

# BUSINESS AND CLIMATE CHANGE

## Section 1

Tuck School of Business at Dartmouth College  
Spring 2010

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*‘The wealth of attribution studies reviewed in this article shows that there is an increasingly remote possibility that climate change is dominated by natural rather than anthropogenic factors.’ Professors Stott, Gillett, Hegerl, Karoly, Stone, Zhang, Zweirs, Wiley Interscience Review, 2010.*

*‘Yes. Climate change is real, and human activities are the major cause. The impacts of climate change will be profound and will affect every sector of the economy.’ Peter Darbee T’79, Chairman of the Board & CEO, PG&E Corporation, 2010.*

*‘Our belief is that there needs to be a price for carbon and if there is a price, the technology will decide. GE and other big companies have really said it’s time for the U.S. to drive forward the need for solutions to climate change.’ Jeff Immelt, CEO, General Electric, 2009.*

### Course Objectives

Looking ahead to the next few decades – a productive time in the span of your careers – there are few issues that will loom larger than climate change. Your careers will unfold in a world in which there will be a ‘price on carbon,’ the implications of which are enormous. Moreover, there is an emerging ‘climate economy,’ whose contours are already taking shape, in which much wealth will be created by companies that get in front of the opportunities and equally, lost by companies that fail to see, or fall behind, the challenges.

The goal of ‘Business and Climate Change (BCC)’ is to explore whether CEOs and CFOs of shareholder value-maximizing companies should care about climate change and the emerging climate economy, and if so, why, how, and what they can learn from the many forward-thinking companies that are getting in front of this issue.

Why are many taking it head-on? Simply put, they know they are the constituency with the largest cause-and-effect relationship to climate change. Through their resource use and greenhouse gas (GHG) emissions, they are the *cause* of climate change; the *effect* of mitigating and adapting to it – and ultimately solving the problem – will be a major source of costs for some, and benefits for others. BCC has four specific goals:

- (1) To develop your awareness of the issue of climate change and the opportunities/challenges it presents for shareholder value-maximizing businesses;
- (2) To understand the emerging climate economy and what it means to your company, its industry, and the global economy;

(3) To develop the frameworks to assess the market value/value-at-risk consequences of firms' exposure to climate change risks, their fossil fuel use, carbon footprints and GHG emissions; and the economic analysis tools to assess impacts of likely regulatory responses to climate change;

(4) To develop your understanding of corporate responses to climate change and to inform your ability to shape the conversation in your company.

### **Requirements**

The most important requirement of BCC is that you commit to a co-learning process, i.e., a process of shared knowledge-creation with me. There are no easy or cookie-cutter answers to the many complex questions that climate change raises. The process of co-learning, in turn, requires careful and thoughtful preparation for discussion in class, the assigned reading material or assignment for the day. The amount is by no means onerous, but, given the breadth of disciplines involved in understanding the phenomenon of climate change, the course will necessarily be reading-intensive. In signing up for BCC, I will assume that you have made a commitment to yourself and your colleagues that you will, indeed, do the readings required for every session.

BCC will deal with the topic of climate change in a self-contained way. No prior knowledge of the science or public policy aspects of climate change is presumed. However, given that some sessions (and at least one major assignment; see below) will address issues in economics and in finance, pre-requisites for BCC are Managerial Economics and Corporate Finance (or equivalent).

We have a lot of issues to cover in nine sessions. Therefore, I expect that you will attend every class. If, for extenuating reasons, you are not able to attend class on a particular day, I assume that it is for an important reason and that you have thought it through. Therefore, I do not need to be told the reason. *But you should try and notify me in advance* since this avoids inadvertent cold calls on those not in class. You should get caught up with the material you missed.

### **BCC and 'ESR' Eligibility**

Beginning with the T'11 class, Tuck requires you to take at least one course that explores the ethical and social (including environmental) challenges of business. It is called the 'ESR Requirement.' BCC meets this requirement.

To meet this requirement, a course must meet three criteria: (i) it recognizes the ethical and social/environmental dimensions of business problems (ii) it develops tools, concepts and frameworks to make practical, reasoned decisions when faced with ethical or social/environmental dilemmas, and (iii) it develops the ability to justify those decisions in language that is both clear and persuasive. (Note: It is in this latter sense of social/environmental concerns that BCC fits the ESR requirement.)

