

Earth Institute Executive Education Program in Conservation & Environmental Sustainability

Spring 2017 COURSES

MODULE 1

Environmental Markets: The Nexus of Business, Regulation, and Sustainability

Richard Weihe, Managing Partner, Karbone

The results of the 2016 U.S. Presidential Election indicate the US EPA's Clean Power Plan will likely not survive. Challenges to environmental regulation and related markets are not new but rather have been commonplace since the Clean Air Act was established in 1970. This course reviews the regulatory, political and business contexts of today's environmental markets using real world examples and actual case studies. In addition, the course reviews potential benefits, limitations, and pitfalls in addressing environmental problems and corporate sustainability objectives through environmental markets. Learn the history of the development of environmental markets and how they are used to solve environmental problems. Topics include air quality, climate change cap and trade, water pollution, and renewable energy mandates.

- Meets: Tuesdays, Jan. 17, 24, 31, Feb. 7, 14 (5 sessions; 6:30-8:30PM)

Richard Weihe has over twenty years' experience in the energy and environmental sectors in roles of investment management and advisory services, energy and environmental commodity trading, and engineering consulting project management. At Karbone he oversees the firm's practices in brokerage and research, and spearheads business development activities in capital advisory services. Prior to Karbone Rich was a senior investment analyst with RNK Capital where he originated and directed investment analysis on private equity and project-related energy and environmental credit transactions associated with solar, wind, geothermal, biogas, and biofuels related technologies. Prior to RNK Capital, Rich held commercial and management positions in the energy and environmental risk management sectors. Rich began his career at AECOM, where he managed water resource and environmental projects in the energy and waste management sectors. He holds an M.B.A. from Northwestern University, a M.S. in Geosciences from Ohio State University and a B.A. in Geosciences from Denison University.

Global Change

Dr. Shahid Naeem, Director, Earth Institute Center for Environmental Research and Conservation (EICES); Professor of Ecology, Evolution and Environmental Biology, Columbia University

Earth's vibrant and resilient environment reflects the workings of an extraordinary beautiful and complex system made up of forests, grasslands, deserts, farmlands, plantations, and much more. The environment we experience is the end product of the myriad biological, geological, chemical, and physical processes that occur everywhere – on

land and in the sea. And all of these processes are intricately linked together by trillions of plants, animals, and microorganisms. The result a fantastic, dynamic, adaptive environmental system within which we have flourished for hundreds of thousands of years.

All that is changing.

Environmental change is so massive that the world, compared to just a couple hundred years ago, is hardly recognizable anymore. The extent of change is global in scale and so extreme that this period in time, this epoch, has been named the *Anthropocene*. While it's not official until approved by the International Commission on Stratigraphy and the International Union of Geological Sciences, the term has nevertheless been adopted by everyone.

But what does it mean to be living in the Anthropocene?

Is this the best of times? Is this the worst of times? Yes, it seems there are scary diseases like Zika and Ebola, but we have medicines and cures for diseases like plague, polio, and small pox, and even HIV no longer spells certain death. Yes, there are a billion people hungry, without enough water and health care to survive, but widespread famines are a thing of the past and there is enough food for everyone now. It's true that the Sixth Mass Extinction is happening, but there have been mass extinctions before; so does it really matter?

And what does the Anthropocene for the Trump Administration, the United Nations, and Global Trade?

Our course objectives are to derive a formal scientific understanding the structure and dynamics of environment in the Anthropocene. We will consider how the environment works, focusing on five major elements of global change - climate, land transformations, mass extinction, emerging disease, and ecological invasions.

