015. Available at <http://www.project-syndicate.org/commentary/sustainable-development-goals-shift-by-jeffrey-d-sachs-2015-03>
* McArthur, John, “Own the Goals: What the Millennium Development Goals Have Accomplished.” Brookings Institute, February 21, 2013. Available at <https://www.brookings.edu/articles/own-the-goals-what-the-millennium-development-goals-have-accomplished/>
* Hardi, Peter and Terrence Zdan, “Assessing Sustainable Development: Principles in Practice.” The International Institute for Sustainable Development, 1997 (pages 1-23). Accessible at <https://www.iisd.org/pdf/bellagio.pdf>

Supplemental Readings:

* United Nations, “Report of the World Commission on Environment and Development: Our Common Future.” 1987. Available at <http://www.un-documents.net/our-common-future.pdf>
* World Health Organization, “Health in 2015: from MDGs to SDGs.” December 2015 (Chapter 9 only). Accessible at <http://www.who.int/gho/publications/mdgs-sdgs/MDGs-SDGs2015_chapter9.pdf?ua=1>
* United Nations, “Agenda 21.” UN Conference on Environment & Development, June 1992.
* UN Millennium Goals Indicators website - <http://mdgs.un.org/unsd/mdg/Default.aspx>
* UN Sustainable Development Goals - <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>
* “Balanced Scorecard Basics.” Balanced Scorecard Institute website. Accessible at <http://balancedscorecard.org/Resources/About-the-Balanced-Scorecard>
* Rosling, Hans, “Factfulness: Ten Reasons We’re Wrong About the World – And Why Things Are Better Than You Think.” Flatiron Books, New York, 2018.

**Week 2: Food Systems (September 16)**

\*\*\* Metric memo due at the beginning of class \*\*\*

*Guest Lecturer: Jacob Koch, Manager, Bloomberg Associates*

Required Readings:

* City of New York, “Five Borough Food Flow: 2016 New York City Food Distribution & Resiliency Study Results.” New York, NY, 2016. Accessible at <https://www.nycedc.com/resource/five-borough-food-flow>
* City of New York, “2018 Food Metrics Report.” New York, NY, 2016. (Pages 1-33, Appendix A) Accessible at <https://www1.nyc.gov/assets/foodpolicy/downloads/pdf/2018-Food-Metrics-Report.pdf>
* Detroit Food and Fitness Collaborative, “Economic Analysis of Detroit’s Food System.” W.K. Kellogg Foundation, 2014. Accessible at <https://dk-media.s3.amazonaws.com/AA/AY/pittsburghfoodpolicy/downloads/298058/Economic_Analysis_of_Detroit_s_Food_System.pdf>
* City of Baltimore, “2018 Food Environment Brief”. City of Baltimore, Updated August 2019. Accessible at <https://planning.baltimorecity.gov/baltimore-food-policy-initiative/food-environment>
* Kimberly Zeuli and Austin Nijhui, “The Resilience of America’s Urban Food Systems.” Initiative for a Competitive Inner City, Roxbury, MA, 2017. Accessible at <http://icic.org/wp-content/uploads/2017/01/Rockefeller_ResilientFoodSystems_FINAL_post.pdf?x96880>
* General Mills, “Global Responsibility 2019.” General Mills, Hidden Valley, MN, 2017. (Pages 1 – 47, 56-63, and skim Appendix). Accessible at <https://globalresponsibility.generalmills.com/images/General_Mills-Global_Responsibility_2019.pdf>

# Supplemental Readings:

* Corinna Hawkes and Jess Halliday, “What Makes Urban Food Policy Happen?” International Panel of Experts on Sustainable Food Systems, 2017. Accessible at <http://www.ipes-food.org/new-report-what-makes-urban-food-policy-happen>
* Union of Concerned Scientists, “Fixing Food: Fresh Solutions from Five U.S. Cities.” Union of Concerned Scientists, Washington, DC, January 2016. Accessible at <http://www.ucsusa.org/food-agriculture/expand-healthy-food-access/fixing-food-fresh-solutions-five-us-cities-2016#.Walpz7LfouU>
* JP Morgan Chase & Co Institute, “Going the Distance: Big Data on Resident Access to Everyday Goods.” JP Morgan Chase, March 2017. Accessible at <https://www.jpmorganchase.com/corporate/institute/document/institute-access-to-consumption-brief.pdf>
* Milan Urban Food Policy Pact Monitoring Framework Indicators (skim). Accessible at <http://www.milanurbanfoodpolicypact.org/milan-urban-food-policy-pact-monitoring-framework/>