An Appendix to the syllabus that explains how BCC meets the three specific criteria. (In the Tuckstreams version of the syllabus, this Appendix can be found [here](#)).

## Policies

### Grading & Assignments

The course will be graded on the basis of class participation (individual, 25% weight), a 'fossil fuel beta' assignment (group, 25%), and a final project poster session and report (group, 50). More details will be forthcoming, but a summary is shown below.

Fossil Fuel Beta (FF $\beta$ ) Assignment: You will have a database on stock returns and other relevant data to calculate the FF $\beta$  of a set of firms in various industries, and interpret your findings. FF $\beta$  is a measure of the sensitivity of a firm's market-adjusted returns to changes in the price of fossil fuels. The idea is that an FF $\beta$  close to zero ('neutral FF $\beta$ ') is desirable, since CFOs might want to work to decouple the effects of an increasingly volatile variable on the value of the firm. The goal is to understand, and develop arguments for why, for instance, some companies have a neutral (or even positive) FF $\beta$  while others have a negative FF $\beta$ .

Project Report: You will work on a final assignment and produce a report that explores a specific aspect of the links between climate change and the corporation. As we get deeper into the issues, you are likely come up with your own topics, but here are some examples from last year's class, to trigger your thinking:

- Assessment of a firm's climate change strategy (carbon footprint, direct and indirect emissions, targets, internal initiatives, efforts to mitigate risks and capture opportunities, etc) and comparison to competition. Last year, students looked at Stonyfield Farm, Cargill, Toyota, US processed food industry, US airline industry.
- Assessment of value-at-risk and return sensitivity to dependence on GHG-producing activities, and strategies to mitigate/eliminate that risk.
- Comparison and contrast of US/EU/China stimulus spending on climate change-related issues. Assessment of renewable energy potential in the US.
- The future of carbon cap & trade in the US (Waxman-Markey; Boxer-Kerry; Cantwell bill drafts). Lessons learned from and comparisons to EU-ETS. Carbon taxes versus cap-and-trade.
- Assessment of the EU ETS: What has worked, what has not, where it goes from here, and lesson for the US.
- Analysis of climate change-related derivatives (weather derivatives, catastrophe bonds).
- Assessment of Tuck's carbon footprint (Scopes 1 + 2 + 3); Current developments in carbon footprint measurement.

- Discussion and analysis of regional climate initiatives in the US (RGGI, WCI)
- An assessment of carbon capture & storage.
- Solar power in India: How to close the financing gaps.
- Private equity & venture capital trends in climate change-related investments; the 'valley of death' and how to mitigate its impact.
- Everything you wanted to know about geo-engineering.
- The future of nuclear power in the US and worldwide; business opportunities associated with nuclear power.
- The role of the UN in helping or hindering the process of finding a solution to climate change; COP15 and COP16; international policy coordination issues.

### Groups

The ideal group size for this class is 3 or 4 (certainly no more than 4). I strongly urge that you prepare for every class in study groups, whether or not there is a group assignment. You will work as a group on both the FF&B assignment, and on your term paper. More details on both will be handed out during Week 2.

### Honor Code

You are expected to bring integrity to the learning process, and accept *personal* responsibility to uphold high ethical standards in your academic work. You are expected to promote a classroom atmosphere in which honest, participative, and imaginative work flourishes. This entails adequate preparation, sharing and challenging each others' ideas in the classroom, and contributing to joint learning on a daily basis. If you have your laptop open, it must be only for the purposes of note-taking, unless the particular class requires the use of your computer. (As you no doubt have experienced yourself, web-surfing and emailing during class detracts from your learning if those around you are doing it.) *As a courtesy to visitors, your laptops must remain closed during visitor sessions.*

### Course Visitors

- 1) **Frank O'Brien Bernini**  
*Chief Sustainability Officer & Chief Innovation Officer*  
Owens Corning  
Tuesday, April 6, 2010.
- 2) **Robert Simpson**  
*Chief Financial Officer*  
Waste Management  
Monday, April 12, 2010.

## Course Material

There has been an explosion of material – articles/reports, books, and websites/blogs/rants – on climate change in the past few years. We will focus on a small subset of those that, in my view, are sufficient to deal with the topic in a confident manner.