- Meets: Wednesdays, Jan. 18, 25, Feb. 1, 8, 15 (5 sessions; 6:10-8:10PM)

Dr. Shahid Naeem is the Director the Earth Institute Center for Environmental Sustainability (EICES). He oversees the development of research science programs that benefit from the combined resources of the Consortium for Environmental Research and Conservation. Naeem studies the ecological and environmental consequences of biodiversity loss. He is interested in how changes in the distribution and abundance of plants, animals and microorganisms affect ecosystem functions and, by extension, how ecosystem services are affected. He is actively involved in bringing the science of biodiversity and ecosystem function to conservation, restoration and policy development. He is author, co-author and editor of over 100 scientific publications and co-chaired the UN Millennium Assessment's Biodiversity Synthesis Report published in 2005. Naeem is also a professor of ecology in Columbia University's Department of Evolution, Ecology and Environmental Biology. He received his Ph.D. from the University of California, Berkeley; was a postdoctoral fellow at Imperial College of London, the University of Copenhagen and the University of Michigan; and served on the faculties of the University of Washington and the University of Minnesota before coming to Columbia in 2003.

Coffee from seed to cup: A case study in sustainable Agriculture

Dr. Amanda Caudill, Coffee Research Scientist

Coffee is a tropical crop grown in regions of the world that host high levels of biodiversity. The way that coffee farms are managed can have a large impact on the local wildlife communities that live in and around coffee farms. Although consumers in import countries pay top dollar for their cup of coffee, many coffee farmers across the globe struggle to support themselves and their families. Can coffee farms be managed in a way that protect wildlife habit and the environment, while at the same time producing a viable, profitable crop for the farmers?

This course explores this question and others related to the complexities surrounding coffee sustainability. We will investigate the coffee industry from seed to cup and have an opportunity to connect with coffee farmers, researchers, roasters/shop owners, and consumers. We will examine coffee farms through case studies; assess coffee certifications such as shade grown, organic, Rainforest Alliance, and Smithsonian Bird Friendly; learn about socio-economics and environmental issues associated with coffee; and gain an understanding of the challenges that farmers face and the nuances involved in defining sustainable coffee.

- Meets: Thursdays, Jan. 19, 26, Feb. 2, 9, 16 (5 sessions; 6:10-8:10PM)

Dr. Amanda Caudill is a conservation ecologist and research scientist and an alumni of Columbia University and the CERC certificate program. She has recently completed a postdoctoral fellowship with the Smithsonian Institution. She has worked with coffee sustainability from seed to cup and has conducted field work in coffee-growing regions of India, Costa Rica, and Mexico. She is interested in sustainable agriculture as a means to provide wildlife habitat, foster ecosystem services, and conserve biodiversity, while simultaneously providing for human livelihoods.

MODULE 2

Hacking the Meat System

Brian Kateman, President Reducetarian Foundation

If the meat system is broken, how can we fix it? Proposed solutions are plentiful, but few seem to agree on one. Some argue for investing in more humane and eco-friendly practices or in the future of food technology like plant-based or cultured animal products; others advocate for leaving meat off our plates entirely. But if we are to develop and deliver effective solutions, the engagement of stakeholders representing all motivations and areas of expertise is critical. At its core, this course explores how we can unite diverse perspectives in human health, environmental sustainability, and animal welfare with emerging scientific tools to create a more equitable, compassionate, and sustainable food system.

- Meets: Tuesdays, Feb. 21, 28, Mar. 7, 21, 28 (5 sessions; 6:10-8:10PM)

Brian Kateman is Co-Founder and President of the Reducetarian Foundation (RF), where he

oversees the day-to-day operations of the organization. A TEDx speaker and leading expert on the food system, he has appeared in hundreds of media outlets including *The Huffington Post*, *National Geographic*, *Los Angeles Times*, *Fox News* and *The Daily Mail*. He is editor of the forthcoming book *The Reducetarian Solution* (Penguin Random House, 2017). Brian received a Master of Arts in Conservation Biology from Columbia University and a Bachelor of Science from the Macaulay Honors College at The City University of New York.

Principles, Tools, and Approaches for a More Resilient World

Thomas Murtha, Senior Adviser, *Preventable Surprises*

The great acceleration of human impacts on a finite planet is straining the resilience of earth system processes that support human society. Humanity has now crossed at least four planetary boundaries affected by climate change, loss of biosphere integrity, land system change, and altered biochemical cycles.