**Week 3: Equity (September 23)**

*Guest Lecturer: Niiobli Armah, Manager, Bloomberg Associates/My Brother’s Keeper*

Required Readings:

* Richard V. Reeves and Eleanor Krause, “Raj Chetty in 14 charts: Big findings on opportunity and mobility we should all know.” Brookings Institute, January 11, 2018. Accessible at <https://www.brookings.edu/blog/social-mobility-memos/2018/01/11/raj-chetty-in-14-charts-big-findings-on-opportunity-and-mobility-we-should-know/>
* Raj Chetty, Nathaniel Hendren, Maggie Jones, and Sonya R. Porter, “Race and Economic Opporunity in the United States: Executive Summary.” The Economic Opportunity Project. March 2018. Accessible at <http://www.equality-of-opportunity.org/assets/documents/race_summary.pdf>
* Frank, Adam, “What Does It Take To See Gentrification Before It Happens?” National Public Radio, Washington, DC, August 29, 2017. Accessible at <http://www.npr.org/sections/13.7/2017/08/29/546980178/what-does-it-take-to-see-gentrification-before-it-happens?cid=social_20170901_73865167&adbid=903584140624199680&adbpl=tw&adbpr=727524717121409024>
* City Prosperity Initiative, “2015 Global City Report.” UN Habitat, New York, NY, 2016. Accessible at <https://unhabitat.org/wp-content/uploads/2016/02-old/CPI_2015%20Global%20City%20Report.compressed.pdf>
* Solomon Greene and Kathryn L.S. Pettit, “What if Cities Used Data to Drive Inclusive Neighborhood Change?” Urban Institute, Washington, DC, June 2016. Accessible at <http://www.urban.org/research/publication/what-if-cities-used-data-drive-inclusive-neighborhood-change>
* City of Seattle, “Equity & Environment Agenda” City of Seattle, Seattle, WA, 2016. Accessible at <https://www.seattle.gov/environment/about-ose/equity-and-environment>

Supplemental Readings:

* <http://www.urbandisplacement.org/policy-tools-2> (skim website)
* The Equality of Opportunity Project website - <http://www.equality-of-opportunity.org/> (skim)
* Washington, DC, “Sustainability DC,” Washington, DC, 2009. (Introduction and Equity & Diversity sections only). Available at <http://sustainable.dc.gov/sites/default/files/dc/sites/sustainable/page_content/attachments/DCS-008%20Report%20508.3j.pdf>

**Week 4: NO CLASS - Climate Resilience (to be rescheduled)**

Required Readings:

* David Eckstein, Marie-Lena Hutfils and Maik Winges, “Global Climate Risk Index 2019: Who suffers Most from Extreme Weather Events? Weather-related Loss Events in 2017 and 1998 to 2017.” German Watch Institute, 2019. Available at <https://germanwatch.org/en/16046>
* Da Silva, Jo, “City Resilience Index.” Arup International Development and Rockefeller Foundation, 2015. Available at <http://www.arup.com/city_resilience_index>
* Economics of Climate Adaptation Working Group, “Shaping Climate-Resilient Development: A Framework for Decision-Making.” 2009 (pages 1-33). Available at <http://mckinseyonsociety.com/downloads/reports/Economic-Development/ECA%20%20%20Shaping%20Climate%20Resilent%20Development%20%20%20Report%20Only.pdf>
* City of New York, “A Stronger, More Resilient New York,” City of New York, 2013 (Climate Analysis Chapter, pages 33-36 only). Available at <http://s-media.nyc.gov/agencies/sirr/SIRR_singles_Lo_res.pdf>
* O’Marah, Kevin, “Supply Chain Executives Must Lead On Climate Change.” Forbes, Sep 8, 2016. Accessible at <https://www.forbes.com/sites/kevinomarah/2016/09/08/supply-chain-executives-must-lead-on-climate-change/#26d3c1162566>
* National Public Radio, “Heat and American Cities”. Available at <https://www.npr.org/series/756048128/urban-heat> (skim)

Supplemental Readings:

* Stephen Tyler, Erwin Nugraha, Ha Kim Nguyen, et al., “Climate Resilience Working Paper # 2: Developing Indicators of Urban Climate Resilience.” Institute for Social and Environmental Transition, Jan. 2014. Available at <https://www.i-s-e-t.org/resource-resilience-working-paper-2>
* World Economic Forum, “A Vision for Managing Natural Disaster Risk: Proposals for Public/Private Stakeholder Solutions.” January 2011. Available at <https://www.weforum.org/reports/vision-managing-natural-disaster-risk>
* Alliance Development Works, “World Risk Report 2013.” Alliance Development Works, 2013. Available at <https://i.unu.edu/media/ehs.unu.edu/news/4070/11895.pdf>
* MunichRe, “Megacities - Megarisks Trends and Challenges for Insurance and Risk Management.” Münchener Rückversicherungs-Gesellschaft, 2004. Available at <http://www.preventionweb.net/files/646_10363.pdf>

**Week 5: Greenhouse Gas Emissions (October 7)**

Required Readings:

* C40 Cities, “The Future of Urban Consumption in a 1.5 Degree World.” C40 Cities, 2019. (Pages 12-55, 98-129) Available at <https://www.c40.org/consumption>
* Global Protocol for Community Scale Greenhouse Gas Inventories Executive Summary. Available at <http://www.ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities>
* McKinsey Center for Business and Environment, “Focused acceleration: A strategic approach to climate action in cities to 2030.” Novermber 2017. Accessible at <https://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/a-strategic-approach-to-climate-action-in-cities-focused-acceleration>
* City of Oakland, “2016 Greenhouse Gas Emissions Inventory Report.” City of Oakland, March 2016. (pages 1-11) Available at <http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak059097.pdf>
* City of New York, “Inventory of New York City’s Greenhouse Gas Emissions.” April 2016, by Cventure LLC, Cathy Pasion, Mikael Amar, and Yun Zhou, Mayor’s Office of Sustainability, New York, 2016. Available at <https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC_GHG_Inventory_2014.pdf>
* World Resources Institute and World Business Council for Sustainable Development, “Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition.” WRI, 2015. (pages 6-33) Available at <http://www.ghgprotocol.org/corporate-standard>

Supplemental Readings:

* Energy Transitions Commission, “Better energy, greater prosperity: Executive Summary.” Energy Transitions Commission, April 2017. Available at <http://energy-transitions.org/sites/default/files/BetterEnergy_Executive%20Summary_DIGITAL.PDF>
* Barrett, Brendan F.D. and Andrew DeWit, “This is why we cannot rely on cities alone to tackle climate change.” The Conversation, September 3, 2017. Accessible at <https://theconversation.com/this-is-why-we-cannot-rely-on-cities-alone-to-tackle-climate-change-82375>
* World Resources Institute, “Sample Corporate Standard Reporting Template.” Available at <http://www.ghgprotocol.org/sites/default/files/ghgp/standards_supporting/GHG-Protocol-Reporting-Template.docx>

**Week 6: Solid Waste (October 14)**

\*\*\* Case study due at the beginning of class and will be discussed for the first 45 minutes of class. \*\*\*

# The case study, “Patagonia's Sustainability Strategy: Don't Buy Our Products,” can be downloaded at <https://hbr.org/product/patagonia-s-sustainability-strategy-don-t-buy-our-products/IMD790-PDF-ENG>

Required Readings:

* New York City Department of Sanitation, “2017 Waste Characterization Study.” City of New York, New York, NY, 2017. Accessible at <https://dsny.cityofnewyork.us/wp-content/uploads/2018/04/2017-Waste-Characterization-Study.pdf>
* General Motors, “The Business Case for Zero Waste.” General Motors, Detroit, MI. Accessible at [https://www.generalmotors.green/dld/content/product/public/us/en/GMGreen/factsheets/\_jcr\_content/par/download\_0/file.res/GM's%20landfill-free%20blueprint\_%202018%20Update.pdf](https://www.generalmotors.green/dld/content/product/public/us/en/GMGreen/factsheets/_jcr_content/par/download_0/file.res/GM%27s%20landfill-free%20blueprint_%202018%20Update.pdf)
* Waste Management, “Leading Change: 2016 Sustainability Report.” Waste Management, 2016. Accessible at <http://www.wm.com/sustainability/pdfs/2016SustainabilityReport_WM.pdf> (pages 5-48)

# Engel, Hauke; Stuchtey, Martin; and Vanthournout, Helga, “Managing waste in emerging markets.” McKinsey and Company, New York, NY, February 2016. Accessible at <http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/managing-waste-in-emerging-markets>

# McKinsey and Company, “Mapping the benefits of a circular economy” McKinsey Quarterly, New York, NY, June 2017. Available at <http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/mapping-the-benefits-of-a-circular-economy>

