SUMA K4035 – Greenhouse Gas Emissions: Measuring and Minimizing the Carbon Footprint

Instructor

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Course Description

Global greenhouse gas emissions are now at a record high, and the world's scientific community agrees that continued unabated release of greenhouse gases will have catastrophic consequences. Many efforts to curb greenhouse gas emissions, both public and private, have been underway for decades, yet it is now clear that collectively these efforts are failing. Critical to any attempt to mitigate greenhouse gas emissions is a clear, accurate understanding of the sources and levels of greenhouse gas emissions. This course will address all facets of greenhouse gas emissions accounting and reporting, and will provide students with tangible skills needed to direct such efforts in the future.

Students in this course will gain hands-on experience designing and executing greenhouse gas emissions inventories, employing all necessary skills including the identification of analysis boundaries, acquisition of data, calculation of emissions levels, and reporting of results. In-class workshops and exercises will complement papers and group assignments. A key component of this exercise will be critical evaluation of both existing and emerging accounting and reporting protocols.

This course will introduce many of the challenges facing carbon accounting practitioners, and will require students to recommend solutions to these challenges derived through critical analysis. Classes will examine current examples of greenhouse gas reporting efforts and will allow students the opportunity to recommend improved calculation and reporting methods.

Assignments will consist of readings and technical analysis projects. Students are expected to have basic experience using Microsoft Excel and basic quantitative skills. However, full Excel proficiency is not required.

Course Objectives

By the end of this course students will be expected to:

- Understand the science of climate change
- Understand the sources and effects of greenhouse gas emissions
- Understand and be able to evaluate greenhouse gas mitigation opportunities – both policies and specific measures
- Understand different greenhouse gas inventory reporting platforms and certification methods
- Design and complete a comprehensive greenhouse gas emissions inventory for a discrete entity
- Understand all greenhouse gas emissions protocols, for both public and private entities
- Calculate the carbon intensity of the electricity supply for a specific geographic area
- Conduct full life cycle analysis of greenhouse gas emissions from a defined consumer product

Course Schedule

- Introduction to Climate Change Science and Greenhouse Gas Inventories
- Measuring to Manage: The Importance of Regular, Accurate Greenhouse Gas Inventories
- Greenhouse Gas Accounting, Reporting, and Certification Methods
- Greenhouse Gas Emissions Data Collection and Emissions Calculation
- Greenhouse Gas Emissions Reporting Platforms
- The Importance of the Electricity Supply in Greenhouse Gas Accounting
- Greenhouse Gas Emissions Mitigation Efforts and Using Greenhouse Gas Inventories to Identify Mitigation Opportunities
- Life cycle/Consumption Based Inventories and Corporate Value Chain Greenhouse Gas Accounting
- Public and Private Sector Carbon Accounting
- The Next Frontier for Carbon Accounting and Reporting
- Final Presentations

Course Requirements

No materials are required to be purchased for this course. All required reading will be made available to students in advance or will be accessible through the internet. Readings will include reports from all levels of government, non-governmental organizations, and private companies, articles from academic journals, and articles from the press. All required readings are expected to be completed prior to each class. In addition, suggested readings, while not required, are recommended to provide additional background and depth on specific areas of focus.

Readings

Class 1: Introduction to Climate Change Science and Greenhouse Gas Inventories

Required Readings:

Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood and D. Wratt, 2007: Technical Summary. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ts.html

Report of an Ad Hoc Study Group on Carbon Dioxide and Climate, Woods Hole, Massachusetts, July 23–27, 1979, to the Climate Research Board, Assembly of Mathematical and Physical Sciences, National Research Council (1979). Carbon Dioxide and Climate: A Scientific Assessment. Washington, D.C.: The National Academies Press. ISBN 0-309-11910-3.

http://www.atmos.ucla.edu/~brianpm/download/charney_report.pdf

Hansen, J., R. Ruedy, M. Sato, and K. Lo (2010), Global surface temperature change, *Rev. Geophys., 48*, RG4004, doi:10.1029/2010RG000345.

