JOHNS HOPKINS
CAREY BUSINESS SCHOOL

Infrastructure Development for Sustainable Cities
2 Credits

BU.241.735 (81)

[Day & Time: Monday, 6pm-9pm]
[Start & End Dates: 1/27/20-3/16/20]

[Semester / Spring I, 2020]
[Location / Harbor East Baltimore Campus]

Instructor
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Required Texts & Learning Materials
Required readings will be posted to Blackboard ***or*** Links provided here in the syllabus.

Harvard Business Publishing case course pack for the course: https://hbsp.harvard.edu/import/702111

Additional suggested references:
Arthur O'Sullivan. Urban Economics. 8th Edition. McGraw Hill. 2012.

Matthew Khan. Fundamentals of Environmental and Urban Economics. Amazon Publishing.

John Sutton. Gridlock: Congested Cities, Contested Policies, Unsustainable Mobility. Routledge. 2016.
Charles Montgomery. Happy City. Random House. 2013.

Edward Glaeser. Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier. Penguin Random House. 2012.

Spiro Pollalis, Andre Georgoulias, Stephen Ramos and Daniel Schodek (editors). Infrastructure Sustainability and Design. Routledge, Taylor and Francis, New York. 2012 (Find the electronic version in https://catalyst.library.jhu.edu/catalog/bib_8183995)

Course Description

This course provides an understanding of the demand for, and supply of, sustainable infrastructure related to the pace of urbanization across the globe. The challenges for both developing and developed countries is examined from the perspective of potential new strategies, new technologies, new business models, and new financing techniques that could make a difference in addressing a full range of infrastructure needs while addressing sustainability objectives. In terms of sustainability, this will include an understanding of the demand and supply side, cultural factors, the policy framework, and the potential impact of technology and innovation. This course was previously titled Sustainable Cities: Urbanization, Infrastructure, and Strategic Choices.

Prerequisite(s)
None

Learning Objectives
By the end of this course, students will be able to:

1. Understand the consequences of urban growth on the demand for infrastructure from a global perspective.
2. Assess the challenges for both developing and developed countries to devise new strategies, new technologies, new business models, and new financing techniques
3. Equip students to think about some of these challenges, many of which present new business opportunities and partnership arrangements.
4. Learn how the private sector can make a difference in ways that can serve societal needs and contribute to improved living conditions that are essential to sustainability imperatives.

To view the complete list of Carey Business School's general learning goals and objectives, visit the Teaching & Learning@Carey website.

Attendance
Attendance and class participation are part of each student's course grade. Students are expected to attend all scheduled class sessions. Regular attendance and active participation are required for students to successfully complete the course.

Assignments
Students will be asked to sign a statement that each test and assignment is their own work and they have abided by the honor code. All assignments must be uploaded to Blackboard before the start of class the week it is due. NO EXCEPTIONS.

Quizzes

Students are not allowed to use any electronic devices during in-class tests. Calculators will be provided if the instructor requires them for test taking. Students must seek permission from the instructor to leave the classroom during an in-class test. Test scripts must not be removed from the classroom during the test.

Project

The final Project, called The Sustainability Challenge, additionally, will allow students to choose one of different proposed topics to develop a research paper. Also, students must produce a *Tableau Story* to present the work for class. Several examples of these projects from previous semesters are:

https://public.tableau.com/profile/yuekai.hu#!/vizhome/SustainabilityProject_15760864343120/SutainabilityProject

https://public.tableau.com/profile/liangyu.chen#!/vizhome/WalkableUrbanism/WalkableUrbanism

https://public.tableau.com/views/WalkableUrbanism-TracyVikie/STORY?:embed=y&:display_count=yes

https://public.tableau.com/profile/peter.liebman#!/vizhome/CitiBikeStory-PWL12_12v9/CitiBikeStory?publish=yes

https://public.tableau.com/profile/brian.gaither#!/vizhome/FinalPresentation_Krisch_Gaither_v2/JKrisch_BGaither_Final?publish=yes

https://public.tableau.com/profile/lucia.la#!/vizhome/Version7LuciaandChristine_IDPresentation_Walkability-Health/FinalStory

Exam

One final exam will be given. Class 8, March 16, 2020.

