

Clayton Munnings

APPOINTMENTS

Undergraduate Research Assistant, Cornell University	Sep 2009 to May 2011
Intern, International Emissions Trading Association	Oct 2011 to Dec 2012
Policy Associate, International Emissions Trading Association	Jan 2012 to Feb 2012
Policy Advisor, International Emissions Trading Association	Mar 2012 to May 2012
COP 19 Delegate, SustainUS	Sep 2013 to Dec 2013
Guest Lecturer, Monroe Community College	Oct 2011 to Oct 2013
Research Assistant, Resources for the Future	Jun 2012 to May 2014
Research Associate, Resources for the Future	Jun 2014 to Jun 2016
Senior Research Associate, Resources for the Future	Jun 2016 to Present
Short Term Consultant, World Bank	Sep 2015 to Sep 2016
Fellow, Clean Energy Leadership Institute	Sep 2016 to Dec 2016
ChinaFAQs Expert, World Resources Institute	Nov 2014 to Present
Research Fellow, Environment for Development	Oct 2015 to Present

EDUCATION

Cornell University
B.S. in Science of Natural and Environmental Systems
Concentration in Environmental Economics
Graduated *Cum Laude* with Distinction in Research for Thesis in Applied Economics

PROFESSIONAL SUMMARY

Clayton Munnings is a Senior Research Associate at Resources for the Future (RFF) where he leads research on domestic and international environmental policies. Clayton's research troubleshoots policies that reduce carbon emissions in an effort to improve their environmental effectiveness and economic efficiency. He focuses on ex-ante design evaluations and ex-post performance assessments of climate policies (e.g., cap-and-trade programs, carbon taxes, carbon offsets) and energy policies (e.g., renewable portfolio standards, feed-in tariffs, production tax credits, incentives to reduce methane emissions from the natural gas sector, and the management of inactive oil and gas wells).

Clayton's research in environmental economics has led to over a dozen RFF discussion papers (including one on China's cap-and-trade pilot programs, which was the most widely downloaded RFF discussion paper in 2015) and publications in academic journals including *Energy Policy*, the *International Journal of Environmental Policy and Law*, and the *Texas A&M Journal of Real Property Law*. He has many manuscripts which are undergoing review or revisions at leading economic and environmental journals. His expertise has resulted in numerous invited presentations, citations in trade publications and popular media, as well as consulting work for the World Bank, Environmental Defense Fund, and Motu Economic and Public Policy Research.

Before joining RFF, Clayton worked at the International Emissions Trading Association (IETA), a non-profit organization composed of over one hundred leading energy and financial companies that endorse a global price on carbon through cap-and-trade. Starting off as an intern, Clayton immediately showed strong leadership and creative problem-solving skills, leading to two promotions in eight months—ultimately achieving the title of Policy Advisor. During Clayton’s time at IETA, he represented members in the implementation of California’s cap-and-trade program. In this capacity, Clayton led policy and strategy meetings, helped achieve consensus among members, and wrote public comments to the California Air Resources Board.

SKILLS

- Quantitative Policy Analysis: data cleaning (R, Stata); data visualization (R, Gephi); statistical analysis (EViews, R and Stata); and, symbolic algebra (Mathematica).
- Qualitative Policy Analysis: securing research funding; reviewing economic, policy, and scientific literatures; writing academic publications; public speaking to general and academic audiences; and, engagement with stakeholders and media.
- Policy Advocacy: leading listening sessions with members; reaching consensus among stakeholders; and, crafting and implementing lobbying strategies.

SELECTED COURSES

- Mathematics: Calculus I, II, and III (UIUC), Linear Algebra (NOVA CC), Introduction to Probability, and Introduction to Proof Writing (GWU).
- Economics: Intermediate Microeconomics, Intermediate Macroeconomics, Environmental Economics, Dynamic Optimization, Environmental Economics, Econometrics I, and Econometrics II (USA Graduate School).
- Coding: The Data Scientist’s Toolbox (JHU), R Programming (JHU), and Getting and Cleaning Data (JHU).

ACADEMIC SERVICE

- Referee: Environment and Development Economics, Carbon Management, Economics of Energy & Environmental Policy.