Article is uploaded on CourseWorks and also available from Columbia University Libraries website, E-Resources:

http://library.columbia.edu/eresources/findarticles.html

The Greenhouse Gas Protocol (GHG Protocol): This widely used international corporate GHG accounting tool is the foundation upon which most other GHG accounting and reporting guidance is based.

World Resources Institute and World Business Council for Sustainable Development, "The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition)", pages 6-33

http://www.ghgprotocol.org/standards/corporate-standard

Supplemental Readings:

Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz and R. Van Dorland, 2007: Changes in Atmospheric Constituents and in Radiative Forcing. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf

The Royal Society. *Climate change: a summary of the science*. London: September 2010

http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2010/4294972962.pdf

National Research Council. *Advancing the Science of Climate Change*. Washington, DC: The National Academies Press, 2010

http://nas-sites.org/americasclimatechoices/sample-page/panel-reports/87-2/

Class 2: Measuring to Manage: The Importance of Regular, Accurate Greenhouse Gas Inventories

Greenhouse gas emissions inventory guidelines and protocols are comprehensive and sometimes lengthy documents. Before employing these documents' guidance, it is essential to understand their content and structure. Students are required to read the provided documents and familiarize themselves with some of the main objectives of greenhouse gas accounting guidelines and protocols. This reading list is a selection of introduction and overview chapters of the protocols and guidelines we will cover in more detail later in the course. This week's class discussion will focus on the content and application of these guidelines and protocols.

Required Readings:

World Resources Institute and World Business Council for Sustainable Development, The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition), pages 6-9.

http://www.ghgprotocol.org/standards/corporate-standard

The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (*2006 Guidelines*) were produced at the invitation of the United Nations Framework Convention on Climate Change (UNFCCC) to provide internationally agreed methodologies intended for use by countries to estimate greenhouse gas inventories to report to the UNFCCC. This chapter provides an overview of 2006 Guidelines which we will cover in more details later in the course.

IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds)., Overview

http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/0_Overview/V0_1_Overview.pdf

The Local Government Operations Protocol is designed to assist U.S. local governments with quantifying and reporting GHG emissions associated with their government operations.

California Air Resources Board, California Climate Action Registry, ICLEI - Local Governments for Sustainability, The Climate Registry, Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories, May 2010, pages 3-10.

http://www.icleiusa.org/action-center/tools/local-government-operations-protocol

The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) is a detailed technical document with cutting-edge methodologies and best practices to help local governments measure and report the emissions associated with their communities.

The Community Protocol is structured as a folder with a main document that includes the core guidance and two appendices. An additional seven detailed accounting appendices and a Scoping and Reporting Tool are included as separate documents in the folder.

ICLEI – Local Governments for Sustainability USA, The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, October 2012, pages 7-19.

Available on Courseworks or download at:

http://www.icleiusa.org/tools/ghg-protocol/community-protocol/download-the-community-protocol

Supplemental Readings:

2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 1, General Guidance and Reporting

http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html

Class 3: Greenhouse Gas Accounting, Reporting, and Certification Methods

This week covers a variety of methods used by both corporate and public entities to measure their GHG emissions. Please read the indicated pages of the following guidelines and understand these different guidelines. In the class we will share and discuss the application and differences between each method.

Required Readings:

World Resources Institute and World Business Council for Sustainable Development, The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition), pages 10-33.

http://www.ghgprotocol.org/standards/corporate-standard

C40 Cities Climate Leadership Group, ICLEI-Local Governments for Sustainability, Global Protocol for Community-Scale GHG Emissions (GPC) - Pilot Version 1.0 - May 2012.

http://c40citieslive.squarespace.com/storage/GPC%20Pilot%20Version%205.14.12.pdf

ICLEI – Local Governments for Sustainability USA, The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, October 2012, pages 20-50.

PDF available on Courseworks or download via:

http://www.icleiusa.org/tools/ghg-protocol/community-protocol/download-the-community-protocol

General Reporting Protocol – Version 2.0, The Climate Registry, March 2013, Chapters 4-6

http://www.theclimateregistry.org/downloads/2013/03/TCR_GRP_Version_2.0.pdf

Supplemental Readings:

These appendices provide detailed description of calculation methods used by various sectors and activities.