Based on these, for every session, there will be a set of *required* readings and a set of *supplementary* readings: the former are necessary, but if you can get to the latter too, your thinking on climate change will be truly pushed forward. (If nothing else, treat the latter as a summer reading project!). To make your task easier, I will try to give you as focused a set of reading guidelines as possible.

The syllabus contains some broad thought questions for each session. I may hand out more detailed preparation questions, roughly a week ahead, as and when needed.

All the course material is available via Tuckstreams. I have concluded that it makes sense for me, at least for the first couple of classes, to hand out a paper copy of the class slides (although e-copies will also be uploaded after class). It is far more carbon- and price-efficient to get it done one-shot and in ‘bulk’ rather than have you print it out individually. I will revisit this depending on how you all feel about it after the first couple of sessions.

## Knowledge Resources on Climate Change for the Long-run: Articles/Books/Blogs

### Articles/Reports of General Interest

(Most of these can be downloaded without registration.)

- Carbon Disclosure Project, ‘CDP S&P500 Report 2009,’ (<https://www.cdproject.net/CDPResults/CDP%202009%20SandP500%20Report.pdf>)
- Carbon Disclosure Project, ‘CDP Global 500 Report 2009,’ (<https://www.cdproject.net/CDPResults/CDP%202009%20Global%20500%20Report.pdf>)
- Carbon Disclosure Project, ‘CDP Supply Chain Report 2009,’ ([https://www.cdproject.net/CDPResults/65\\_329\\_201\\_CDP-Supply-Chain-Report\\_2009.pdf](https://www.cdproject.net/CDPResults/65_329_201_CDP-Supply-Chain-Report_2009.pdf))
- Intergovernmental Panel on Climate Change, ‘Climate Change 2007: Synthesis Report,’ ([http://www.ipcc.ch/publications\\_and\\_data/ar4/syr/en/contents.html](http://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html))
- Intergovernmental Panel on Climate Change, ‘Fourth Assessment Report – Summary for Policy Makers,’ 2007 ([http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf))
- McKinsey & Co, ‘Carbon Productivity Challenge,’ 2008 ([http://www.mckinsey.com/mgi/reports/pdfs/Carbon\\_Productivity/MGI\\_carbon\\_productivity\\_full\\_report.pdf](http://www.mckinsey.com/mgi/reports/pdfs/Carbon_Productivity/MGI_carbon_productivity_full_report.pdf))
- Pew Center on Global Climate Change, ‘Climate Change 101: Understanding and Responding to Global Climate Change,’ 2009 (<http://www.pewclimate.org/docUploads/Climate101-Complete-Jan09.pdf>)
- Pew Center on Global Climate Change, ‘The European Union’s Emissions Trading System in Perspective,’ 2008 (<http://www.pewclimate.org/docUploads/EU-ETS-In-Perspective-Report.pdf>)

- UN Foundation, 'Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable,' 2007 (<http://www.sigmaxi.org/about/news/UNSEGOonline.pdf>)
- University of Copenhagen: 'Climate Change – Global Risks, Challenges, and Decisions: A Synthesis Report,' 2009 (<http://climatecongress.ku.dk/pdf/synthesisreport>)
- US Climate Action Partnership: A Blueprint for Legislative Action, 2009 (<http://www.pewclimate.org/docUploads/USCAP-legislative-blueprint.pdf>)
- World Meteorological Organization: '2000-2009 – The Warmest Decade,' 2009 ([http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_869\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_869_en.html))

### Books

(These are useful for your bookshelf. The Friedman book is an easy read, and well-written. Labbatt & White is semi-interesting – a 2.5 out of 5 based on my assessment of the 'finance' content of chapters. The Nordhaus book manuscript can be downloaded for free; it is somewhat tougher reading, but a must-read, in my view. Stern is classic, but somewhat plodding and ponderous).

- Thomas Friedman, 'Hot, Flat, and Crowded,' FSG Press, 2008
- Sonia Labbatt and Rodney White, 'Carbon Finance,' 2007
- William Nordhaus, 'The Challenge of Global Warming: Economic Models and Environmental Policy,' ([http://nordhaus.econ.yale.edu/dice\\_mss\\_072407\\_all.pdf](http://nordhaus.econ.yale.edu/dice_mss_072407_all.pdf))
- Nicholas Stern, 'The Economics of Climate Change: The Stern Report,' Cambridge University Press, 2007.