OTHER ACTIVITIES AND INTERESTS

- Former professional paintball player, amateur creative writer, and aspiring Californian.

SELECTED FUNDRAISING

273 K from Vulcan Inc / The Paul G. Allen Foundation for “Inactive Oil and Gas Wells: How Significant an Environmental Threat?” with Alan Krupnick and Jhih-Shyang Shih.

48 K from the Energy Foundation for “Informing Allowance Allocation Design in Pilot CO₂ Trading Programs in Shenzhen, Guangdong, and Shanghai” with Richard Morgenstern and Zhongmin Wang.

SELECTED ACADEMIC PUBLICATIONS (INCLUDING THOSE UNDER REVIEW)

Goulder, L. H., Morgenstern, R., **Munnings, C.**, and J. Schreifels, “China’s Nationwide Cap-and-Trade System: Goals and Challenges”, forthcoming, *Economics of Energy & Environmental Policy*.

Burtraw, D., **Munnings, C.**, Palmer, K., and M. Woerman, “Linking Carbon Markets with Different Initial Conditions”, Under Review at *Journal of the Association of Environmental and Resource Economists*.

Munnings, C., Acworth, W., Kim, Y. G., Neuhoff, K. and O. Sartor, “Pricing Carbon Consumption: A Review of an Emerging Trend”, Resources for the Future Discussion Paper 16-49, Under Review at *Climate Policy*.

Cosbey, A., Fischer, C., Droege, S., and **C. Munnings**, “Developing Guidance for Implementing Border Carbon Adjustments”, Revisions Requested at *Review of Environmental Economics and Policy*.

Linn, J., Leard, B. and **C. Munnings**, “Explaining the U.S. Petroleum Consumption Prize”, Resources for the Future Discussion Paper 16-38, Revisions Requested at *The Energy Journal*.

Krupnick, A., Ho, J., McLaughlin, K., Muehlenbachs, L., **Munnings, C.**, and J. S. Shih, “Heterogeneity of State Regulations on Inactive Oil and Gas Wells”, Revisions Requested at *Environmental Science & Technology*.

Munnings, C., Morgenstern, R., Wang, Z., and X. Liu, 2016, “Assessing the Design of Three Carbon Trading Pilot Programs in China”. *Energy Policy* 96: 688-699.

Linn, J., and **C. Munnings**, 2014, “Lessons of Wind Policies in Texas”. *Texas A&M Journal of Real Property Law*.

Munnings, C., 2012, “Greenhouse Gas Policy under the Clean Air Act”. *International Journal of Environmental Policy and Law*.

SELECTED DISCUSSION PAPERS

Munnings, C., and A. Krupnick, *forthcoming*, “Comparing Options to Regulate Methane Emissions from the Oil and Gas Sector in the United States”, Resources for the Future Discussion Paper.

Krupnick, A., Ho, J., McLaughlin, K., Muehlenbachs, L., **Munnings, C.**, and J. S. Shih, 2016, “Plugging the Gaps in Inactive Well Policy” Resources for the Future Report.

Munnings, C., Leard, B., and A. Bento, 2016, “The Net Emissions Impact of HFC-23 Offset Projects from the Clean Development Mechanism”, Resources for the Future Discussion Paper [16-01](#).

Burtraw, D., Bushnell, J. and **C. Munnings**, 2015, “State and Regional Comprehensive Carbon Pricing and Greenhouse Gas Regulation in the Power Sector under EPA’s Clean Power Plan”, Resources for the Future Discussion Paper [15-31](#).

Burtraw, D., Palmer, K., **Munnings, C.**, Weber, P., and M. Woerman, 2013, “Linking by Degrees: Incremental Alignment of Cap-and-Trade Markets” Resources for the Future Discussion Paper [13-04](#).

Munnings, C., Morgenstern, R. Wang, Z., and X. Liu, 2014, “Assessing the Design of Three Pilot Programs for Carbon Trading in China.” Resources for the Future Discussion Paper [14-36](#).

Morris, D., and **C. Munnings**, 2013, “Progressing to a Fair Carbon Tax: Policy Design Options and Impacts to Households,” Resources for the Future Issue Brief [13-03](#).

Linn, J., Fell, H., and **C. Munnings**, 2012, “Designing Renewable Electricity Policies to Reduce Emissions”, Resources for the Future Discussion Paper [12-54](#).