This is a survey course that examines the squeeze on planetary boundaries and introduces essential principles, tools, approaches, and resources for providing individual citizens with the agency to address sustainability issues in their homes, workplaces, and communities. Through the course lectures, readings, videos, and discussions, we will examine how individuals and civil society can better align lifestyles and societal values to enable a more resilient and diverse world. Topics may include climate change, freshwater use, land system use change, rate of biodiversity loss, economic benefits from the wise management of ecosystems, sustainable capitalism, and developing new narratives for humanity in the Anthropocene Era that enable prosperity, diversity, and good lives.

- Meets: Wednesdays, Feb. 22, Mar. 1, 8, 22, 29 (5 sessions; 6:10-8:10PM)

Thomas Murtha has over thirty-five years' experience as a journalist, investment banker, institutional investment manager, director of corporate engagement at the Nature Conservancy, and as an environmental/investment activist working on issues related to the systemic and transition risk of climate change. At *Preventable Surprises*, he works with institutional investors and other NGOs to engage publicly traded companies in North American, Europe and Asia on the adoption of 2°C transition plans in accordance with the science-based targets of the UN COP21 Agreement. Prior to *Preventable Surprises*, his work at the Nature Conservancy focused on working with Royal Dutch Shell on approaches to replacing grey with green living infrastructure for improved coastal resilience and landscape scale mitigation of oil and gas development as well as scenario planning for climate change adaptation and pathways to net zero emissions. Also at TNC, Thomas worked with BHP Billiton to develop the Martu Living Deserts Project in Australia, the Valdivian Coastal Reserve in Southern Chile, and the Sustainable Rivers and Forest Initiative in Texas. At T. Rowe Price Associates in Baltimore, he was a portfolio manager for the International Stock Fund and the Global Technology Fund. Earlier in his career, Thomas was an investment banker in Asia for Jardine Fleming, a joint venture of Hong Kong based conglomerate Jardine Matheson and London based bank Robert Fleming. Prior to his career in finance, Tom was journalist for McGraw Hill Publications and Dun and Bradstreet where he covered technology and finance beats in Asia. Tom is an occasional contributor of op-ed articles to Institutional Investor, Pensions and Investments, Greenbiz.com, and the Huffington Post.

Introduction to Evolution: Darwin to DNA

Dr. Sergios-Orestis Kolokotronis, Assistant Professor of Epidemiology, SUNY Downstate Medical Center

Are Darwin's findings still relevant today? How could he have come up with the idea of evolution through natural selection if he did not know about DNA or how heredity works? And how did heredity work, again...? Now that we have decoded the human genome, what do we know – and still don't – about life? This course will lead students on a broad exploration of evolutionary science, seeking to answer questions such as these, among many others. We will review the history of evolutionary thought and science, genetics and heredity, the main mechanisms by which evolution acts, and the tools and findings of evolutionary research, including the evolution of humans and microbial pathogens.

-Meets: Thursdays, Feb. 23, Mar. 2, 9, 23, 30, (5 sessions, 6:10-8:10PM)

Dr. Sergios-Orestis Kolokotronis is an Assistant Professor of Epidemiology at the School of Public Health at SUNY Downstate Medical Center located in Brooklyn. He maintains secondary affiliations at the American Museum of Natural History, NYU, and the NY Botanical Garden. His research group focuses on molecular evolution of biological diversity by employing modern tools drawn from genomics and bioinformatics to investigate the tempo and mode of evolution leading to adaptation of organisms to their environment. Having worked on endangered species, his interests are now focused on the application of evolutionary thinking to questions in public health, such as infectious diseases and pathogen vectors, as well as polluted environments and their microbial communities. He has coauthored numerous scientific publications that can be accessed at <http://kolokolab.org>. He received his PhD, MPhil, and MA in Ecology and Evolutionary Biology from Columbia University; and was a postdoctoral fellow at the American Museum of Natural History's Sackler Institute for Comparative Genomics.