ICLEI – Local Governments for Sustainability USA, "The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions", October 2012 (Appendix C-I)

PDFs available on Courseworks or download via:

http://www.icleiusa.org/tools/ghg-protocol/community-protocol/download-the-community-protocol

GHG accounting and reporting requirements vary around the world. Students must adhere to requirements applicable to the entity they are assessing. For example, for calculation of emissions occurring in Australia and UK the appropriate methods are provided here.

The *National Greenhouse Accounts (NGA) Factors* has been prepared by the Australia's Department of Climate Change and Energy Efficiency and is designed for use by companies and individuals to estimate greenhouse gas emissions. Please see the link for more information:

http://www.climatechange.gov.au/en/publications/greenhouse-acctg/national-greenhouse-factors.aspx

The UK Government announced in June 2012 that it will introduce a regulation requiring reporting of greenhouse gas (GHG) emissions by UK quoted companies from 2013. Defra (Department for Environment, Food and Rural Affairs) has now published a draft of the GHG reporting regulations for consultation. It gives more information on what companies will need to disclose in their reports:

http://www.defra.gov.uk/environment/economy/business-efficiency/reporting/

Class 4: Greenhouse Gas Emissions Data Collection and Emissions Calculation

Access to and application of quality data is key to successful GHG emissions accounting and reporting. This week's discussion will focus on data requirements and challenges.

Required Readings:

ICLEI – Local Governments for Sustainability USA, The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, October 2012, pages 20-22

PDF available on Courseworks or download via:

http://www.icleiusa.org/tools/ghg-protocol/community-protocol/download-the-community-protocol

The IPCC launched software designed to implement Tier 1 and Tier 2 methodologies in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. This software is appropriate for either complete inventories or to assess individual sectors or groups of categories. Students can download the software along with the User Manual from the following links:

Intergovernmental Panel on Climate Change, Task Force on National Greenhouse Gas Inventories, "IPCC Inventory Software User Manual Version 2.00" (April 2012)

http://www.ipcc-nggip.iges.or.jp/software/files/IPCCInventorySoftwareUserManualV2_0.pdf

http://www.ipcc-nggip.iges.or.jp/software/new.html

World Resources Institute and World Business Council for Sustainable Development, *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition)*, pages 48-57.

http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf

In Australia, corporations that exceed a certain energy consumption and GHG gas emissions threshold are required by the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) to report their emissions. The following links provide more details on the regulations and platforms used in Australia.

http://www.cleanenergyregulator.gov.au/National-Greenhouse-and-Energy-Reporting/About-NGER/Pages/default.aspx

http://www.cleanenergyregulator.gov.au/National-Greenhouse-and-Energy-Reporting/steps-for-reporting-corporations/Pages/default.aspx

U.S. EPA Greenhouse Gas Reporting Program:
http://www.epa.gov/ghgreporting/index.html

http://ghgdata.epa.gov/ghgp/main.do

World Resources Institute and World Business Council for Sustainable Development, The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition), pages 40-47.

http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf

ICLEI – Local Governments for Sustainability USA, "The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions", October 2012 (Appendix C-I)

PDFs available on Courseworks or download via:

http://www.icleiusa.org/tools/ghg-protocol/community-protocol/download-the-community-protocol

Class 5: Greenhouse Gas Emissions Reporting Platforms

Required Readings:

Accelerating progress toward a lower-carbon future: CDP S&P 500 Climate Change Report 2012 (pages 26-40)

https://www.cdproject.net/CDPResults/CDP-SP500-2012.pdf

Global Reporting Initiative Sustainability Reporting Guidelines (Intro: 1-52 and ENV: 72-112)

https://www.globalreporting.org/resourcelibrary/G3.1-Guidelines-Incl-Technical-Protocol.pdf

General Reporting Protocol – Version 2.0, The Climate Registry, March 2013, Chapters 1, 2, and 3

http://www.theclimateregistry.org/downloads/2013/03/TCR_GRP_Version_2.0.pdf

Supplemental Readings:

The Electronic Code of Federal Regulations, 40 CFR Part 98, Subpart A – General Provision

http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=1d6b5fa559c429190f7de5ffd42a232a&rgn=div5&view=text&node=40:22.0.1.1.3&idno=40#40:22.0.1.1.3.1.1.3

http://www.epa.gov/ghgreporting/

Class 6: The Importance of the Electricity Supply in Greenhouse Gas Accounting

Required Readings:

City of New York, *Inventory of New York City Greenhouse Gas Emissions, December 2012*, by Jonathan Dickinson, Jamil Khan, Douglas Price, Steven A. Caputo, Jr. and Sergej Mahnovski. Mayor's Office of Long-Term Planning and Sustainability, New York, 2012. Pages 11-14

http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/greenhousegas_2012.pdf

Rothschild, S., Quiroz, C., Salhotra, M., Diem, A., "The Value of eGRID and eGRIDweb to GHG Inventories", December 2009

http://www.epa.gov/cleanenergy/documents/egridzips/The_Value_of_eGRID_Dec_2009.pdf

Rothschild, S., Diem, A., "Total, Non-baseload, eGRID Subregion, State? Guidance on the Use of eGRID Output Emission Rates"

http://www.epa.gov/ttnchie1/conference/ei18/session5/rothschild.pdf

Siler-Evans, K. et al, "Marginal Emissions Factors for the U.S. Electricity System". *Environmental Science & Technology* (2012) 46 (9), pp 4742–4748.

Available on Courseworks

Pacific Gas and Electric, "Greenhouse Gas Emission Factors Info Sheet", 2011

http://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf

UK Department of Energy and Climate Change, "Valuation of energy use and greenhouse gas (GHG) emissions", (Section 2)

http://www.decc.gov.uk/assets/decc/statistics/analysis_group/1_20100125163218_e_@@_valuationenergyuseggemissionsbackground.pdf

Class 7: Greenhouse Gas Emissions Mitigation and Using Greenhouse Gas Inventories to Identify Mitigation Opportunities

Required Readings:

Barker T., I. Bashmakov, L. Bernstein, J. E. Bogner, P. R. Bosch, R. Dave, O. R. Davidson, B. S. Fisher, S. Gupta, K. Halsnæs, G.J. Heij, S. Kahn Ribeiro, S. Kobayashi, M. D. Levine, D. L. Martino, O. Masera, B. Metz, L. A. Meyer, G.-J. Nabuurs, A. Najam, N. Nakicenovic, H. -H. Rogner, J. Roy, J. Sathaye, R. Schock, P. Shukla, R. E. H. Sims, P. Smith, D. A. Tirpak, D. Urge-Vorsatz, D. Zhou, 2007: Technical Summary. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-ts.pdf

Stern, Nicolas. 2006. *Stern Review on the Economics of Climate Change*. (Cambridge University Press: Cambridge, United Kingdom), October 20. (Executive Summary)

http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf

Enkvist, P. et al, "A cost curve for greenhouse gas reduction". McKinsey Quarterly, 2007 Number 1

http://www.epa.gov/oar/caaac/coaltech/2007_05_mckinsey.pdf

City of New York, "PlaNYC 2011 Update". Mayor's Office of Long-Term Planning and Sustainability, April 2011. (pages 3-14, 150-153)

http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/planyc_2011_planyc_full_report.pdf

The World Bank. *State and Trends of the Carbon Market Report 2012*. Washington, DC, May 2012

http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf

City of New York, *Inventory of New York City Greenhouse Gas Emissions, December 2012*, by Jonathan Dickinson, Jamil Khan, Douglas Price, Steven A. Caputo, Jr. and Sergej Mahnovski. Mayor's Office of Long-Term Planning and Sustainability, New York, 2012. Pages 3-10, 15-17

http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/greenhousegas_2012.pdf

http://www.google.com/green/bigpicture/#/

FedEx: Environment & Efficiency: 2011 Global Citizenship Goals and Progress Update

http://about.van.fedex.com/sites/default/files/gcr/2011_fedex_environment_efficiency.pdf

http://about.van.fedex.com/environment-efficiency

The website has a number of reports on GHG emissions, third party verification, and mitigation strategies. Review this website and prepare for some questions and class discussions.