### Websites/Blogs

(There are now literally hundreds of blogs, websites, and rants – on both sides of the issue – on climate change. The noise-to-signal ratio is high! The following, however, are oases of sanity that I regularly keep tabs on. A quick scan of these is an excellent way to stay on top of the material).

- Climate Debate Daily (A site that regularly updates key insights, arguments, and issues from both sides of the debate; also includes links to just about every climate change-related website or blog): <http://climatedebatedaily.com/>
- Dot Earth (A blog about climate change, the environment, and sustainability by New York Times's Andrew Revkin): <http://dotearth.blogs.nytimes.com/>
- Goddard Institute of Space Studies (A good source of a great deal of surface temperature data; lots of great pictures/videos/animations): (<http://data.giss.nasa.gov/gistemp/>)
- Green Inc (A blog about "...energy, environment, and the bottom line..." in the New York Times): <http://greeninc.blogs.nytimes.com/>
- Pew Center on Global Climate Change (A great resource for facts and figures, all things climate change): <http://www.pewclimate.org/>
- Roger Pielke Jr.'s Blog (A relatively neutral site – but tends to favor some degree of skepticism on climate science – that takes a hard look at IPCC's claims): <http://rogerpielkejr.blogspot.com/>
- US Climate Action Partnership (A group of businesses and environmental organizations that have come together to call on the federal government to enact strong national legislation to require significant reductions of GHG): <http://www.us-cap.org/>



### Syllabus Summary

<i>Tuesday, March 23, 2010</i>	Climate Change: Basic Issues and Corporate Implications
<i>Wednesday, March 24, 2010</i>	The Emerging Climate Economy <u>Case: Vital Communities</u>
<i>Monday, March 29, 2010</i>	Corporate Climate Strategy <u>Case: Carbon Footprint and Clean Energy at Simon Pearce</u>
<i>Tuesday, March 30, 2010</i>	Economics and Regulation of the Climate Economy
<i>Monday, April 5, 2010</i>	Climate Change, Sustainability, and the Corporate Value Creation Process
<i>Tuesday, April 6, 2010</i>	<u>Corporate Best Practice 1: Climate and Sustainability Strategy at Owens Corning</u> <i>Frank O'Brien-Bernini, CSO+CIO</i>
<i>Monday, April 12, 2010</i>	<u>Corporate Best Practice 2: Climate Strategy at Waste Management</u> <i>Robert Simpson, CFO</i>
<i>Tuesday, April 13, 2010</i>	International Coordination: Lessons from COP15 and Looking Ahead to COP16 <i>The Tuck COP15 Team</i>
<i>Monday, April 19, 2010</i>	Group Project Poster Sessions <i>Student-led</i>

## Detailed Syllabus

### **Session 1: Climate Change: Basic Issues and Corporate Implications**

*Tue, Mar 23*

- What is climate change? What are its causes, what are its likely effects? What aspects of the evidence are strong? Where is the evidence less strong? What are IPCC's key findings and uncertainties?
- Should businesses care about climate change? Why?
- What do businesses have to do with either the cause or effect of the phenomenon of climate change?
- What are the specific paths through which climate change impacts businesses? Could it affect firm value? How?

#### Required Reading:

1) University of Copenhagen: '*Climate Change – Global Risks, Challenges, and Decisions: A Synthesis Report*,' 2009 ([link](#)). Read the following sections: Executive Summary, Key Message 1, Key Message 3, and Key Message 5.

2) Sundaram's COP15 blogs: "What is the link between business and climate change?" <http://tuckatcop15.wordpress.com/2009/12/09/what-is-the-link-between-businesses-and-climate-change-by-professor-anant-sundaram/>

3) Sundaram's COP15 blogs: "Why should MBAs care about climate change?" <http://tuckatcop15.wordpress.com/2009/12/10/why-should-mbas---or-more-generally-business-schools---care-about-climate-change-by-professor-anant-sundaram/>

#### Supplementary Reading (skim, or use as additional reference):

1) Stott et. al, 'Detection and Attribution of Climate Change: A Regional Perspective,' *Wiley Interscience Review*, 2010. ([link](#))