SPRING BREAK (BERMUDA FIELD EXPERIENCE)

Coral Reef Ecology: Bermuda

Kaitlin Baird, Science Officer, Bermuda Institute of Ocean Sciences

Located at the Bermuda Institute of Ocean Sciences (BIOS), this five-day field course introduces participants to the world of corals. Learn the biology and microbiology of corals, the ecology of coral communities, anthropogenic factors that impact coral reefs and coral reef restoration and sustainability. Daily snorkeling excursions enhance the learning experience.

Coral reef ecosystems around the world contain some of the highest biodiversity on our planet. Not only are coral reefs home to thousands of marine species but are important to our daily lives through tourism, fisheries, carbon sequestration and coastal protection, just to name a few. The decline of coral reefs has become a pressing concern for scientists and managers alike as environmental and human threats to these ecosystems increase. Understanding the complex ecological relationship of coral reefs is a cornerstone to understanding how they will respond in the coming decade.

Bermuda is an ideal location for an introduction to Coral Reef Ecology because it is the northern most tropical reef in the world and on the cutting edge in research on the effects of

climate change on coral reefs. The course is an introduction to the coral reef as an ecosystem and some of the many organisms that inhabit and sustain the reef. Students learn about the basics of corals and their growth, reproduction and recruitment. Accompanying lectures are hands on snorkels to see up close what the coral species and reef ecosystems of Bermuda look like. Additionally demonstrations allow for students to become the scientist and learn techniques that marine biologists use to analyze corals and food chains.

Students also visit the Bermuda Aquarium and Zoo and Nonsuch Island to learn more about the various projects being studied on the islands. Students are exposed to the many threats to these ecosystems and some of the ways that conservation efforts have aided their preservation. ****Not Available via Distance Learning****

Course takes place in Bermuda from March 15 - 19, 2017. Additional course fees apply. Related Course Links:

- Bermuda Institute of Ocean Science (BIOS)

<http://www.bios.edu>

MODULE 3

Introduction to Environmental Policy

Bipasha Chatterjee, Adjunct Lecturer, CUNY Hunter College

The past two decades have seen an increasing amount of attention given to the importance of environmental policy and planning in promoting a sustainable future for the planet. This course examines contemporary domestic and international issues that require environmental policy and planning solutions. Explore policy responses to local and global environmental problems such as biodiversity loss, clean air and water, and climate change. Examine how governments of industrial and developing countries, non-governmental organizations, the scientific community, and the private sector shape environmental policy through a wide range of economic, social, and political factors. Topics include environmental law, economics, human population growth, and public health.

-Meets: Mondays, Apr. 10, 17, 24, May 1, 8 (5 sessions, 6:10-8:10PM)

Bipasha Chatterjee is an environmental economist. She has extensive experience working on environmental and climate change policy issues. She has led projects in the areas of climate change mitigation action, Kyoto protocol and clean development mechanism (CDM), renewable energy related research and advisory work in the United Kingdom as a public sector consultant at AEA Technology (currently known as Ricardo-AEA). She is currently teaching the Environmental Economics and the Urban Economics courses (MA & BA) at Hunter College, City University of New York. Bipasha is qualified in Development Economics and Environmental Policy and Regulation from the University of Cambridge, UK and the London School of Economics, UK.

Biomimicry: Innovative by Nature

Lisa Dokken, Private Consultant

Nature inspired solutions, including biomimicry, is an interdisciplinary approach which

uses time tested strategies from nature that have evolved over 3.8 billion years and translates them into how we can design products, materials, processes and ecosystem strategies to solve human problems. The idea of nature-based solutions and the value of ecosystems are being used to reframe policy debates, climate change, regulatory frameworks, corporate strategies, and urban planning to name just a few areas where nature is becoming a driver for change. At its most transformative, nature based solutions are helping us to find ways that fit, align and integrate the human species into the natural process of Earth. Weather permitting we will spend some time outside of the classroom learning the discipline of looking to nature for solutions.