http://www.chevron.com/globalissues/climatechange/

Supplemental Readings:

Halsnæs, K., P. Shukla, D. Ahuja, G. Akumu, R. Beale, J. Edmonds, C. Gollier, A. Grübler, M. Ha Duong, A. Markandya, M. McFarland, E. Nikitina, T. Sugiyama, A. Villavicencio, J. Zou, 2007: Framing issues. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter2.pdf

United Nations Environment Program (UNEP). *Introduction to the Clean Development Mechanism (CDM)*

http://unfccc.int/files/cooperation_and_support/capacity_building/application/pdf/unepcdmintro.pdf

Walmart 2012 Global Responsibility Report, *Beyond 50 years: Building a sustainable future*, Pages 68-81

http://corporate.walmart.com/global-responsibility/environment-sustainability/global-responsibility-report

http://www.unilever.com/sustainable-living/greenhousegases/

This presentation provides a number of cases in which organizations were able to appropriately identify and prioritize the hot spots in managing their carbon footprints.

http://www.wtcsd.org/Resources/Documents/WTCSD_Reich-Weiser%20Final.pdf

Class 8: Life cycle/Consumption Based Inventories and Corporate Value Chain Greenhouse Gas Accounting

Required Readings:

Greenhouse Gas Protocol, "*Product Life Cycle Accounting and Reporting Standard*", World Resources Institute and World Business Council for Sustainable Development, Pankaj Bhatia, Cynthia Cummis, Laura Draucker, David Rich, Holly Lahd (WRI), Andrea Brown (WBCSD), October 2011 (pages 1-148)

http://pdf.wri.org/ghgp_product_life_cycle_standard.pdf

Greenhouse Gas Protocol "*Corporate Value Chain (Scope 3) Accounting and Reporting Standard*", World Resources Institute and World Business Council for Sustainable Development (2011) (pages 1-152)

http://www.ghgprotocol.org/files/ghgp/public/Corporate%20Value%20Chain%20%28Scope%203%29%20Accounting%20and%20Reporting%20Standard.pdf

http://www.pwc.com/en_US/us/corporate-sustainability-climate-change/assets/sustainability-matters-carbon-accounting-in-the-value-chain.pdf

British Standards Institution, PAS 2050:2011, Specification for the assessment of the life cycle greenhouse gas emissions of goods and services, London, September 2011, pages 1-45.

PDF available on Courseworks or download via

http://shop.bsigroup.com/upload/Shop/Download/PAS/PAS2050.pdf

A Demand-Centered, Hybrid Life-Cycle Methodology for City-Scale Greenhouse Gas Inventories; Anu Ramaswami, Tim Hillman, Bruce Janson, Mark Reiner and Gregg Thomas; *Environ. Sci. Technol.*, 2008, 42 (17), pp 6455–6461; DOI: 10.1021/es702992q

Greenhouse Gas Emission Footprints and Energy Use Benchmarks for Eight U.S. Cities; Tim Hillman and Anu Ramaswami; *Environ. Sci. Technol.*, 2010, 44 (6), pp 1902–1910; DOI: 10.1021/es9024194.

The Economic Input-Output Life Cycle Assessment (EIO-LCA) method is used for supply chain and consumption based GHG emissions measurement. This website developed by researchers at the Green Design Institute of Carnegie Mellon University operationalizes the EIO-LCA method and transforms it into a user-friendly online tool to quickly and easily evaluate a commodity or service, as well as its supply chain. The results from the EIO-LCA model and this website are free for non-commercial use and may not be used in other derivative works or websites without permission.

http://www.eiolca.net/

Class 9: Public and Private Sector Carbon Accounting

Required Readings:

City of New York, Inventory of New York City Greenhouse Gas Emissions, December 2012, by Jonathan Dickinson, Jamil Khan, Douglas Price, Steven A. Caputo, Jr. and Sergej Mahnovski. Mayor's Office of Long-Term Planning and Sustainability, New York, 2012.