OTHER ACADEMIC WORK

Zetterberg, L., Mandell, S., Marcu, A., **Munnings, C.**, and S. Roth, 2013, “The Evolution of the EU System of Emissions Trading and the Future International Emissions Market”, Research Report for the Swedish Government.

Siikamäki , J., **Munnings, C.**, and J. Ferris, 2012, “Competitiveness Impacts of Climate Policy”, Resources for the Future [Background](#).

Siikamäki , J., **Munnings, C.**, Ferris, J., and D. Morris, 2012, “Climate Policy, International Trade and Emissions Leakage”, Resources for the Future [Background](#).

Siikamäki , J., Ferris, J., and **C. Munnings**, 2012, “Kyoto Flexibility Mechanisms: Clean Development Mechanism and Joint Implementation”, Resources for the Future [Background](#).

Siikamäki , J., Ferris, J. and **C. Munnings**, 2012, “Land Use, Land-Use Change and Forestry Offsets”, Resources for the Future [Background](#).

Siikamäki , J., **Munnings, C.**, and J. Ferris, 2012, “The European Union Emissions Trading System”, Resources for the Future [Background](#).

Siikamäki , J., Burtraw, D., Maher, J., and **C. Munnings**, 2012, “The US Environmental Protection Agency’s Acid Rain Program”, Resources for the Future [Background](#).

Munnings, C., 2012, “Distorted Markets and Deadweight Loss under the American Clean Energy and Security Act of 2009: Allowance Allocations to Local Distribution Companies”, Undergraduate [Thesis](#) for College of Agriculture and Life Sciences.

SELECTED PRESENTATIONS

“Research in Developing Countries: Ongoing and Aspirational Work at Resources for the Future” 2016, Presentation at Environment for Development Annual Meetings in Addis Ababa.

“The Net Emissions Impact of Clean Development Mechanism HFC-23 Projects in China” 2015, Presentation at Environment for Development Academic Conference in Shanghai.

“Linking Toward a Global Climate Architecture?” 2015, (with Gilbert Metcalf, Gernot Wagner and Thomas Sterner), Organizer and Discussant for Policy Session at the European Association of Environmental and Resource Economists Annual Meeting in Helsinki.

“Experience with Pricing Carbon Consumption in California and China” 2015, Presentation at Climate Strategies Meeting at DIW Berlin.

“[Carbon Cap and Trade in China: From Experimentation to Nationalization?](#)”, 2014, (with Dick Morgenstern, Zhongmin Wang, Jeremy Schreifels and Liu Shaung), Organizer and Presenter for Public Forum at Resources for the Future in Washington DC.

“The Role Think Tanks Play in United States Climate Policy Research”, 2014, Presentation at Chinese Pavilion at the United Nation’s 20th Conference of Parties in Peru.

“Hope After Warsaw? The Clash of Emerging Domestic Carbon Prices, Framework for Various Approaches and a New Market Mechanism”, 2013, Internal Presentation at Resources for the Future in Washington DC.

“Can Regulators Overcome Barriers to Linking Carbon Markets?”, 2013, Moderator (and Co-Organizer with the International Emissions Trading Association) for a Panel at the United Nation’s 19th Conference of Parties in Warsaw.

“Linking by Degrees and Formal Linkage: Are California and the Regional Greenhouse Gas Initiative Ready to Link?” 2013, Presenter (and Co-Organizer with the International Emissions Trading Association) for a Panel at the United Nation’s 19th Conference of Parties in Warsaw.

“Business and Youth Partnership? Advancing Clean Air Act Climate Policy in the United States and Climate Policy in the International Arena” 2013, Presentation for a Panel at the United Nation’s 19th Conference of Parties in Warsaw.

“Designing Adaptive Climate Policy in China: Lessons from the United States”, 2013, Presentation at a China – U.S. Workshop at Resources for the Future in Washington DC.

“Linking Without Trade? California’s Contribution to Linkage by Degrees”, 2013, Moderator (and Co-organizer with the International Emissions Trading Association and University of California Davis) for a Panel in Sacramento, California.

SELECTED MEDIA COVERAGE

Fairley, Peter. "[If Carbon Pricing Is So Great, Why Isn't It Working?](#)" *Ensia* 12 July 2016.