Assignment	**Weight**
Project Proposal (5%) Tableau Story (15%) Presentation (20%)	40%
Exam	30%
Cases, Homework, Class Participation	20%
Quizzes	10%
Total	100%

The grade of **A** is reserved for those who demonstrate **extraordinarily excellent** performance. The grade of **A-** is awarded only for **excellent** performance. The grade for **good** performance in this course is a **B+/B**. The grades of D+, D, and D- are not awarded at the graduate level. Please refer to the **Carey Business School's Student Handbook** for grade appeal information.

Tentative Course Calendar: *The instructors reserve the right to alter course content and/or adjust the pace to accommodate class progress. Students are responsible for keeping up with all adjustments to the course calendar.*

The course is organized in a series of topics that proceed from the macro to the micro – from a global scale to the level of particular technologies. The course will rely on readings and research papers. Class discussion may result in an expanded list of topics to reflect a more insightful view of some of the key issues. Students are required to come to class well prepared for discussion.

Additional readings may be added or removed for each session as new topics arise in class discussions. Changes will be uploaded to and announced on the course Blackboard site.

Course Sections

1. **Urbanization – Challenges and Opportunities:** Urbanization in developing countries is the defining feature of the 21st century. Global urban expansion poses a fundamental challenge and opportunities for cities, nations, and the international community. Consequences of urbanization include traffic congestion, environmental degradation including air and water pollution, resource scarcity, increase in poverty and crime, and the creation of slums. However, it is only through cities that the challenges of poverty reduction, economic growth, environmental sustainability, and climate change may be addressed. These are challenges that have relevance right down to the building.
   - *Optional* Readings:
     - The Challenge of the Sustainable City. Environment, Development and Sustainability Luc Hens. Pp 875-876, vol 12.
     - Beyond Climate: The Crisis of Environmental Sustainability. Steve Cohen.
     - Informed and Interconnected: A Manifesto for Smarter Cities. Kanter, R. and Litow, S. Harvard Business School Working Paper 09-141. 2009.

- McKinsey Global Institute. How to Make a City Great. 2013.
- World Bank. 2009. World Development Report 2009: Reshaping Economic Geography. Pgs 48-72, 126-145, 198-230.
- Sustainable Development and Planetary Boundaries. Johan Rockstrom et al. (22 pages).

2. **Sustainability – What Does It Mean and Why It Is Difficult to Attain?:** Sustainability must be understood in its broader context with respect to the consequences of demographic trends, lifestyle choices, consumption patterns, resources constraints, and infrastructure. Central to the sustainability debate is the ability to achieve convergence on what sustainability means, the metrics by which we can measure performance, and the targets that we hope to achieve, and when. A clearer understanding of sustainability should prompt better solutions to what we build, where we build, and how we build in the future. Once a concept is agreed upon, it is necessary to understand whether sustainability requires regulation or whether the market can deliver efficient solutions. Understanding the role of public and private costs and benefits, and the issues of coordination of the different agents involved, is key to understand how to address sustainability issues and why cities have been unsuccessful in tackling many of the sustainability problems.
   - *Required* Readings:
     - Spiro Pollalis, Andre Georgoulias, Stephen Ramos and Daniel Schodek (editors). **Infrastructure Sustainability and Design.** Edited by Routledge, Taylor and Francis, New York. 2012. Part 2: Sustainable Practice in Infrastructure Systems: Pgs1-5; Pgs 20-24.
     - The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness. Ambec S., Cohen M., Elgie S., and Lanoie P. 2010.
     - What is the Coase Theorem, really? Haab, Tim. Environmental Economics: The Cromulent Economics Blog. 2006.
     - The Coase Theorem is widely cited in economics. Ronald Coase hated it. Lee, T. The Washington Post. 2013.
     - The Fannie and Freddie Solution for Pollution. Mason, D. The Daily Signal. The Heritage Foundation. May 13, 2010.
     - The Non-Tragedy of the Commons. John Tierney. The New York Times. 2009.
     - The Tragedy of the Commons. Garrett Hardin. Science 13 Dec 1968: Vol. 162, Issue 3859, pp. 1243-1248.
   - *Optional* Readings:
     - The Problem of Social Cost. Coase, R. Law and Economics. Vol 2. 1960.
     - The Coase Theorem. Medema, S., and Zerbe, R. Encyclopedia of Law and Economics. 1999.
     - Other Things Equal, The so-called Coase Theorem. McClosekey, D. 1998.
     - Elinor Ostrom's 8 Principles for Managing A Commons. Walljasper, J. On the Commons. 2011.
     - Community-run fisheries: avoiding the 'tragedy of the commons'. Leal, D. 1996.
     - *Required* Assignment (Due before the start of Class 2 via upload to Blackboard):
       - Go to https://www3.epa.gov/carbon-footprint-calculator/ and calculate your carbon footprint.
       - Go to http://www.earthday.org/take-action/footprint-calculator/ and calculate your ecological footprint?