http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/greenhousegas_2012.pdf

United States Environmental Protection Agency. *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2010*. Washington: April 15, 2012 - Executive Summary

http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-ES.pdf

Kennedy, C.A. et al, "Greenhouse Gas Emission Baselines for Global Cities and Metropolitan Regions", paper presented at the World Bank's Fifth Urban Research Symposium, Marseille, France June 28-30, 2009

http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1256566800920/6505269-1268260567624/KennedyComm.pdf

Kennedy, C.A. et al, "Methodology for inventorying greenhouse gas emissions from global cities", Energy Policy, Volume 8, Issue 9, September 2010 (pages 4828-4837)

Available on Courseworks

Carbon Disclosure Project, "Measurement for Management – CDP Cities 2012 Global Report", 2012

https://www.cdproject.net/CDPResults/CDP-Cities-2012-Global-Report.pdf

This link contains files with publicly available data from the GHG Reporting Program for 2010. This data includes non-confidential data reported by facilities that directly emit GHGs:
http://www.epa.gov/ghgreporting/ghgdata/datasets.html

Bloomberg LP 2012, *The Sustainability Edge: Sustainability Update 2011*, Bloomberg LP, New York

http://www.bloomberg.com/bsustainfiles12/images/report_2011/2011_BloombergSustainabilityUpdate.pdf

According to its website: “In 2005, HSBC was the first FTSE 100 company to become carbon neutral”:

http://www.hsbc.com/1/2/carbonneutrality.

For class discussion: What do you think of HSBC’s initiatives? What does it mean for HSBC and the banking industry in general to be “carbon neutral”?

Carbon Disclosure Project, “Accelerating progress toward a lower-carbon future”, New York, 2012

https://www.cdproject.net/CDPResults/CDP-SP500-2012.pdf

Supplemental Readings:

The following links contain the most recent data on UK and Australia GHG emissions.

UK:
http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspx

http://uk-air.defra.gov.uk/reports/cat07/1207021214_UK_Emission_Mapping_Methodology_2008.pdf

Australia:

Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2012

http://www.climatechange.gov.au/en/publications/greenhouse-acctg/national-greenhouse-gas-inventory-2012-06.aspx

Please review the Global 100 website, which lists the top 100 most sustainable organizations in the world. Select a company from the list and be prepared to give the class a brief presentation on its GHG emissions and management practices (5 minute presentation).

http://www.global100.org/

http://www.global100.org/annual-lists/2012-global-100-list.html

For example, Johnson & Johnson was ranked #2 in 2011 and the link below provides information regarding its GHG emissions.

http://www.jnj.com/responsibility/ESG/Environment/Climate_Change/greenhouse_gas_emissions/

Carbon Disclosure Project, “Global 500 Climate Change Report 2012: Business resilience in an uncertain, resource-constrained world”, 2012

https://www.cdproject.net/CDPResults/CDP-Global-500-Climate-Change-Report-2012.pdf

Class 10: The Next Frontier for Carbon Accounting and Reporting

PUMA Environmental Profit and Loss (EP&L): Puma’s EP&L is a first-of-its-kind attempt to put a financial figure on a company’s environmental impact.

http://www.pwc.com/gx/en/corporate-reporting/sustainability-reporting/pumas-reporting-highlights-global-business-challenges.jhtml

http://www.guardian.co.uk/sustainable-business/blog/puma-scales-up-environmental-profit-loss-product

Novo Nordisk (Integrated Reporting)

http://annualreport2011.novonordisk.com/web-media/pdfs/Novo-Nordisk-AR-2011-en.pdf

http://www.novonordisk.com/sustainability/online-reports/online-reports.asp

Class 11: Final Presentations

Grading and Assignments

10% - Attendance and Class Participation

5% - Homework assignment 1

15% - Short Paper (2-3 pages)

5% - Homework assignment 2

5% - Homework assignment 3

15% - Data Analysis Project and Report due (group project - data submission and 2-3 page report plus presentation)

15% - Electricity Emissions Coefficient Exercise (data submission and 1 page summary)

30% - Final Assignment (8-10 page report plus presentation)

Participation is very important and will represent 10% of the student's grade. All students are expected to contribute to the classroom discussion throughout the course.