Garside, Ben. "[HFC-23 CDM Projects May Not Be That Bad After All, Study Suggests](#)" *Carbon Pulse* 19 January 2016.

Plumber, Brad. "[The Paris Climate Talks Won't Solve Global Warming. Here's What They'll Do Instead](#)" *Vox* 30 November 2015.

Koch, Wendy. "[Why New U.S.-China Climate Steps Matter: Three Things to Know](#)" *National Geographic* 25 September 2015.

He, Amy. "[On the Road to Paris](#)" *China Daily USA* 4 September 2015.

Koch, Wendy. "[How U.S. Climate Plan Can Follow China and Europe—Or Not](#)" *National Geographic* 14 August 2015.

He, Amy. "[Earth Was the Hottest Ever in June](#)" *ChinaDaily USA* 22 June 2015.

Friedman, Lisa. "[China's Carbon Trading Markets Hold Promise, But Need Major Revisions—Study](#)" *Climate Wire* 4 December 2014.

Gonzalez, Gloria. "[China's Grand Carbon Trading Experiment Experiences Highs and Lows](#)" *Ecosystem Marketplace* 22 October 2014.

Wolff, Eric. "[China's Cap-and-Trade Pilots Offer Model for Potential National Carbon Market](#)" *SNL Energy* 26 September 2014.

Stelzer, Irwin. "[The Case for a Carbon Tax](#)" *The Weekly Standard Blog* 17 July 2014.

Jervey, Ben. "[They're Going Hungry: A Chat With the Young Americans Fasting at COP 19](#)" *Huffington Post Green Blog* 22 November 2013.

SELECTED PROJECTS

[Carbon Cap and Trade in China: From Experimentation to Nationalization?](#)

January 2013 to January 2016

Resources for the Future

Clayton led writing and outreach and helped to fundraise and formulate a project that assessed the design of three of China's seven cap-and-trade pilot programs and analyzed whether China might successfully adopt cap-and-trade at the national level. Clayton and his colleagues, Richard Morgenstern and Zhongmin Wang, met with dozens of Chinese regulators in Beijing, Shanghai, Shenzhen and Washington DC to inform their research, culminating in an RFF

discussion paper (which is now published in the academic journal *Energy Policy* and was the most widely downloaded climate and energy paper on RFF's website in 2015) and a well-attended public forum. The paper and forum were notably cited in trade publications and popular media.

[Experts Forum on the Clean Power Plan](#)

June to November 2014

Resources for the Future

Clayton managed RFF's Expert Forum, which asked experts from academia, non-profits and the private sector to share their contrasting and constructive views on ten important design issues for EPA's Clean Power Plan. The blogs that resulted from the expert's forum were among the most highly read at RFF. In turn, these blogs informed RFF's eighty pages of [comments](#) to the EPA on its Clean Power Plan, which Clayton co-authored along with numerous RFF fellows.

[The Coming US Carbon Market: Planning for Ex Post Analysis](#)

June 2012 to October 2013

Resources for the Future

The Alfred P. Sloan Foundation asked RFF to anticipate which data policy analysts would need to determine whether a future U.S. carbon market had been successful. For this project, Clayton completed six issue briefs and co-organized a workshop that convened leading researchers, federal policymakers and state regulators to discuss how to best plan for ex post analysis of three policy instruments (a cap-and-trade market, a carbon tax, and Section 111 carbon rules) across three different criteria: environmental efficacy, cost effectiveness, and distributional impacts.

[The World's Carbon Markets: A Case Study Guide to Emissions Trading](#)

November 2012 to June 2013

International Emissions Trading Association and Environmental Defense Fund

Together with Ruben Lubowski from EDF, Clayton started a joint project between IETA and EDF to create detailed case studies of the world's existing and proposed cap-and-trade markets. Clayton and his coauthors (Peter Sopher from EDF and Anthony Mansell from IETA) collectively finished eighteen case studies. These case studies summarize the design of all existing cap-and-trade markets and several proposed cap-and-trade markets including Brazil, China, India, Japan, Kazakhstan and Mexico. This initial set of case studies has undergone several additional iterations and has been cited widely by policymakers and analysts around the world.