3. **Sustainable Urban Infrastructure – What Does This Encompass?** Urban infrastructure is essential to buildings cities and generally refers the “hard” systems - transportation, telecommunications, energy, water, sanitation, and waste. On the “soft” side are health, education, social services, security and natural areas. To this list must be water and food. The requirements of each must be examined and understood in a socio-political, cultural and economic context. Each must be examined separately, either as networks or nodes, then collectively. In terms of sustainability the challenge is with methods of measurement and performance evaluation, typically applied to complex systems. Compounding the problem is the many stakeholders involved in the lifetime of most infrastructure systems.
   - *Required* Readings:

- Spiro Pollalis, Andre Georgoulias, Stephen Ramos and Daniel Schodek (editors). **Infrastructure Sustainability and Design.** Edited by Routledge, Taylor and Francis, New York. 2012. Part 2: Sustainable Practice in Infrastructure Systems: Pgs1-5; Pgs 20-24; Pp71-168.
- Growing resources for growing cities: Density and the cost of municipal public services in Latin America. Libertun et al. Urban Studies Journal. September 2015. (Login with JHU ID to access)
- Energy Cases: *Coal, Nuclear, Natural Gas, Oil or Renewable: Which Type of Power Plant Should We Build?* (2010) and *BrightSource: Challenges and Prospects for a Concentrated Solar Power Plant* (2013). From Harvard Business Publishing case course pack.
- Water Cases: *Water Shortage and Property Investing in Mexico City* (2014), *Mexico City Water Shortage* (2014) and *City Water Tanzania (A): Urban Water Partners for Dar Es Salaam* (2007). From Harvard Business Publishing case course pack.
- Transportation Case: *Rose Smart Growth Investment Fund* (2010). From Harvard Business Publishing case course pack.

- Optional readings:
  - Cities Infrastructure: a report on sustainability. KPMG 2012.
- *Required* Assignment – Posted the day after Class 2, Due before the start of Class 3 via upload to Blackboard

4. **Guest Speakers:** 21st Century Cities and Baltimore Development Corporation **Urban Development and Finance with Opportunity Zones** Described as an innovative new tool for American economic development, Opportunity Zones were introduced into the tax code through the Tax Cuts and Job Act of 2017. The policy, which aims to spur real estate development and small business growth in struggling census tracts across the nation, has generated significant excitement and interest. With the program generating both interest and controversy, though, the amount of "opportunity" actually promised remains to be seen.

   St Louis Tableau Exercise On a related note, many older Rust Belt cities, tied to a singular industry during the American industrialization boom, find themselves unable to compete with growing cities as those industries moved offshore and replacement difficult to find. St Louis reflects the similar trajectory of declining cities, left with a shrunk tax base in the central areas surrounded by wealthier suburbs, formed from the historical pathway of urban development and changing demographics. Transit accessibility, the strongest predictor of inner-city poverty, may help connect residents to jobs, companies to labor, reduce commuting time and provide opportunities for bridging economic gaps.

   - *Required* Readings:
     - Guest Speaker Readings (to be announced on and/or posted to Blackboard)
     - McKinsey Global Institute. The future of work in America. 2019. https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-in-america-people-and-places-today-and-tomorrow
     - St Louis Readings.
   - Optional Readings:
     - The growing distance between people and jobs in metropolitan America. Kneebone E. and Holmes N. Brookings. 2015.
   - *Required* Assignment – Tableau and Question Development from Readings homework posted the day after Class 3, Due before the start of Class 4 via upload to Blackboard

5. **Climate Change** Climate change is one of the biggest challenges of our time. Average temperatures have risen to record levels. This has affected the frequency and strength of extreme weather events. These changes affect productivity, health, and in some cases even the survival of vulnerable cities. Furthermore, contribution to the causes and vulnerability to the effects is unequally distributed both across and within countries. Cities real estate and infrastructure face strong challenges with climate change. Infrastructure plays a particularly important role, in addressing vulnerabilities. It is also one of the main victims of extreme weather effects. As stated by the National Climate Assessment 2014 Report "Infrastructure is being damaged by sea level rise, heavy downpours, and extreme heat; damages are projected to increase with continued climate change". In particular, essential infrastructure systems such as water, energy supply, and transportation will increasingly be compromised. Taking steps to address this crisis is urgent, but it requires

a level of global coordination that we are far from reaching. Additionally, polarization in the political scene of this topic has made relevant policy and reform become harder than ever to implement.