**Week 7: Mobility (October 21)**

*Guest Lecturer: Eduardo Pompeo, National Association of City Transportation Officials (NACTO)*

Required Readings:

* City of New York, “Vision Zero Action Plan.” 2014. <http://www.nyc.gov/html/visionzero/pdf/nyc-vision-zero-action-plan.pdf>
* City of Los Angeles, “Great Streets for Los Angeles.” City of LA, 2014. Available at <http://www.smartgrowthamerica.org/documents/cs/impl/ca-losangeles-dot-strategicplan2014.pdf>
* NYC Department of Transportation, “Measuring the Street: New Metrics for 21st Century Streets.” City of New York 2012. Available at <http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf>
* National Association of City Transportation Officials, “NACTO Policy 2017: Creating Safe, Sustainable, Multi-Modal Urban Transportation.” NACTO, New York, NY, 2017. Accessible at <https://nacto.org/wp-content/uploads/2017/03/NACTO-Policy-2017.pdf>
* McCahill, Chris and Mary Ebeling, “Tools for measuring accessibility in an equity framework.” Congress for the New Urbanism, 2015. Available at <http://www.cnu.org/sites/default/files/ssti_transpo_equity.pdf>
* Goldsmith, Stephen, “Los Angeles’s Testing Ground for Transportation Efficiency” Harvard Kennedy School, Cambridge, MA, 2016. Accessible at <http://datasmart.ash.harvard.edu/news/article/los-angeles-testing-ground-for-transportation-efficiency-803>

Supplemental Readings:

* NYC Department of Transportation, “The Economic Benefits of Sustainable Streets.” City of New York, 2013. Available at <http://www.nyc.gov/html/dot/downloads/pdf/dot-economic-benefits-of-sustainable-streets.pdf>

# Hossein Haghshenas and Manouchehr Vaziri, “Urban sustainable transportation indicators for global comparison.” Ecological Indicators. Volume 15, Issue 1, April 2012. Available at <http://ac.els-cdn.com/S1470160X11002974/1-s2.0-S1470160X11002974-main.pdf?_tid=efd6aad2-5700-11e5-99a5-00000aacb35d&acdnat=1441809904_889a599a9cac5e70296491af6668da5a>

# Peter Roberts and Cordula Thum, “Transport Core Measures and Indicators: A Users Guide. The World Bank, Transport and Urban Department. March 2015 (Work in Progress). Available at <http://siteresources.worldbank.org/INTTRM/Resources/514793-1131130428609/trial_Guide0503-web-links.pdf>

* Alla Reddy, et al, “Designing New York City Subways’ Key Performance Indicators to Improve Service Delivery and Operations.” Transit, 2014 Volume 1. Transportation Research Record: Journal of the Transportation Research Board. January 2014. Available at <http://lexciestuff.net/Papers/14-1710_BSC_KPI_036.pdf>

**Week 8: Corporate Sustainability (October 28)**

*Guest Lecturer: Davida Heller, Vice President, Corporate Sustainability, Citigroup*

Required Readings:

* Pivot Goals website (skim) <http://pivotgoals.com/search.php>
* World Economic Forum, “White Paper on Business Sustainability: What it is and why it matters,” World Economic Forum, 2014. Accessible at <http://www3.weforum.org/docs/GAC/2014/WEF_GAC_HumanRights_BusinessSustainability_WhitePaper_2014.pdf>
* Global Reporting Initiative, “GRI 101: Foundation,” GRI, Amsterdam, The Netherlands, 2016 (pages 3-26). Available at <https://www.globalreporting.org/standards/gri-standards-download-center/>
* Tullis, Paul, “Bloomberg’s Push for Corporate Sustainability.” Fast Company, April 2011. Available at <http://www.fastcompany.com/1739782/bloombergs-push-corporate-sustainability>
* Kering “Kering Environmental Profit and Loss.” Kering, 2017. Available at <https://keringcorporate.dam.kering.com/m/4b93719b3980f5b0/original/kering_2017_epl_report.pdf>
* KPMG International, “The KPMG Survey of Corporate Responsibility Reporting 2017.” KPMG, 2018. Available at <https://assets.kpmg/content/dam/kpmg/be/pdf/2017/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf>

Supplemental Readings:

* Deloitte, “Sustainability & Compliance Trends.” Deloitte, 2015. Available at <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Risk/gx-risk-sustainability-and-compliance-trends-winter-2015.pdf>
* Global Reporting Initiative, “Carrots and Sticks: Sustainability reporting policies worldwide –today’s best practice, tomorrow’s trends.” GRI, Amsterdam, The Netherlands, 2013 (pages 8-24). Available at <https://www.globalreporting.org/resourcelibrary/Carrots-and-Sticks.pdf>
* Rohm, Howard and Dan Montgomery, “Link Sustainability to Corporate Strategy Using the Balanced Scorecard.” Balanced Scorecard Institute. Available at <http://balancedscorecard.org/Portals/0/PDF/LinkingSustainabilitytoCorporateStrategyUsingtheBalancedScorecard.pdf>
* Bloomberg LP, “Impact Report 2018.” Bloomberg LP, New York, NY, 2016. Available at <https://www.bloomberg.com/impact/>
* Walmart, “2019 Global Responsibility Report.” Walmart, 2019. Available at <https://corporate.walmart.com/media-library/document/2019-environmental-social-governance-report/_proxyDocument?id=0000016a-9485-d766-abfb-fd8d84300000>

**\*\*\* No class November 4 for Academic Holiday \*\*\***

**Week 9: Air Quality (November 11)**

*Guest Lecturer: Iyad Kheirbek, Head of Air Quality, C40 Cities Climate Leadership Group*

Required Readings:

* Kheirbek, Iyad, Jay Haney, Sharon Douglas, Kazuhiko Ito, Steven Caputo, Jr., and Thomas Matte, “The Public Health Benefits of Reducing Fine Particulate Matter through Conversion to Cleaner Heating Fuels in New York City.” Environmental Science and Technology. Volume 48, Issue 23. December 2014. Available on Canvas.
* Health Effects Institute, “State of Global Air 2018.” Boston, MA, Health Effects Institute, 2018. Accessible at <https://www.stateofglobalair.org/sites/default/files/soga-2018-report.pdf>
* Angel Hsu and Alisa Zomer, “Monitoring Global Air Pollution - Interactive Data Visualization.” Scientific American. May 6, 2015. Available at <http://www.scientificamerican.com/article/monitoring-global-air-pollution-interactive/>
* World Health Organization. “Ambient (outdoor) air quality and health”. Fact sheet No 313. WHO, March 2014. <http://www.who.int/mediacentre/factsheets/fs313/en/>
* Michal Krzyzanowski, et al. “Air Pollution in the Mega-cities.” Global Environmental Health and Sustainability. Current Environmental Health Reports. Volume 1, Issue 3. September 2014. Available on Canvas.
* Angel Hsua, et al, “Towards the Next Generation of Air Quality Monitoring Indicators.” Atmospheric Environment Volume 80, December 2013. Available at <http://www.sciencedirect.com/science/article/pii/S1352231013005578> (free via Columbia login)

Supplemental Readings:

* City of New York, The New York City Community Air Survey, 2008-2014. New York City Department of Mental Health and Hygiene. April 2016. Available at: <https://www1.nyc.gov/assets/doh/downloads/pdf/environmental/comm-air-survey-08-14.pdf>
* Michael Brauer, et al. “Exposure assessment for estimation of the global burden of disease attributable to outdoor air pollution.” Environmental Science and Technology. Volume 46. Issue 2. January 2012. Available on Canvas.
* Rob McDonald, et. al, “Planting Healthy Air.” The Nature Conservancy, Washington, DC, 2016. Accessible at <https://global.nature.org/content/healthyair?intc=glob_sol.sp>
* Air Pollution Monitoring – US EPA website: <https://www3.epa.gov/airquality/montring.html>

**Week 10: Water (November 18)**

Required Readings:

* McDonald, R.I and D. Shemie, “Urban Water Blueprint: Mapping conservation solutions to the global water challenge.” 2014, The Nature Conservancy, Washington, D.C. Available at <http://water.nature.org/waterblueprint/>
* Arcadis, “Sustainable Cities Water Index.” Arcadis, 2016. Available at <https://www.arcadis.com/media/4/6/2/%7B462EFA0A-4278-49DF-9943-C067182CA682%7DArcadis_Sustainable_Cities_Water_Index-Web.pdf>
* Asian Development Bank, “Asian Water Development Outlook 2013.” ADB, 2013. (Part 1only) Available at <https://www.adb.org/sites/default/files/publication/30190/asian-water-development-outlook-2013.pdf>
* Coca-Cola Replenishment Report (website). (skim) Available at <http://www.coca-colacompany.com/water-stewardship-replenish-report/>
* Winston, Andrew, “Coca-Cola Met Its Water Goals Early. Were They Too Easy?” Harvard Business Review, September 9, 2015. Available at <https://hbr.org/2015/09/coca-cola-met-its-water-goals-early-were-they-too-easy>