2) Nordhaus, "Summary for the Concerned Citizen" pp. 10 – 35. ([http://nordhaus.econ.yale.edu/dice\\_mss\\_072407\\_all.pdf](http://nordhaus.econ.yale.edu/dice_mss_072407_all.pdf))

3) IPCC, '*Fourth Assessment Report – Summary for Policy Makers*,' 2007 ([link](#))

4) World Meteorological Organization, '2000-09: The Warmest Decade.' ([link](#))

### **Session 2: The Emerging Climate Economy**

*Wed, Mar 24 Mini-case: "Vital Communities," Tuck School of Business, 2010. ([link](#))*

- What are likely the key elements of the emerging 'climate economy'?
- What are the risks and value-creation opportunities for businesses from the climate economy? How could climate change affect a company's growth strategies?
- What new types of financial instruments and financial markets might evolve from efforts to address climate change?
- Read the *Vital Communities* case, and think about the following questions:



- What do 'Scope' 1, 2, and 3 mean?
- Examining the Scopes 1, 2, and 3 emissions data for the firms in the Energy Subcommittee of Vital Communities, what conclusions do you draw? Specifically, do you see any differences between 'Beds,' 'Services' and 'Manufacturing'?
- What recommendations would you have for this group of firms, if you were advising them on a set of collective action solutions to reduce their carbon footprint?

Required Reading:

- 1) Barrett, "The Coming Global Climate-Technology Revolution," *Journal of Economic Perspectives*, Spring 2009 ([link](#))
- 2) S. Pacala and R. Socolow, "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies," *Science*, August 2004. ([link](#))
- 3) Perold, Reinhardt, Hyman, "The Carbon Market," HBS Note 9-209-064, 2009 ([link](#))

Supplementary Reading (skim, or use as additional reference):

- 1) IPCC Annexes, Annex 2 "Glossary," Annex 3 "Key Acronyms" (pp. 76 - 91) ([link](#))
- 2) McKinsey & Co, 'Carbon Productivity Challenge,' 2008 ([link](#))

**Session 3: Corporate Climate Strategy**

**Mon, Mar 29 Case: Carbon Footprint and Clean Energy at Simon Pearce, Tuck School of Business, 2010.** ([link](#))

- Carbon footprint measurement
- GHG Protocol
- NPV analysis of wind and solar energy
- Developing a corporate climate strategy
- DETAILED STUDY QUESTIONS TO BE SEPARATELY HANDED OUT.

**Session 4: Economics and Regulation of the Climate Economy: The Costs and Benefits of CO<sub>2</sub> Abatement**

**Tues, Mar 30**

This session will cover the essential economics of carbon, from the concept of externality to alternative economic control methods.

- The CBO study (read only the 'Summary') is a very good review of the two main control techniques, either a carbon tax or a "cap and trade" system. In principle, the two methods are equivalent. Yet they differ in important practical ways, and each has its own supporters.
- See if you can understand why they should be similar, and also how they are likely to differ.
- Think of which industry and company you might end up working for: do you have reason to prefer one method over the other?

- There are three bills in the US Congress related to cap and trade: Waxman-Markey (which passed the House), Boxer-Kerry (did not get off the ground in the Senate), and the Cantwell (newly proposed) bills. Look the links to the summary of the three bills and think about which one, if any, you would recommend, and why.

Required Reading:

- 1) CBO Study, "Policy Options for Reducing CO<sub>2</sub> Emissions," February 2008. ([link](#)) (Read only the "Summary" section; skim the rest.)
- 2) McKinsey, "Business Strategies for Climate Change," *McKinsey Quarterly*, April 2008, pp. 24 - 33. ([link](#))
- 3) (SKIM) Cantwell cap-and-trade bill summary (PPT presentation): ([link](#))
- 4) Comparison of Cantwell and Waxman-Markey bills: ([link](#))

Supplementary Reading (skim, or use as additional reference):

- 1) Metcalf, 'Market-based Policy Options to Control GHG Emissions,' *Journal of Economic Perspectives*, Spring 2009. ([link](#))
- 2) Tol, 'The Economic Effects of Climate Change,' *Journal of Economic Perspectives*, Spring 2009. ([link](#))