- *Required* Readings:
  - Spiro Pollalis, Andre Georgoulias, Stephen Ramos and Daniel Schodek (editors). **Infrastructure Sustainability and Design.** Edited by Routledge, Taylor and Francis, New York. 2012. Part 3: Assessing Urban Infrastructures: Pp169-244.
  - Cases: *The Big Easy, Not So Easy* (2012) and *The Political Economy of Carbon Trading* (2010). From Harvard Business Publishing case course pack.
  - **The Solutions Project Infographic**
- *Required* Assignment (Due before the start of Class 5 via upload to Blackboard): Venn Diagram Assignment (see in blackboard). This assignment is a presentation for next class. You do not need to prepare any visual aids. You can present very briefly citing what data you used to make your choice. You can work in groups of up to 5 people. You should not take longer than 5 minutes.

6. **Sustainability at a Building/Neighborhood Level: LEED, Energy and the Built Environment:** Multiple attributes are at play at the micro-level to reduce the environmental impacts of new construction. Given the large impact construction and operation of buildings has on sustainability (the EPA estimates that these activities account for about 40% of U.S. energy consumption and almost three-quarters of U.S. electricity consumption), as well as on the bottom line of private firms, it is fundamental to understand the benefits of making these operations more energy efficient. Empirical work has shown that energy efficient buildings and related infrastructure not only improves sustainability measures but also increases profits of real estate holdings. In this section we analyze how energy efficient infrastructure, especially buildings, can be implemented and the impact this implementation, especially LEED certification, has on the performance of the real estate assets.

- *Required* Readings
  - Spiro Pollalis, Andre Georgoulias, Stephen Ramos and Daniel Schodek (editors). **Infrastructure Sustainability and Design.** Edited by Routledge, Taylor and Francis, New York. 2012. Part 4: Design and Planning for Infrastructure Sustainability: Pp245-319
  - KSA Reading: Gensler. King Abdullah City for Atomic and Renewable Energy. 2013.
  - Inside Songdo, The City Designed from Scratch To Be Sustainable. Fastcoexist. 2016.
  - Designing Cities for a Sustainable Future. Emmons, G. Harvard Business School: Working Knowledge. 2011.
  - What's Behind the Backlash over Sidewalk Labs' Smart City? CityLab. 2018.
  - Why LEED Certification Matters to your Bottom Line. USGBC.
  - Piet Eichholtz, Nils Kok and John M. Quigley. The Economics of Green Building. The Review of Economics and Statistics. Volume 95, Issue 1.
  - Gilbert E. Metcalf and Kevin A. Hassett. Measuring the Energy Savings from Home Improvement Investments- Evidence from Monthly Billing Data. Review of Economics and Statistics. Volume 81, Issue 3, August 1999, p.516-528.
  - Piet Eichholtz, Nils Kok, and John M. Quigley. Doing Well by Doing Good? Green Office Buildings. American Economic Review Number 100, pgs 2492–2509.
  - Cases:
    - Design Creates Fortune: 2000 Towner Oakes Boulevard, Reawakening the World's Most Famous Office Building (2010) and The Green Duplex (2009) (residential). From Harvard Business Publishing case course pack.
    - King Abdullah Economic City: Population Drivers and Cash Flow. 2019. From Harvard Business Publishing case course pack.
    - LIVING PlanIT. From Harvard Business Publishing case course pack.
    - Sidewalk Labs: Privacy in a City Built from the Internet Up. 2019. From Harvard Publishing case course pack.

    - Toronto Overview. Sidewalk Labs. 2019.