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 instructor in advance.

Papers and Reports are due by the beginning of class on the date that they are due, uploaded to CourseWorks. All assignments must be handed in on time. Any late submission will receive an automatic reduction of one letter grade – **there are no exceptions to this policy**.

- **Homework exercise 1**

  This assignment requires students to complete basic greenhouse gas emissions calculations as a comparative exercise, examining three separate activities. Additional instructions regarding this assignment will be distributed during the course.

- **Short Paper**

  This assignment is a 2-3-page paper qualitatively analyzing a publicly available greenhouse gas inventory of the student's choosing. In this analysis, students are expected to present findings on the inventory's approach, depth of content, and prospective utility to both issuing entity and broader audiences (e.g. shareholders for corporate inventories). Students are not expected to complete detailed assessment of

quantitative elements of the inventory, including data or calculation methodologies – these assessments will be the subject of later analyses.

In 2-3 pages, summarize the scope of the inventory and examine how closely the report achieves the issuer's goals. Critical to this assessment is an understanding of the value of greenhouse gas emissions accounting efforts. Students may elect to support or challenge elements of their chosen inventory – in either case specific examples are required. Papers that demonstrate thoughtful choice of what inventory to assess coupled with well-articulated results of analysis will be most successful.

· **Homework exercise 2**

This assignment requires students to measure and compare greenhouse gas emissions of email versus conventional mail. Additional instructions regarding this assignment will be distributed during the course.

· **Homework exercise 3**

This assignment requires students to complete basic greenhouse gas calculations for an example private company and small town. Additional instructions regarding this assignment will be distributed during the course.

· **Data Analysis Project and Report – Group Project**

This assignment is a 2-3-page report summarizing the results of a group problem-solving exercise involving data essential to the completion of greenhouse gas emissions inventories, plus a corrected Excel file. For this project, groups of students will be presented with a dataset of greenhouse gas emissions data that may contain errors, omissions, misapplied calculations, or other possible pitfalls. Groups will be expected to identify any elements that may lead to incorrect results, and to make corrections to amend such problems. The report must contain a detailed description of all steps taken to both identify and correct problems, and each group will present its findings to the class. Projects will be graded on accuracy and forensic skills, as well as presentation of results. Students will turn in both completed spreadsheets with corrected results and a report describing their approach and findings. Additional instructions regarding this assignment will be distributed during the course.

· **Electricity Emissions Coefficient Exercise**

This assignment will require the calculation of the carbon intensity of the electricity supply for a defined geographic region. Students will be expected to acquire needed electricity generation and consumption data, adjust any data to account for generator-specific conditions that may affect results (e.g. co-generation facilities), and calculate the region's greenhouse gas emissions coefficient. The deliverable is a completed data spreadsheet and a 1-page summary of the effort. Additional instructions regarding this assignment will be distributed during this course.

· **Final Assignment**

The final assignment is a complete greenhouse gas inventory report for a public or private entity to be defined by the student (in consultation with the instructor) during the course. Accompanying this report will be a short presentation from each student, to be delivered during class. The report will consist of an 8-10-page paper that presents the methodology employed and the analysis results. Additional instructions regarding this assignment will be distributed during the course.

Policies

Academic Integrity

The School of Continuing Education does not tolerate cheating and/or plagiarism in any form. Those students who violate the Code of Academic and Professional Conduct will be subject to the Dean's Disciplinary Procedures. The Code of Academic and Professional Conduct can be viewed online:
http://ce.columbia.edu/node/217

All work must be your own. The use of any research or external source must be cited and documented appropriately. The School provides some useful resources online; we strongly encourage you to familiarize yourself with these various styles before conducting your research:
http://library.columbia.edu/help/howto/endnote.html

Violations of the Code of Academic and Professional Conduct will be reported to the Associate Dean for Student Affairs.

Accessibility Statement

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