Supplemental Readings:

* 2030 Water Resources Group, “Charting Our Water Future: Economic Frameworks to Inform Decision-Making.” 2009 (just the Executive Summary, Introduction). Available at <https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/sustainability/pdfs/charting%20our%20water%20future/charting_our_water_future_full_report_.ashx>
* Robert I. McDonald, et al, “Water on an urban planet: Urbanization and the reach of urban water infrastructure,” Global Environmental Change, July 2014. <http://www.sciencedirect.com/science/article/pii/S0959378014000880>
* World Resource Institute, “Aqueduct Water Risk Framework.” WRI, Washington, DC, 2013. Available at <https://www.wri.org/publication/aqueduct-water-risk-framework>
* World Resource Institute’s “Aqueduct Water Risk Mapping Tool”: <http://aqueduct.wri.org/>
* Brown, Amber and Marty D. Matlock, “A Review of Water Scarcity Indices and Methodologies.” University of Arkansas, The Sustainability Consortium, White Paper #106, April 2011. Available at <https://www.sustainabilityconsortium.org/downloads/a-review-of-water-scarcity-indices-and-methodologies/>
* CDP, “Cities and Water infographic.” CDP, Washington, DC, 2017. Accessible at <https://www.cdp.net/en/research/global-reports/cities-infographic-2017>

**Week 11: Urban Sustainability (November 25)**

\*\*\* Problem set due at the beginning of class. \*\*\*

Required Readings:

* Woyke, Elizabeth, “A smarter smart city.” MIT Technology Review, February 21, 2018. Accessible at <https://www.technologyreview.com/s/610249/a-smarter-smart-city/>
* Prakash, Mihir, et. al., “Achieving a Sustainable Urban America.” Sustainable Development Solutions Network, New York, 2017. Accessible at <http://unsdsn.org/wp-content/uploads/2017/04/Report-SDG-Cities-Index-Master_MP_Fixed.pdf>
* City of New York, “PlaNYC 2011 Update”. Mayor’s Office of Long-Term Planning & Sustainability, April 2011. (introduction and skim some of the chapters) Available at <http://www.nyc.gov/html/planyc/downloads/pdf/publications/planyc_2011_planyc_full_report.pdf>
* City of New York, OneNYC 2050: New York City’s Green New Deal. April, 2019. (Introduction and skim Volumes 1-9). Available at <http://onenyc.cityofnewyork.us/>
* Jones Lang LeSalle, “The Business of Cities 2015.” Jones Lang LeSalle, 2015. Available at <http://cities-research.jll.com/cities-research/Documents/benchmarking-future-world-of-cities/jll-business-of-cities-report.pdf>
* Arcadis, “Sustainable Cities Index 2016.” Arcadis, the Netherlands, 2016, Accessible at <https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2016/>

Supplemental Readings:

* David Ribeiro, et. al, “The 2019 City Clean Energy Scorecard.” ACEEE, July 2019. Available at <https://aceee.org/research-report/u1904>
* Tim Moonen and Greg Clark, “The Business of Cities 2013: What do 150 city indexes and benchmarking studies tell us about the urban world in 2013?”Jones Lang LeSalle, November 2013. Available on Canvas.
* OECD, “Resilient Cities: Policy Highlights of the OECD Report (Preliminary version).” OECD, Paris, 2016. Accessible at <https://www.oecd.org/fr/regional/resilient-cities-policy-highlights.htm>
* Ministry of the Environment and Water Resources, “Sustainable Singapore 2015 Blueprint,” Singapore, 2015. Available at <https://www.mewr.gov.sg/docs/default-source/module/ssb-publications/41f1d882-73f6-4a4a-964b-6c67091a0fe2.pdf.> Full website at <http://www.mewr.gov.sg/ssb/>
* Los Angeles, “pLAn: Los Angeles’ Green New Deal.” City of Los Angeles, 2019. (Pages 1-21). Available at <http://plan.lamayor.org/sites/default/files/pLAn_2019_final.pdf>
* City of Philadelphia, “Greenworks Philadelphia.” (2009); and 2016 Progress Report. Available at <https://www.phila.gov/departments/office-of-sustainability/publications/>

**Week 12: Wrap-up discussion and Final Presentations (December 2)**

**Week 13: Final Presentations (December 9)**