SELECTED COMMENTS TO REGULATORS

Burtraw, D., Fischer, C., **Munnings, C.**, Palmer, K., Paul, A., Richardson, N., Shih, J. S. and R. C. Williams III, 2014, "Comments to the US Environmental Protection Agency on Its Proposed Clean Power Plan", Resources for the Future [Report](#).

Burtraw, D., **Munnings, C.** and K. Palmer, 2012, Harmonizing Cap and Trade Markets, [Comments](#) to the Regional Greenhouse Gas Initiative.

Burtraw, D., Woerman, M. and **C. Munnings**, 2012, Price Containment in Cap and Trade Markets, [Comments](#) to the Regional Greenhouse Gas Initiative.

Derwent, H., Sullivan, K., **C. Munnings**, Hunter, D., A. Mansell and R. Fraser, 2012, “International Emissions Trading Association – Comments on Linking California and Quebec’s Cap-and-Trade Programs”, [Comments](#) to the California Air Resources Board.

Derwent, H., Sullivan, K., **C. Munnings**, Hunter, D., A. Mansell and R. Fraser, 2012, “International Emissions Trading Association – Comments on Draft Amendments to the Regulations for Linking with Quebec Cap-and-Trade Program”, [Comments](#) to the California Air Resources Board.

Derwent, H., Sullivan, K., **C. Munnings**, Hunter, D., A. Mansell and R. Fraser, 2012, “International Emissions Trading Association – Comments on Draft Amendments to the Regulations for Linking with Quebec Cap-and-Trade Program (Proposed Regulation Order Appendix A.1 & A.2)”, [Comments](#) to the California Air Resources Board.

SELECTED MAGAZINE AND TRADE PUBLICATIONS

Munnings, C., 2014, “China National Carbon Scheme Will Need Clarity on Cap”, [China Dialogue](#).

Sekar, S., **Munnings, C.**, and D. Burtraw, 2014, “Capitalising on Carbon Revenues”, Article for [International Emissions Trading Association](#).

Mansell, A. and **C. Munnings**, 2013, “The Linking Rainbow: Evaluating Parallel Approaches to Expand Carbon Markets”, Article for the [International Emissions Trading Association](#).

Morris, D. and **C. Munnings**, 2013, “Designing a Fair Carbon Tax”, Article for [Resources Magazine](#).

SELECTED BLOG POSTS

- Flannery, B., Kopp, R. J. and **C. Munnings**, 2015, “[Questions for COP 21: Before Paris and After](#)”
- **Munnings, C.** and Anthony Paul, 2015, “[What to Watch For In EPA’s Final Clean Power Plan: Trading](#)”
- Linn, J. and **C. Munnings**, 2014, “[Climate Benefits from the Production Tax Credit](#)”
- Linn, J. and **C. Munnings**, 2014, “[Do Renewables Policies Promote Valuable Investments?](#)”
- **Munnings, C.**, 2014, “[Cap and Trade in China: How Might It Work?](#)”

- Burtraw, D. and **C. Munnings**, 2013 “[What Value Does a Potential Pacific Coast Carbon Price Have?](#)”
- Linn, J. and **C. Munnings**, 2013 “[How Much Do Fuel Economy Standards Reduce Greenhouse Gas Emissions?](#)”
- Richardson, N. and **C. Munnings**, 2013, “[Obama’s Biggest Climate Move Wasn’t In His Speech](#)”
- Burtraw, D. and **C. Munnings**, 2013, “[Linking Carbon Markets Offers More Than Economic Benefits](#)”
- **Munnings, C.** and N. Richardson, 2013, “[Climate in the Second Inaugural: Don’t Get Too Excited](#)”
- Morris, D. and **C. Munnings**, 2013, “[Doha in Context: A Brief History of Climate Negotiations](#)”
- Linn, J., and **C. Munnings**, 2012 “[Why the Wind Tax Credit is a Bad Way to Cut Carbon](#)”
- Burtraw, D. and **C. Munnings**, 2012, “[California’s First Carbon Auction Successful](#)”
- Burtraw, D. and **C. Munnings**, 2012, “[Linking EU-Australia Carbon Markets Offers New Beginning and Challenges for Global Carbon Pricing](#)”