**Session 5: Climate Change, Sustainability, and Corporate Value Creation**

**Mon, Apr 5 GROUP WRITE-UP DUE. (More details will be handed out separately)**

- Climate change initiatives are closely linked to broader sustainability initiatives within companies. Needless to say, such initiatives become *strategic* only if and when they can be linked to the underlying business model, and to the value-creation process in the company. Tuck recently organized a Forum to address precisely this (see the Allwin Initiative link under 'Readings'):
  - What does 'sustainability' mean?
  - How are sustainability initiatives linked to shareholder value creation, specifically, revenues, costs, investments?
  - Where does it work well, where is it still a struggle?
  - What are the lessons learned from successful implementation?
- "Fossil Fuel Beta (FFβ)" assignment:
  - Derivation and interpretation of FFβ;
  - Pairwise comparisons of firms' FFβ in various industries;
  - Constructing plausible arguments for the signs and magnitudes of FFβ
  - Implications for managing the effects of energy use and carbon footprint on cash flows and cost of capital

Required Reading:

- 1) Allwin Initiative, "Corporate Sustainability Practices and Shareholder Value," <http://mba.tuck.dartmouth.edu/initiative/pdf/ExecEnvSustainForum2009SummaryReportFinal.pdf>
- 2) Dataset for 'FFβ' assignment (To be uploaded)
- 3) CFO Magazine, "What Goes Down, Must Come Up", December 2008: [http://www.cfo.com/article.cfm/12667500/c\\_12671474](http://www.cfo.com/article.cfm/12667500/c_12671474)

Supplementary Reading (*skim, or use as additional reference*):

1) Darbee and Field, 'Climate Change for Policy Makers and Business Leaders,' 2010.  
([link](#))

**Session 6: Corporate Best Practice: 1**  
**Tue, Apr 6** **Visitor: Frank O'Brien-Bernini**  
*Chief Sustainability Officer & Chief Innovation Officer,*  
*OWENS CORNING*  
(<http://sustainability.owenscorning.com/>)

**Session 7: Corporate Best Practice: 2**  
**Mon, Apr 12** **Visitor: Robert Simpson**  
*Chief Financial Officer,*  
*WASTE MANAGEMENT*  
([http://www.wm.com/wm/environmental/renewable\\_energy.asp](http://www.wm.com/wm/environmental/renewable_energy.asp))  
(<http://www.wm.com/wm/investor/presentations/index.asp>)

- On the investor relations website, scroll down to the section titled "Conference Calls/Webcasts" and click on "March 8, 2010 - Raymond James Institutional Investor Conference, Orlando, FL"

**Session 8: International Policy Coordination Issues**  
**Tue, Apr 13** **Presentation by The Tuck COP15 Team** (*Collier, DeRosier, Hegde, Pamliotto, Parks, Sahoo, Sundaram*)

- Lessons learned from COP15 (Copenhagen Summit) and looking ahead to COP16 (Mexico City).
- Why should MBAs care?

Required Reading:

1) Nick Robins, "The Ugly Duckling," HSBC Global Report (Climate Change), 2010 ([link](#))  
2) TuckatCOP15 blog: <http://tuckatcop15.wordpress.com/> (Skim the during- and post COP15 assessments and impressions of the Tuck team).

**Session 9: Poster Session**  
**Mon, Apr 19** **Student Project Summaries**

- DETAILS TO FOLLOW.

## Appendix: BCC and ESR Criteria

**Re:** Request to make **Business and Climate Change** an ESR-eligible course

I request that “Business and Climate Change” be considered ESR-eligible. I will use the Committee’s three key criteria to make the case: social dimensions of business problems, the tools, concepts and frameworks to make practical, reasoned decisions when faced with dilemmas, and the ability to justify those decisions in language that is both clear and persuasive.

### Climate Change, Business, and Society

Few issues loom larger at the intersection of business and society than climate change. The implications for MBAs graduating today are both multifaceted and significant. First, there is a large, emerging ‘climate economy’ wherein it is possible that large amounts of wealth will be created by firms that get in front of it, and lost (or not captured) by those that fall behind. Given that the careers of MBAs graduating today will likely unfold in a world with a price on ‘carbon,’ our students must understand the potentially wide-ranging implications of the climate economy.