-Meets: Wednesdays, Apr. 5, 12, 19, 26, May 3 (5 sessions, 6:10-8:10PM)

***Lisa Dokken** is a senior sustainability professional with broad experience in developing and managing innovative sustainable development programming across the globe, including over a decade working for the UN Development programme implementing sustainable development programming in over 30 countries. Lisa lived and consulted in Asia, North and South America for over 15 years in the built environment, conservation, policy analysis, strategy planning and advocacy. Lisa holds a Masters in Public Policy and Administration from Columbia University and was one of the first to receive a Masters in Science in Biomimicry from Arizona State University in 2015.*

Food Security and Sustainability

***Clare Sullivan**, Deputy Research Director, Agriculture and Food Security Center, Earth Institute*

There is increasing concern about the sustainability of food production systems and the quality of the diets that they are producing. The second Sustainable Development Goal (SDG) to “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” recognizes the close linkages between community’s health and wellbeing, sustainable food production and healthy ecosystems. The SDG agenda will guide development policy for the next fifteen years and has ambitious targets under SDG2 for empowering smallholder farmers, promoting gender equality, ending rural poverty, ensuring healthy lifestyles, and increasing the resilience of agricultural systems to climate change. Yet these relationships are complex and both social and ecological trade-offs and synergies are still not well-understood. This course will cover current state of policy, frameworks for assessment, and appropriate indicators for nutrition sensitive sustainable agriculture.

-Meets: Thursdays, Apr. 6, 13, 20, 27, May 4 (5 sessions, 6:10-8:10PM)

***Clare Sullivan** is the Deputy Research Director at the Agriculture and Food Security Center at Columbia University. The Center’s mission is to analyze the tradeoffs and synergies between sustainable agricultural intensification, livelihoods and ecosystem services—searching for options that minimize negative environmental effects while increasing yields and improving livelihoods. Clare led the development of integrated soil health indicators for Vital Signs Africa, a \$10 million, two year Gates Foundation funded project. She has also founded an urban agriculture organization, Feedback Farms, and worked on projects with the National Park Service in the US, the CGIAR system in the Peruvian Andes and Amazon Basin, and with UNEP in Haiti. She has a Masters in International Affairs from Columbia University’s School of International and Public Affairs, with a concentration in environmental science and policy.*

MODULE 4

Forest Management and Conservation

Dr. Matt Palmer, Senior Lecturer, Department of Ecology, Evolution & Environmental Biology, Columbia University

Forests are a vitally important habitat for much of the world's terrestrial biodiversity. They are sources of goods, such as timber and food, and provide services, such as carbon storage and water filtration. However, forests worldwide are threatened by overexploitation, conversion, climate change, and invasive species. Learn key issues in forest ecology and management through the local environment of Black Rock Forest. Participate in an all-day field trip to Black Rock Forest to study how pathogens and other invasive species affect forest structure and function. Local observations are scaled up to consider how these issues affect forest conservation on a global scale. ****Not Available via Distance Learning****

*****Meets: Thursdays, May 11, 18 (6:10-8:10PM) & Saturday, May 13 (9AM-4:30PM; includes travel to and from Black Forest) – 3 sessions total*****

Dr. Matt Palmer is a faculty member in the department of Ecology, Evolution and Environmental Biology (E3B) at Columbia University. His research interests are based in plant community ecology, with emphases on conservation, restoration and ecosystem function. Palmer has done research on the effects of microtopography and plant interactions on centimeter-scale diversity patterns in fens of the New Jersey Pinelands. He is currently doing research on the community dynamics and ecosystem functions of urban forests and green roofs, the population biology of rare plants and the effects of forest canopy disturbance on understory structure and function.