- Optional Readings:
    - Franz Fuerst and Patrick McAllister. Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values. Real Estate Economics. Vol 39, No 1, pp. 45–69.
    - Nils Kok, Marquise McGraw, and John M. Quigley. The Diffusion of Energy Efficiency in Building. American Economic Review. Vol 101, No. 3.
    - Arik Levinson. How Much Energy Do Building Energy Codes Save? Evidence from California Houses. American Economic Review. Vol 106, No 10, pgs 2867–2894.
    - Gensler Research and Insight: Measuring Urban Experience: How can we quantify the quality and authenticity of our urban spaces? 2016.
    - Google's Guinea-Pig City.. Sauter, M. The Atlantic. 2018.
    - Benjamin F. Zaitchik, Kathleen O'Meara, Kristin Baja, Anna A. Scott, Darryn W. Waugh and Meredith C. McCormack. B'more Cool: Monitoring the Urban Heat Island at High Density for Health and Urban Design. earthzine.org.
    - Gensler. Impact by Design. Sustainable Performance, Environmental Impact, Design Innovation.
    - MacCleery, R., Peterson C., and Stern, J.D. Shifting Suburbs: Reinventing Infrastructure for Compact Development. Urban Land Institute. 2012.
- *Required* Assignment: Posted the day after Class 5; Due before the start of Class 6 via upload to Blackboard). One portion of the assignment will require each student to Choose and Read 1 of the cases from the Required Reading list for Class 6.

7. **Group Project Presentations and Demand and Supply of Sustainable Infrastructure.** This is one of the most difficult challenges given the lack of data, the proliferation of misinformation, and the politics involved. In emerging economies, the gap between demand and supply is rapidly expanding, while capacity building is severely constrained. Driving demand is the scale and rate of urbanization within developing countries that face serious resource constraints (natural, fiscal, administrative and technical). Driving supply are the international capital markets, entrepreneurship, technology, and political will. Creative, practical and cost-effective measures, many of which are home-grown, are already in use to address local needs and may soon influence the way that demand and supply are traditionally defined and measured.

- *Required* Main reading Materials:
    - McKinsey Quarterly. Mobilizing for a resource revolution. McKinsey Global Institute. McKinsey & Company. January 2012.
    - McKinsey Global Institute. Urban World: Cities and the rise of the middle class. McKinsey & Company. June 2012.
    - McKinsey Global Institute. Brookings Reports. Water theft and water smuggling Executive Report. Felbab-Brown, V. 2017.
- Optional Readings:
    - Sustainable Service Delivery in an Increasingly Urbanized World. USAID Policy Note. 2013.
    - Methodologies and Tools for Forecasting Infrastructure. Patterns of Potential Human Progress Volume 4: **Building Global Infrastructure.** The Frederick S. Pardee Center for International Futures, IFS.
    - McKinsey Global Institute. Resource Revolution: Meeting the world's energy, materials, food and water needs Full Report. McKinsey & Company. 2011.
    - Brookings Reports. Water theft and water smuggling: Growing Problem or Tempest in a Teapot? Full Report. 2017.
- *Required* Presentation Assignment: Group presentations **must be uploaded and functional** on the Tableau site *30 minutes before* the start of Class 7.

Carey Business School
Policies and General Information

Blackboard Site
A Blackboard course site is set up for this course. Each student is expected to check the site throughout the semester as Blackboard will be the primary venue for outside classroom communications between the instructors and the students. Students can access the course site at https://blackboard.jhu.edu. Support for Blackboard is available at 1-866-669-6138.

Course Evaluation
As a research and learning community, the Carey Business School is committed to continuous improvement. The faculty strongly encourages students to provide complete and honest feedback for this course. Please take this activity seriously; we depend on your feedback to help us improve. Information on how to complete the evaluation will be provided toward the end of the course.

Disability Services
Johns Hopkins University and the Carey Business School are committed to making all academic programs, support services, and facilities accessible. To determine eligibility for accommodations, please contact the Disability Services Office at time of admission and allow at least four weeks prior to the beginning of the first class meeting. Students should contact Priscilla Mint in the Disability Services Office by phone at 410-234-9243, by fax at 443-529-1552, or by email.

Honor Code/Code of Conduct
All students are expected to view the Carey Business School Honor Code/Code of Conduct tutorial and submit their pledge online. Students who fail to complete and submit the pledge will have a registrar's hold on their account. Please contact the student services office via email if you have any questions.

Students are not allowed to use any electronic devices during in-class tests. Calculators will be provided if the instructor requires them for test taking. Students must seek permission from the instructor to leave the classroom during an in-class test. Test scripts must not be removed from the classroom during the test.

Other Important Academic Policies and Services
Students are strongly encouraged to consult the Carey Business School's Student Handbook and Academic Catalog and Student Resources for information regarding the following items:

- Statement of Diversity and Inclusion
- Student Success Center
- Inclement Weather Policy