Second, unlike other very important global issues – such as, say, hunger or poverty – climate change is one where firms have the most significant cause-and-effect relationship. Firms are the largest emitters of greenhouse gases, and they will ultimately be the ones to develop the technologies and deploy the resources to solve the problem. The social dimensions of this cause-effect relationship are complex. By being the primary cause of emissions, firms are imposing an externality on society, the costs of mitigating and adapting to which could largely be borne by those not a party to the private contracts that led to those emissions in the first place.

Third, firms being at the center of a climate economy emerging in the following three areas – becoming carbon efficient in existing (fossil fuel-based) operations, developing and deploying new sources of non-fossil fuel based energy, and finding ways to capture/store the emitted carbon – makes it replete with dilemmas for society. On the one hand, firms’ actions will be closely linked to innovations to create greater efficiencies, to eliminate waste, and to find new sources of clean energy to manage value chains, all arguably good outcomes. On the other hand, investments in energy efficiency suffer from market failures such as absence of credit, information asymmetries, agency problems, concentrated costs/diffused benefits and the like. Since growth is not possible without energy and energy is currently dependent on low-cost fossil fuels, efforts to address this – e.g., putting a price on carbon, shifting to cleaner but higher-cost sources of energy – increases the cost of economic betterment for billions around the globe. Carbon capture and storage and other geo-engineering solutions can produce unintended (and potentially runaway) social and political consequences.

### Tools, Concepts, Frameworks

The course adopts primarily an economics/finance lens of the links between the firm, society, and climate change. The tools, concepts and frameworks reflect those viewpoints.

The first key concept is that of an externality that private actors will have to internalize in their decisions. This naturally leads to a discussion of the ways in which society might seek to get private actors to internalize those costs via both market and non-market solutions (e.g., carbon taxes, carbon markets via cap and trade, mandates), and in turn to the implications for firm value. Value, in turn, results from cash flows and cost of capital, leading us to think about how responses to climate change – mitigation, adaptation, fossil fuel use, price on carbon, mandates – affect a firm’s revenues, costs, decisions to invest for the future (e.g., capital budgeting, M&A, new product introduction, retooling business processes, redesigning supply and customer chains), and market risks resulting in a change in cost of capital.

The course also addresses and explores the tensions that arise between a 'CSR' point of view to address climate change versus a 'competitive strategy' view: a tension that Porter refers to as a 'philanthropist's' versus a 'strategist's' view.' While the former is driven by the imperative to 'do good' but may fall short on its links to the value creation process in the firm, the latter is driven by wanting to 'do well' but prone to 'greenwashing,' lobbying, seeking opportunities for regulatory arbitrage, etc kinds of behavior. A key theme and set of ideas we explore is how 'doing good' and 'doing well' need not be in conflict with each other when it comes to the strategies that firms could adopt, and how we might seek out those 'spheres of confluence.'

*Ability to Justify in Clear, Persuasive Language*

The course focuses on four straightforward questions: (i) If you are the CEO, CFO, or board member of a value-maximizing company, should you care about climate change? (ii) If so, why – i.e., how will you make the case to your stakeholders that it matters? (iii) Then, how – i.e., what frameworks will you use to guide your decisions to develop and implement strategies to deal with the issue? And, (iv) What can you learn from companies that are successfully getting in front of this?

This, in turn, leads to clear questions such as: What is the impact of the climate change initiative in increasing revenue? What is the impact on decreasing cost? What is the impact of the initiative on the investment spending practices and processes that the company uses to achieve its future growth – e.g., capital budgeting practices, new product introduction or new market entry, product and process innovation, M&A, supply chain configuration? What is the impact, if any, in reducing the risks of future cash flows, i.e., on cost of capital? Finally, even if these links are being measured and managed well, how do we communicate it to key corporate stakeholder constituencies so as to ensure buy-in and ongoing support?

The concepts and frameworks that I use are all based on mainstream ideas addressed in courses that students have already taken, for example ManEc (externality; price v. quantity regulation), Finance (link to shareholder value creation), GEM (international macroeconomic coordination), Statistics (fossil fuel beta), Strategy (Porter, McKinsey, etc. on CSR, sustainability, climate change). Bringing in practitioners implementing policies related to climate change in their companies anchors course concepts in the world of practice.