Sustainability of Local Food Systems

Jeffrey Potent, Adjunct Professor, School of International and Public Affairs, Columbia University

The locavore movement is alive and well in New York, its environs and across the nation. Green markets, CSAs, farm to table restaurants and established retailers and restaurants now offer a dizzying array of locally produced meats, libations, veggies, cheeses, breads, and other value-added products. Foodies, environmentalists, farmers and economic development professionals are all singing the praises of this revolution in the way many of us buy our food and what we choose to eat.

In this course, we will explore this exciting and hopeful trend, with a focus on how it is contributing to the sustainable development of our region. We will address this topic from three key perspectives:

1. The land -- How is the local food movement serving to keep productive land in agriculture, and farmed in a manner that restores and protects soil health, water and air quality, and helps to mitigate and adapt to climate change?

2. The nutrition value of the food -- Is locally produced food more accessible and nutritious than other alternatives?
3. The economy -- Does local agriculture provide economic opportunities and stability for farmers, distributors, processors, retailers and restaurateurs?

From this exploration, we will gain perspective on how this phenomenon must evolve to best serve people, planet and profit so that it will continue to expand as a critical element of an emerging sustainable economy and society.

-Meets: Tuesdays, May 16, 23, 30, June 6, 13

***Jeffrey Potent** develops and teaches courses in corporate sustainable development, systems theory, natural capital, and sustainable agriculture at the Earth Institute and the School of International and Public Affairs. He also consults and speaks publicly on corporate and agricultural sustainability and water quality. Mr. Potent formerly led corporate partnerships for the US Environmental Protection Agency (EPA), Office of Water in Washington DC, advancing sustainable and market-based approaches to environmental protection. Earlier in his career, he served as EPA/US Department of Agriculture (USDA) liaison, facilitating collaboration among Land Grant Universities, EPA, USDA, and other agencies and academic institutions. In 2001 he established the regional component of the USDA National Integrated Water Quality Program, serving as regional coordinator and member of the program's national leadership team. Before that, he led an energy and environmental engineering consulting practice, managed pollution prevention programs for a large environmental agency, and planned satellite and cable infrastructure for a global telecommunications corporation.*

Chemical Pollution in the Biosphere

***Dr. James Cervino**, Marine and Earth Scientist at Restoration and Conservation Advisement, Visiting Scientist in Marine Pathology and Climate Change at Woods Hole Oceanographic Institution*

This class will highlight how chemical toxins, specifically atmospheric and groundwater pollution, moves through ecosystems, into food webs, onto our dinner table and eventually into our cell tissues. We will also identify how “Global Warming” and chemical pollution is changing major ecosystems, marine & terrestrial food chains, precious natural resources and human health. In the last century, we witnessed the incredible losses to our precious marine ecosystems and natural resources due to industrial chemical pollution. We have witnessed a major disruption the chemical balance on earth that sustains life, as we know it within the biosphere. We will explain how earth’s basic ecosystems function, and how any relax in EPA regulations will cause a decline in human health, a collapse in marine food chains, contaminate our groundwater, atmosphere, and cause a temperature imbalance that will accelerate global warming.

-Meets: Wednesdays, May 17, 24, 31, June 7, 14 (5 sessions, 6:10-8:10PM)

***Dr. James M. Cervino** received a Bachelors degree from New York University that focused on Earth Science and Physical Anthropology, a Masters Degree from Boston University in Marine Biology and a Ph.D. in Marine Science from University of South Carolina. His research interest involves, the investigation of global warming induced climate change, chemical pollution and its links to disease, compromised immunity and cancer in marine habitats globally. His current*

research interest, is to understand how chemicals move through food chains and the biological and ecological effects of chemical pollution, thermal stress and disease on tropical marine life, and wetlands, specifically marine plants and Cnidarians globally. He recently started an environmental consulting firm in New York City and is a Visiting Scientist at the Woods Hole Oceanographic Institution.